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AERIAL AGE WEEKLY

Vol. 8, No. 1 SEPTEMBER 16, 1918 10 CENTS A COPY



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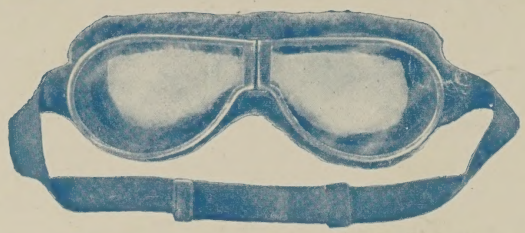
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INDEX TO AERIAL AGE

VOLUME 8

A PAGE

Aces:
List of American 938
Tell Exploits in Washington 1265
Activities of the Philadelphia Naval Aircraft Factory (Illus.) 666
Addresses:
Kettering to Address Detroit S. A. E... 63
By C. F. Kettering 295
At Aero Club Banquet 1155
President Wilson Speaks for Liberty Loan 163
Detroit S. A. E. Addressed By G. Douglas Wardrop 608
At the Manufacturers' Aircraft Banquet 941
S. A. E. Annual Meeting 983
Captain Bartlett's Address to Brooklyn Rotary Club 1025
Future Air Traffic and Necessary Regulations to Govern Same (By Alan R. Hawley) 1067
Major Charles J. Biddle to National Geographic Society 1115
Aeronautics in Peace and War (By Dr. Thomas Eldridge) 1133
Elmer Sperry to Address Detroit S. A. E. 1161
Aerial Delivery: See Transportation.
Aerial Gunnery and Trick Flying School... 116
Aerial Gunnery at Taliaferro Field (Illus.).. 32
Aerial Hunting:
New Jersey to Prohibit 1114
Hunts Whale with Aeroplane 1114
Wolf Hunt by Aeroplane 1114
Aerial Mail:
Service in August Without Mishap 69
Postmaster Patten Handing Mail to Aviator Max Miller (Illus.) 131
Promoters May Be Busy 370
Aeroplane Postage Stamps 370
Douglas Fairbanks Flies to New York... 370
New York-Chicago Service This Winter. 370
As Others See Us 370
Possibilities 370
French Aerial Mail 418
Denver to Have 418
Chicago Aerial Mail 478
At 43c Per Mile 520
Notes On 520
Opinion of London "Aeroplane" 520
Kipling's Dream May Be Reality 520
Ready for New York-Chicago Service.. 563
5,000 H.P. Planes May Carry Mail Across Atlantic 563
A Check Which Should Be Honored This Year 563
Max Miller and Edward V. Gardner (Illus.) 611
Plan Fifty New Lines 605
Navy Starts New Service 611
Seek $1,500,000 for Air and Motor Truck Mail 611
From Australia 611
Peace Will Boom 611
Spain-United States Service 611
New York to Chicago at Reduced Rate.. 659
New Cost Figures 659
Developments in Great Britain 659
Postmaster Burleson Reports Plans.... 704
Cost of Service 704
One Hundred and Twelve Additional Planes 704
New York-Chicago Aero Mail 758
Over Two Millions for Lines 758
Christmas Cards by Aero Mail 758
Terminus Removed to Belmont Park... 810
Record Flight 810
Boston-Chicago Service is Next 854
Aero Mail in Belgium 854
Chart New York-Chicago Route 854
Christmas Aerial Mail 854
Brazil to Have Service 854
Aero Mail for Chili 854
Resume Service to Fleet 854
Increases 600 Per Cent 854
Atlantic to Pacific, Across Isthmus of Panama 854
New York-Chicago Service, Official Statement 896
Italy to Have Aerial Mail with Colonies 896
Standard Type Plane (Illus.) 896
Aerial Mail Service 940
Six-Cent Stamp, New 940
Preparation for New York-Chicago Service 984
Military Planes Not Suitable 984
Want Low Compression Motors 984
Five Landing Fields 984
London-Buenos Aires Trip Planned.... 1028
Postmarks on Aerial Mail 1028
Postmaster Otto Praeger (Illus.) 1028

PAGE
New Terminal Approved 1072
Service Between United States and Brazil Urged 1072
Alaska Seeks 1117
Brazil Authorizes 1117
Cuba to Have Service to Key West.... 1117
Trans-Adriatic Service 1117
Captain Wm. F. Jones 1117
St. Louis Establishes Landing Place.... 1161
Plan Australia-London Service 1161
Asks Bids to Modify D.H. 4's 1265
Air Mail for Honduras 1265
Four French Lines in Operation 1265
A Questionnaire 1347
French Service Officially Started 1347
Receives Bid for D.H. 4 Changes 1347
United States Post Office Aerial Mail Service. Monthly Report of Operation and Maintenance: July, 1918—p. 117; August, 1918—p. 370; September, 1918—p. 520; October, 1918—p. 659; November, 1918—p. 758; December, 1918—p. 1161.
Aerial Research Emphasized By Col. Bane.. 1070
Aerial Transport Company 853
Aero Carnival at Garden City 287
Aero Club of America:
To Have Club in Paris 164
Gives $6,000 to Promote Efficiency in Aviation 282
Awards Medals of Merit 428
Has Extensive Program 557
Offers Intercollegiate Aeronautic Trophies (Edit.) 699
Renews Effort to Get Proper Aerial Laws 754
To Send Aerial Expedition to Arctic... 875
Organizes Aerial Transportation Committee 892
Reception to Lt. Col. Wm. A. Bishop (Illus.) 1025
Plans Complete for Banquet (Edit.)... 1112
Addresses At Banquet 1155
National and International Races 1156
Mackay Trophy Awarded to Captain Rickenbacker 1156
Medals of Valor and Diploma Awarded.. 1156
Medals of Merit Awarded 1156
Banquet in Honor of Captain Rickenbacker (Illus.) 1158
Creates Airmen Memorial Fund (Edit.).. 1326
Aero Club of the Northwest: Arranging Aerial Landing Places 1069
Aerodromes: The Shotwell Electric Weather Vane for 672
Aero Engines: See Motors.
Aeromarine Development (Illus.) 303
Aeromarine Motor: See Motors.
Aeronautic Convention to Follow Aero Show (Edit.) 1325
Aeronautic Course At Brooklyn Polytechnic.. 807
Aeronautic Exposition:
To Be Held in February 851
Army and Navy to Participate 937
Plans Progressing 981
Plans Maturing 1025
Plans Developing 1113
Descriptive Illustrated Article 1327
To Be Followed By Aeronautic Convention (Edit.) 1325
Aeroplane Exhibits (Illus. Desc.) 1328
Aeronautical Day at Brooklyn Rotary Club.. 1025
Aeronautical Inventions 660
Aeronautical Radiator (Illus. Desc. Line Drawings By S. R. Swenson) 1256
Aeronautics. Third Annual Report of the National Advisory Committee 174
Aeronitis: Pp. 78, 136, 187, 232, 328, 390, 434, 484, 532, 582, 628, 678, 728, 782, 827, 870, 914, 958, 1002, 1046, 1090, 1136, 1178, 1270, 1332, 1354.
Aeroplane and Seaplane Engineering (Illus. Art. By Commander H. C. Richardson, U. S. N. 1171
Aeroplanes:
Assembly System In Training Course... 165
Of Three Allied Nations and Germany (Illus.) 176
Plant for Chicago 286
Give Soldiers News 472
Vs. Automobile (Illus.) 472
As Possible Bootleggers 703
First Flights (Illus. Art.) 723
Added to Equipment of Northwest Mounted Police 1088
Bring Food to Belgium 1088
Used By Oil Man 1116
To Make 300 Miles Per Hour 1221
Used in France for Relief Work 1221
Show for Chicago 1222
American Aeroplanes and Seaplanes (Illus. Desc.) 1225

PAGE
Exhibits At Aero Show (Illus. Desc.)..1328
Aeroplanes (Types):
Aeromarine:
Model 40-T Flying Boat Equipped with 100 H.P. Curtiss OX Engine (Illus.)..1160
Model 40-T Flying Boat Designed for Sport (Illus.) 1239
Navy Training Seaplane of Single Float Type (Illus.) 1239
Armstrong Whitworth Quadruplane with 130 H.P. Clerget Engine (Illus.) 956
Avro: Making a Bank (Illus.) ..... Cover No. 8
Bellanca:
35 H.P. Biplane (Illus. Desc. Line Drawing) 1118
Biplane (Illus. Showing Warping Wings and Streamline Body) 1233
Brequet:
Biplane with Renault Motor (Illus.) 481
Biplane (Illus. Desc. with Line Drawings) 612
Bombing Planes in Factory (Illus.) 626
Caproni:
First Liberty (Illus.) 120
Bomber with Three Liberty Motors (Illus.) 120
American Made (Illus.) 166
Bombing Biplane (Illus.) 176
Biplane in Winter Surroundings (Illus.) 562
Christmas:
Strutless Biplane (Illus. Desc. Line Drawing) 948
Bullet 1026
Strutless and Wireless Biplane (Illus.)..1238
Curtiss:
Sportsman Type Flying Boat (Illus.)...1087
H-16 Flying Boat with Two Liberty Motors (Illus.) 1230
Model H-A Hydro (Illus.) 1236
Model H-A Mail Machine (Illus.) 1236
Model K Triplane with Curtiss Engine (Illus.) 808
Model K Triplane Scout (Illus.) 901
Three-quarter View of Model K Triplane (Illus.) 1237
Model K Triplane with Curtiss K-12 Engine (Illus.) 1237
MF Flying Boat with Curtiss OX 5 Engine (Illus.) 981
MF Flying Boat Used in Coastal Training Work (Illus.) 1230
NC-1 Flying Boat with Three Liberty Engines (Illus.) 807
NC-1 Returning from a Trip (Illus.)... 895
NC-1 Flying Boat (Illus.) 859
Front View of Power Unite, NC-1 Flying Boat (Illus.) 955
NC-1 (Illus.) 1224
NC-1 Returning from a Trip (Illus.)...1238
Dayton-Wright:
Honeymoon Express On Display At Aero Show 1113
Honeymoon Express (Illus.) 1235
Messenger Biplane (Illus.) 1220
Sedan (Illus.) 1234
DeHaviland:
V Single Seater (Illus. Desc. Line Drawings) 70
9 On Record Flight 214
4 on Exhibition (Illus.) 286
4 Radiator Ornament (Illus. Model News) 781
4 with Liberty 12 Engine (Illus. Desc. Line Drawings) 860
4 Built By Standard Aero Corp. (Illus.) 860
4 with 400 H.P. Liberty 12 Engine (Illus.) 852
DeHaviland 5 (Illus.) 1086
10 with Two Rolls Royce Motors (Illus.) 1159
Biplane with Rolls Royce Engine (Illus.) 1113
Some American Planes (Illus.) 1224
DeHaviland Fours Meet Battle Test (Edit.) 59
D.H. 4 Statement By Major General W. A. Kenley 214
Liberty-Motored 4 (Illus.) 1228
Cockpits on D.H. 9 Machine with Which Altitude Record Was Made (Illus.)...1344
Farman: "Aerobus" Used in Paris-London Service (Illus.) 1268
F.B.A.P. Flying Boats (Illus.) 1352
Fokker: Single Seater Biplane—Type D7 (Illus. Desc. Line Drawings) 424

PAGE

Ford Motored Aeroplane (Illus. Desc. By John F. McMahon). Pp. 677, 727, 781, 826, 869, 913, 957, 1001, 1045, 1089, 1135.
French A.R. Biplane (Illus. Desc. Line Drawings) 374
Gallaudet:
D-4 Light Bomber (Illus.)..... 903
D-4 Seaplane Bomber (Illus. Desc.)... 817
D-4 Bomber (Illus.)..... 1230
Gotha: (Illus.)..... 573
Halberstadt: Two-seater, By G. Douglas Wardrop (Illus. Desc.)..... 130
Handley Page:
Bomber "Langley", Constructed By Standard Aircraft Corp. (Illus.).... 288
Twin Liberty-Motored Bomber, Type O-400 (Illus. Desc., Line Drawing)...1082
Bomber with Two Motors (Illus.).....1228
H. S. 2 L. Flying Boat, Constructed By the Standard Aircraft Corp. (Illus.). Pp. 663 and 1232.
LePere:
Fighter with 400 H.P. Liberty Engine (Illus. Desc. Line Drawing)..... 904
Planes at Bolling Field..... 1161
Fighter Equipped with Liberty Engine (Illus.) 1238
Letard: French Biplane with Two Hispano-Suiza Engines (Illus.)..... 174
L. F. G.: German Machines (Illus.)..... 572
Loughead: Plane to Cross Continent (Illus. Desc.) 373
Martin:
K-III Single Seater (Illus. Desc. Line Drawings) 759
K-III Scout (Illus.)..... 1117
K-III Scout, Powered with A.B.C. Engine (Illus.)..... 1226
Cruising Bomber (Short Desc.)..... 1346
Glenn L. Martin:
Twin Liberty-Engined Bomber (Illus.).. 756
Liberty-Motored Bomber (Illus.)..... 1071
Biplane with Two Liberty Motors (Illus.) 1232
Bomber, Twin Liberty-Motored (Illus.)..1233
J. V. Martin: Tractor (Illus.)..... 1239
Murray-Carns: Biplane (Illus.)..... 893
Nieuport: French Scout (Illus.)..... 1044
O. E. C.:
80 H.P. LeRhone Training Scout (Illus.) 1114
LeRhone Training Scout (Illus.)..... 1226
Pemberton-Billing: Quadrupleplane (Illus.)..1175
Roland Chaser D-11. (Illus. Desc., Drawings By G. Douglas Wardrop)..... 310
Salmson:
Biplane Equipped with Hispano-Suiza Motor (Illus.)..... 675
Two Place Combat Machine (Illus.)... 868
Sopwith: Flight of "Camels" (Illus.)..... 529
Spad:
Machines Lined Up at Aerodrome (Illus.) 177
Combat Machine with 200 H.P. Hispano-Suiza Motor (Illus.)..... 518
Machine with Hispano-Suiza Motor (Illus.) 767
Standard:
Plane Used in Mail Service (Illus.).... 896
ME-1 Scout. (Illus.)..... 901
E-4 Mail Aeroplane (Illus. Desc. Line Drawings) 1036
E-4 Mail Plane with Hispano-Suiza Engine (Illus.)..... 1238
ME-1 Defense Scout (Illus.)..... 1237
Sunstedt-Hannevig:
Trans-Atlantic Cruiser (Illus.)..... 1115
Seaplane (Illus. Desc. Line Drawing)..1162
Seaplane for Trans-Atlantic Flight (Illus.) 1236
Tandem Biplane (Illus.)..... 937
Thomas-Morse:
Type S-4. Advanced Training Machine (Illus.) 901
Type S 4-E with 80 H.P. LeRhone Motor (Illus.)..... 1226
Voisin:
Bombing Plane, Twin-Motored (Illus.).. 477
Pusher, Used for Photography and Bombing (Illus.)..... 1134
Zeppelin: Bombing Plane (Illus.)..... 124
Zeppelin Bombing Biplane (Illus. Desc. Line Drawings) 122
Aero Radio Surveying (Edit.)..... 1155
Aero Squadron in France, American (Illus.) 321

PAGE

Aero Squadron Makes Flight to San Bias, R. P..... 1267
Aero Stations: See Naval Stations.
Agriculture, Aeroplane in..... 1221
Air Battle Staged for Motion Pictures..... 808
Air Chiefs at Rockwell Field (Illus.)..... 133
Air Conference..... 1088
Aircraft Appropriations and Cancellations (Edit.) 699
Aircraft Celebration..... 121
Aircraft Motor Lubrication..... 63
Aircraft Production:
Board Needs Men..... 1338
Col. Mar Heads Board..... 851
United States Naval..... 1027
Aircraft Trade Review:
Pp. 1315, 63, 121, 167, 215, 286, 372, 419, 474, 519, 562, 610, 658, 703, 757, 809, 851, 895, 939, 983, 1027, 1071, 1116, 1160, 1222, 1346.
Air Division Discovers Surplus Materials... 301
Air Fete Over Fleet in Hudson..... 853
Air Fighters to Use Cameras..... 1312
Airfone, The Meissner (Illus. Desc.)..... 1081
Air Mechanics Arming British Bombing Plane (Illus.)..... 1327
Airmen in Civil Life (Edit.)..... 979
Airmen Memorial Fund (Edit.)..... 1326
Airscrews: See Propellers.
Air Service:
Open for Enlistments..... 118
Histories 981
History to Be Written..... 1070
Units to Sail..... 893
Honor Roll..... 1255
Airships: See Balloons and Dirigibles.
Airship Report (By Admiral Mayo)..... 1170
Air Stations: See Naval Stations.
Albany to Have Municipal Aerodrome..... 807
Allied Air Control..... 114
Allied Air Service to Pool Resources..... 115
Allied Instructors Finish Their Work..... 473
Allom, Sir Charles..... 1345
Aluminum Company..... 1346
American Aeronautics Great Future (Edit.)..1217
American Aviation Camps in France..... 116
American-British Gage Bureau..... 703
American Official Communique..... 473
Americans Cited By General Pershing..... 61
American Victories in the Air..... 214
Appropriations:
Aircraft Appropriations and Cancellations (Edit.)..... 699
For Large Dirigibles Should Be Granted (Edit.) 1111
Naval Bill Under Consideration.....1160
Armstrong, Miss Helen F. (Photo)..... 810
Army:
Squadron Turns Southward..... 873
Airmen to Be Instructed Yearly..... 807
Aviators Fly Over Grand Canyon.....1344
Reorganization Bill.....1026
Arnold, Col. Henry.....1070
Artillery Observation (Art.)..... 382
Assembly Room, Naval Aircraft Factory.... 669
Assignments:
Pp. 1326, 74, 131, 178, 227, 318, 385, 430, 479, 527, 577, 624, 674, 724, 777, 822, 866, 910, 954, 998, 1042, 1086, 1132, 1174, 1266, 1350.
Attache, First Aviation.....1221
Australian Aeronautic Courses.....1158
Austria Hungary and Germany Surrender (Edit.) 461
Aviation Camp in Michigan..... 62
Aviation Carnival at Belmont Park..... 413
Aviation School, Princeton..... 657
Aviation Section, New York Police..... 702
Aviators:
Guests of Manufacturers.....1311
Help Lafayette Day Celebration.....1311
American Outwits Fourteen Hostile Airplanes 1312
Americans in Ninety-four Flights..... 61
Americans Bomb Conflans..... 61
Aero Club to Have Club for Aviators in France..... 164
Training for Contact Patrol (Illus.).... 320
Americans in France (Edit. New York Times) 366
Break Flight Records..... 538
Decorated 608
Americans Get British D.F.C..... 656
Six Hundred Naval Airmen Return.... 755
Naval Fliers..... 755
In Fox Hunt..... 808
Returning from Abroad.....1133
Athletic Equipment for..... 115
National Memorial Clubhouse.....1221
Cadets' Pay.....1219

B

Bahl, Lieut. James.....1221
Baker, Lieut. Hobey..... 852

PAGE

Baker, L. M.....1116
Baker, Secretary Newton D.
In France Regarding Aircraft Situation (Edit.) 1309
Ruling as to Enlisted Men.....1159
Balloons:
Observers Needed..... 62
Cable Used as Aerial..... 116
Winches (Military Aerostatics)..... 65
Caquot (Illus.)..... 576
Section Congratulated..... 702
New Gas for Army and Navy..... 757
Goodyear S-11 Makes Record..... 853
Experience of a Balloonist..... 955
Italian Observation Balloon.....1133
Ban on Civilian Flying Lifted.....1027
Ban on Promotions Explained.....1070
Bane, Col. Thurman Harris (Photo.)..... 852
Aerial Research Emphasized By.....1070
(Photo) 297
Barnhart, G. Edward.....1116
Bartholf, Major John C. P. (Photo)..... 937
Bartlett, Captain Robert A.
In Liberty Loan Campaign..... 214
Proposed Flight..... 559
Arctic Expedition..... 850
Roosevelt Memorial Expedition (Edit.).. 935
Bartlett Hayward Company.....1160
Bartsch, Alfred H.....1160
Bassett, Rear Admiral Frederick D.....1113
Batts, Carl, His Father and Brother (Illus. Group) 755
Belmont Park, Photograph Taken at.....1324
Benefit for Air Corps..... 213
Bent, P. P.: Re-designed Ford Motor (Illus. Model News).....1177
Biddle, Major Charles J., Addresses Nat'l. Geographic Society.....1115
Bids:
Asked for Service Equipment..... 851
For Army Planes..... 939
Bijur Electric Starter for Aero Engines (Illus. Desc. Line Drawings).....1073
Binoculars Being Returned..... 807
Biographies 1350
Bishop, Col. William A.
Commercial Uses for Aeroplanes.....1025
Aero Club Reception to (Illus.).....1025
Black, Lieut. H. K.: Military Aerostatics, pp. 65, 119, 169, 218, 325, 371, 475, 521, 576, 707, 811, 1166.
Blood, Major H. E. (Photo)..... 296
Transferred to Finance Division.....1116
Board of Sales Review.....1114
Bomber Makes 143 M.P.H..... 286
Bombing: Light and Dark Work..... 62
Book Reviews:
Internal Combustion Manual..... 619
Lubrication of Internal Combustion Engines 619
High Speed Combustion Engines..... 619
Automotive Magneto Ignition..... 619
Aeroplane and Aero Engines..... 619
Submarine Vessels..... 619
Aero Engines, Magnetos and Carburetors 619
The Wireless Telephone..... 756
The A B C of Aviation..... 756
Aeroplane Characteristics..... 756
Aeroplane Construction and Assembly.. 756
Model Making.....1133
Gasoline and Kerosene Carburetors.....1133
The Skyrider.....1183
The Aeroplane.....1183
The Flying Fighter.....1183
Bosch Magneto Company.....1027
Boulton, B. C.: The Manufacture of Veneer and Plywood.....1240
Bradford, Lieut. George L. (Photo)..... 214
Brake, Aeroplane.....1219
Brant, Col. C. G. (Photo).....1167
Britain's Part.....1312
British Training Camp (Illus.)..... 475
British Award D.S.O. to American..... 526
British Flier Sets Altitude Record..... 893
British Had Flying Tank..... 608
British Output of Aeroplanes.....1315
British R.A.F. Squadron (Illus.)..... 176
Brogan, Graham W..... 939
Brooks, Lieut. Ray..... 116
Brown, George M. (Photo).....1223
Brown Carburetor (Illus. Desc.).....1223
Bureau of Aircraft Production:
Regarding Aircraft Program..... 665
Consolidation of Branches..... 851
Changes 893
Bureau of Industrial Research..... 1026
Bureau of Standards.....1160
Burgess Aeroplane Plant Burns..... 519
Burns, Ensign Arthur Childs (Photo)..... 115
Burkhardt, Otto M.: Problems of Crankshaft Design (Illus. Desc.)..... 376
Burrage, Charles W.: Importance of High Thermal Efficiency in Aeroplane Engine Design and Construction (Desc. Art.) 1168

C

PAGE

Cadet:
Fliers Have Choice..... 657
Aviators' Pay.....1219
Camp Green to Be Enlarged..... 115
Campbell, Lieut. William T.:
(Photo) 701
With Biplane (Photo)..... 867
Canada Buys Flying Boat for Fire Patrol... 215
Capehart, Lieut. Commdr. Wadleigh.....1345
Caproni Aeroplanes: See Aeroplanes.
Caproni Plans Made Known At Aero Club Meeting (Edit.)..... 510
Carburetion, A New Principle in (Illus. Desc. Brown Carburetor).....1223
Cartoons:
Manufacturers' Aircraft Association Banquet, By Norman E. Jennett..... 900
Sketches from Life at the Aero Show, By Norman E. Jennett.....1335
Castor Oil Industry.....1113
Cato, J. L..... 853
Caywood, D. G.....1026
Chamberlain, Senator.....1025
Champion Spark Plugs.....1346
Chapman, Victor.....1265
Characteristics of Leading Aero Engines (Table) 1252
Charavay, Frederick (Illus.)..... 312
Charlton, Brig. Gen. Lionel E. O.....1221
Charting Air Lines..... 569
Chevrons 1114
Christensen Starter.....1346
Christmas, Dr. William W. (Photo)..... 895
Citations, Air Service.....1175
Two U. S. Units Cited as a Whole....1344
Citations for Bravery: pp. 895, 961, 1035, 1084, 1133, 1141, 1265, 1365.
Citations for Distinguished Service: pp. 897, 987, 995, 916, 911, 1120, 1165, 1264, 1285, 1347.
Cited for Promotion.....1222
Civilian:
Licenses to Fly.....1350
Flying License to Be Required.....1344
Flying Officially Sanctioned.....1085
Rides in Army Planes Not Permitted...1159
Claggett, Col. Henry B.....1175
Class in Gas Engine Construction..... 288
Class II Flying..... 893
Club, New Standard..... 757
Cockpits on D.H.9 Machine.....1344
Colleges:
Congress Aids Ground Training in.....1344
To Have Courses in Aeronautics..... 106
College of the City of New York:
To Continue Aeroplane Classes..... 657
New Aeroplane Classes.....1116
Starts More Aeroplane Courses.....1345
Exhibiting Laureati's Aeroplane.....1346
Columbia to Honor Aces..... 981
Commercial Aeronautic Possibilities.....1088
Conference on Disposal of Surplus Plywood and Veneer.....1346
Conflict of Thread Standards..... 703
Congress:
Aids Ground Training in Colleges.....1344
Incensed at Delay in Giving Military Planes to Aerial Mail Service..... 754
Connelly, Sgt. James A.....1220
Contracts:
Cancelled Aircraft.....1267
Liquidating 1218
Outstanding 1351
Covers:
Max Miller Starting On Aerial Mail Flight. No. 1, September 16.
The Departure of the Aerial Mail. No. 2, September 23.
Fourth Liberty Loan (Cartoon). No. 3, September 30.
New Jersey Reserves Reviewed By Governor Edge. No. 4, October 7.
German Prisoners Going to the Rear. No. 5, October 14.
"Uncle Sam, We Are Here". (Cartoon). No. 6, October 21.
Handley Page Bombing Machine. No. 7, October 28.
Avro Aeroplane Making a Bank. No. 8, November 4.
The Shield of Protection (Cartoon). No. 9, November 11.
A Formation Flight at an American Training School. No. 10, November 18.
Berlin, Photographed from the Air. No. 11, November 25.
A Formation Flight at an Aviation Field. No. 12, December 2.
Curtiss Twin-Motored Flying Boat. No. 13, December 9.

PAGE

Men Who Unveiled Liberty Motor. No. 14, December 16.
Formation Flight of Liberty-Motored Machines. No. 15, December 23.
The H-16 Naval Flying Boat. No. 16, December 30.
Curtiss H-16 Flying Boat. No. 17, January 6.
The British Flag-ship Queen Elizabeth. No. 18, January 13.
Formation Flight at an American Field. No. 19, January 20.
The Aerial Vista Surpasses That of All Other Methods of Transportation. No. 20, January 27.
Sopwith Torpedoplane Dropping Torpedo Over the North Sea. No. 21, February 3.
A Fleet of 212 Curtiss J. N. Training Planes. No. 22, February 10.
Four J M-4H Training Planes at Ellington Field. No. 23, February 17.
Aeroplane de Luxe, Reconstructed D.H.4. No. 24, February 24.
Aero Show Number (Cartoon). No. 25, March 3.
Modern Aerial Acrobatics. No. 26, March 10.
Crank Shaft Bearings of Liberty Motors (Illus. Desc. By A. A. Martell).....1349
Crates for Construction Work..... 895
Crew of the "Langley" (Illus. Group)..... 561
Culver, Col. Clarence C. (Photo)..... 725
Curtiss:
Marine Flying Trophy Prize..... 849
Motors Make Excellent Record.....1116
The Engineering Genius Back of (Illus. Edit.) 298
Sales Force on Peace Basis.....1116
Curtiss Motors: See Motors.

D

Dalrymple, Ensign F.....1025
D'Amico, Lieut. Stefano: Value of Plywood in Aeroplane Fuselage Construction...1123
Daniels, Secretary Josephus: Commends Naval Airmen.....1344
Danish Prince Here on Aeronautic Mission.. 608
Data, Flying.....1350
Davis, Col Milton F. and Lt. Col Mallard F. Harmon (Photo)..... 165
Dayton—Aviation Center of the Nation (Art. By Howard Egbert)..... 290
Dayton-Wright Airplane Company: View of Wiring Department (Illus.)..... 295
Debarkation Hospitals.....1113
DeCastro, Lieut. Ralph E. (Photo)..... 307
Decision Concerning Inducted Men..... 609
Deeds, Colonel Edward A.: Not to Be Court-Martialed .....980 & 1040
DeHaviland Aeroplanes: See Aeroplanes.
DeLesseps, Count Jacques..... 560
Demobilization 1350
DePalma, Ralph, Breaks Record.....1220
Department of Military Aeronautics.....1025
Detroit S. A. E. to Be Addressed by G. Douglas Wardrop..... 608
Difficult Problem Which May Interfere with International Aerial Transportation (Edit.) 935
Director of the Air Service, Authority and Function of.....1266
Dirigibles:
American Made with Hispano-Suiza Motor (Illus.)..... 476
Ground Crew Repairing Envelope (Illus.) 521
Make Record..... 808
Record Homologated..... 937
Make 1,200 Miles in 29½ Hours.....1026
Appropriation Should Be Granted (Edit.) 1111
Endurance Record Broken.....1265
Discharge Emblem Selected.....1344
D. M. A. Aeronautic Library.....1175
Divisions: Location Overseas.....1281
Dohner, Miss Della, Operating Mill in Dayton-Wright Factory (Photo)..... 294
Donaldson, Lieut. J. O.....1350
Doolittle, A. H..... 939
Dope:
Plants Nearly Ready.....1315
Wing Doping in Aeroplane Construction (Art. By Gordon F. Smith)..... 722
Douglas Automatic Ignition Interrupter (Illus. Desc.).....1121
Duesenberg, Fred S. (Photo)..... 575
Duesenberg Aero Engine Test House (Illus.) 66
Duesenberg Motors Corporation..... 62

PAGE

Duncan, Lieut. Col. Thomas (Photo)..... 779
Dunwoody, The Gymnasium at (Illus.)....1320
Dupont, Lamot..... 519

E

Editorials:
Pp. 1309, 1310, 59, 113, 114, 163, 164, 211, 281, 282, 298, 365, 413, 461, 509, 510, 557, 558, 653, 655, 699, 753, 754, 805, 806, 849, 850, 891, 892, 898, 935, 936, 941, 979, 1023, 1111, 1155, 1217, 1325, 1327.
Editorials from Other Papers:
Pp. 211, 1112.
Egbert, Howard: Dayton—The Aviation Center of the Nation (Art.)..... 290
Egyptian Flying Forces..... 116
Eldridge, Dr. Thomas: Aeronautics in Peace and War (Address).....1133
Elementary Aeronautics and Model Notes, By John F. McMahon:
Pp. 483, 531, 581, 627, 677, 727, 781, 826, 869, 913, 957, 1001, 1045, 1089, 1135, 1177, 1269, 1353.
Ellington Field.....1339
Emmons, Lieut. Harold E. (Art. & Photo.)..1122
History of Aviation Engine Production (Art.) 662
Enemy Fears Aeroplane Shortage..... 87
Engines: See Motors.
Enlistment 938
Equipment, Bids Asked for..... 851
Evans, Chick: To Be Aviator..... 518
Exhibits at Aero Show (Illus. Desc.).....1328
Exploits of Famous Airmen..... 472

F

Factories:
Women in the Aircraft Industry (Illus.) 287
View Dayton-Wright Factory (Illus.).. 292
Two Views of the Interior of the Aeromarine Factory (Illus.)..... 303
Philadelphia Naval Aircraft Factory (Illus.) 666
Woodworking Department in Aircraft Factory (Illus.)..... 703
Finishing Liberty Cylinders (Illus.).... 710
Grinding Operations on Liberty Twelve. 713
Liberty Twelves in the Marmon Factory (Illus.) 706
Commander Coburn of the Naval Aircraft Factory (Illus.)..... 807
American Labor Leaders at the Caproni Factory (Illus. Group)..... 808
Naval Aircraft Factory..... 824
Activities of the Naval Aircraft Factory (Illus.)..... 666
Building a Human Machine..... 823
Interior of the Standard Factory (Illus.) 911
Fairbanks, Douglas: To Help War Fund Drive 472
Falchi, Major L..... 656
Farman Aeroplanes: See Aeroplanes.
Faurote, Fay L. (Photo)..... 902
Field, American Aviation (Illus.)..... 480
Finger Prints.....1339
Fire at Far Rockaway.....1070
Fisher Body Corp.....1113
Flachaire, Lieut. Georges:
Who Flew for Liberty Loan (Photo)... 165
Returns to U. S.....1344
Flax Needed in Britain..... 474
Flight:
From Aberdeen, Md., to New York.... 213
550 Miles in 250 Minutes..... 656
228 Miles in 105 Minutes..... 473
200 Miles Standing on Wing.....1158
Abandon Two-Stop..... 658
Official Publication for Surgeons.....1043
Record Paris-London Flight.....1176
4000 Miles in 50 Hours..... 892
Test of Caproni Plane..... 286
Egypt to India..... 755
215 Miles in 75 Minutes..... 893
Largest Formation Flight at March Field (Illus. Art.)..... 420
Flyers Carry Rations to Our Fighting men.. 518
Flying Circus:
At Rockwell Field.....1161
To Be Annual Event.....1220
Flying Data.....1351
Fokker: See Aeroplanes.
Fonck, Lieut. Rene:
75th Victory..... 517
To Be Guest of Aero Club.....1070
Promoted to Rank of Captain.....1176
Ford, Henry: Statement By..... 899
Foreign News:
Pp. 1330, 76, 134, 180, 227, 327, 388, 432, 482, 530, 580, 626, 676, 726, 780, 825, 868, 912, 956, 1000, 1044, 1088, 1134, 1176, 1268, 1352.

PAGE

Fourragers, 103rd Aero Squadron Entitled to Wear....1266
Fourth Annual Speed Boat Regatta....1115
Francis, Captain Roy N....1219
French Air Mission....1266
French Aviators Sail for Siberia....1158
Future Air Traffic and Regulations to Govern Same (Address By Alan R. Hawley)....1067
Future of the Aircraft Industry, By B. L. Williams 122

G

Gage Inspection.... 703
Garros, Roland.... 473
Gas Station at Porvenir, R. P....1267
Gasoline, Specifications for.... 562
Gates, Lieut. A. L....1133
Geodotic Survey Planning Aerial Mapping..1070
Germans Use Five Bombs.... 284
German Planes Turned Over to French (Illus.)....1221
German Machines Turned Over to the Allies (Illus.)....1351
Germany Drops Plan to Punish Our Aviators 213
Germany Surrenders (Edit.).... 509
Giant Plane Crosses British Channel.... 62
Giant Seaplane to Make Radio Tests.... 701
Gifford, Walter S.... 607
Girl, Christian....1346
Godman Field Named.... 526
Godoy, Lieut. Dagoberta: Flies Over Andes 755
Goodyear Tire & Rubber Company:
Performance (Art. By E. E. Helm).... 313
Balloon Makes Record.... 852
Gets Aero Mail Letter.... 121
Gorton, Ensign A. W.: Flies 200 Miles Standing on Wing....1158
Great Britain Restricts Imports....1069
Great Lakes Naval Training Station....1113
Ground Schools: See Schools.
"Gulf to Lakes" Fliers Triumph.... 893
Gunnery: Lewis Gun Mounting Improved..1114
At the North Island, Calif., School (Illus.) 283
Browning Guns Perfected.... 853
Guynemer, The Story of.... 657

H

Hall, Captain Norman, Set Free.... 981
Hall-Scott Motors: See Motors.
Hammered Piston Ring Company....1160
Hammond, John Hayes, Jr.: Use of Radio Devices in Map-Making....1155
Hangar, In the Interior of (Illus.).... 132
Hare, C. W., To Direct Board of Sales Review 1114
Harmon, Lieut. Frank H., Makes Record Flight 1219
Hasler Revolution Circumference and Cutting Speed Indicator.... 305
Hawley, Alan R.: Future Air Traffic (Address) 1067
Helm, E. E.: Goodyear Performance (Art.) 313
Hill, E. K....1116
Hispano-Suiza Motor: See Motors.
History of the War....1350
Hitchcock, Lieut. Thomas, Returns to U. S.. 559
Hitchcock, Major Thomas, Honorably Discharged 755
Hoag, E. K....1116
Homing Airmen, The (Poem By J. E. Kelly) 1112
Honor British Flier.... 526
Honor Roll of American Airmen.... 909
Honor Roll of the Air Service....1255
Honorably Discharged: Pp. 1114 & 1222.
Hooven Radiator (Brief Desc.)....1346
Hoyt, Lieut. Henry W., U.S.N. (Photo.).. 321
Hoyt, R. F. (Photo.).... 902
Hughes Aircraft Report:
Pp. 462, 511, 568, 616, 671, 820, 864, 908.
Hull, Crating for Shipment.... 667
Hydro-Aeroplane Garage for New York....1347

I

Idle Wings (Edit.) 1112
Ignition Interrupter, Douglas Automatic (Illus. Desc.)....1121
Improved Arc Welding Tool (Illus.).... 619
Information Bureau Ends Domestic Duty.. 702
Insignia:
Prescribed for the Air Service.... 306
New Insignia for Instructors.... 755
Changes in Flying Insignia.... 895
War Dept. Warns Against Unauthorized 1159
Divisional Insignia....1159
Instruments for Cross Country Flying (Illus. Art. By T. A. Morgan).....1029

PAGE

Interned in Holland: Pp. 63 & 472.
Invention Board Appointed.... 658
Invitations to Aviators.... 517
Irving, Leslie L., Makes Parachute Jump...1115
Is Germany's Demand for Peace a Trick to Defeat Liberty Loan? (Edit.).... 211
Italian Service Ribbon for American Airmen 1043
Italy Honors Two U. S. Airmen....1221

J

Jamieson, Brig.-Gen. C. C., In Charge of Equipment Disposition.... 658
Japan Establishing Aeronautic Schools....1088
Jerwan, S. S. (Photo.)....1335
Jig for Rib Construction (Brief Desc.)....1027
John, W. E.: Shop Organization: A Simple Scheme (Art.)....1316
Johns Manville Company....1222
Junior Plattsburgh to Have Aviation Ground School....1222

K

Kelly, J. E.: "The Homing Airmen" (Poem) 1112
Kenley, Maj. Gen. W .L.:
At Start of New York-Chicago Mail (Illus. Group).... 73
Makes Balloon Flight (Illus. Art.):.... 429
In Record Flight from Washington.... 893
Talks to Aviator in Plane from Office..1133
Commends Airmen....1219
Kenley, Lieuts. W. L. & H. C. (Photo.)... 657
Kepperley, James E. (Photo.).... 298
Kettering, C. F.:
To Address Detroit S. A. E.... 63
Suggestion Contest.... 295
Key to Abbreviations (Special Orders):
Pp. 1326, 74, 131, 178, 227, 318, 385, 430, 479, 527, 577, 624, 674, 724, 777, 822, 866, 910, 954, 998, 1042, 1086, 1133, 1174, 1266.
Kight, Charles N.: Talks on Aero Mail Advantages 731
King, Charles B. (Photo.)....1116
King of England Asks for U. S. Aeroplanes (Edit.) 1300
Kluyskens, G. J....1115

L

LaGuardia, Major Fiorello H., Resigns Commission 609
Lake, Major Harley W., Flies 175 Miles in 75 Minutes.... 701
Lakin, H. K., Represents American Manufacturers in England....1222
Landing Stations: Aero Club of the Northwest Arranging....1069
Meeting the Demand for (Edit.).... 606
Landis, Judge K. M., Capt. Reed K. and Mrs. Landis (Photo.)....1219
Lang, Captain Andrew (Photo.)....1176
Lateral Stability in Aeroplanes (Art. By C. Levick)....660
Laureati's Aeroplane On Exhibition....1346
Leaps Mile Safely from Aeroplane.... 473
Lee, General Charles F., Returns Home....1043
Lees, Walter E.:
Notice to Students.... 893
In Group at Wilbur Wright Field (Photo.) 1043
Le Pere, Captain G.... 904
Le Rhone Motor: See Motors.
"Les Terribles" (Art.).... 287
Letters: From T. W. Gregory to Presideent Wilson 701
Levick, E.: Lateral Stability in Aeroplanes 660
Lewis Gun: Mounting Improved....1114
Liberty Motors: See Motors.
Liberty Starter: Desc. Line Drawings..... 816
Air Motor and Compressor (Illus.)..... 297
Desc. with Line Drawings....1282
Liberty Walnut Propellers and the Men Behind Them (Illus.).... 312
Licenses to Fly Civilian Aircraft....1350
Light and Dark Work of Night Bombers... 62
Line Drawings:
De Haviland V. Single Seater..... 70
Zeppelin Bombing Biplane..... 122
Sopwith "Camel"..... 219
A. E. G. Armored Biplane..... 220
Hannoveraner Biplane..... 221
Panhard 300 H.P. Aviation Motor..... 308
Roland DII Chaser..... 310
Continental KB-3T Training Tractor.... 316
French A. R. Biplane..... 375
Fokker Single-Seater Biplane—Type D.7 425
Breguet Biplane..... 612
Liberty Twelve Motor..... 707
Martin K-III Single-Seater..... 760

PAGE

Hispano-Suiza Motor..... 766
Wright-Martin Hispano-Suiza Motor.... 813
Liberty Starter..... 816
DeHaviland 4 Reconnaissance Plane... 861
Christmas Strutless Biplane..... 948
Standard Model E-4 Mail Aeroplane....1037
Curtiss Model K-12 Aviation Motor....1034
King-Bugatti Aviation Engine.....1075
Handley Page Type O-400 Bomber....1083
King-Bugatti Aviation Engine.....1125
Bellanca 35 H.P. Anzani Light Tractor..1119
Sundstedt-Hannevig Twin-Motored Seaplane 1163
Napier "Lion" 450 H.P. Aero Engine..1264
Liberty Starter....1282
Lipsner, Capt. B. B.:
Resigns as Superintendent of Aerial Mail 731
Plans Aerial Transportation Lines..... 754
Livingston Radiator Corp.... 939
London Enemy Aircraft Exhibit (Art. By G. Douglas Wardrop):
Pp. 1319, 68, 130, 310, 424.
London Rest Camp for Aviators..... 61
Long Island:
Flyers Make One Brigade..... 115
Flying School Reopens..... 702
Lufbery, Major Raoul:
Sister Goes to France..... 473
Relics to Go to Home Town..... 807
Luke, Lieut. Frank:
Destroys Three German Balloons..... 213
Missing Since October 20..... 489
Lumber: Prices Fixed for Spruce..... 474

Mc

McCaul, Captain, Brought Down 75 Germans 115
McClellan, J. F. (Photo.)..... 297
McCook Field, Group of Flyers (Illus.)... 938
McHugh, E. C., Works Manager of Steuben Co....1345
McLaughlin, George F.:
Drawings: Pp. 1227, 1229, 1231.
Line Drawings: Pp. 612, 760, 861, 948, 1037, 1083, 1119, 1163.
McMahon, John F.:
Continental K.B.-3T Training Tractor (Illus. Desc. Line Drawing)..... 316
Ford Motored Aeroplane: Pp. 677, 727, 781, 826, 869, 913, 957, 1001, 1045, 1089, 1135.
Model Aeroplane Contests.....1089
Model Aeroplane Building as a Step to Aeronautical Engineering: Pp. 1331, 77, 135, 181, 231, 327, 389, 433, 483, 531, 581, 627, 677, 727, 781, 826, 869, 913, 957, 1001, 1045, 1089, 1135, 1177, 1269, 1353.

M

Macauley Plans New Flights..... 981
Mail: Addressing to A. E. F.....1116
Making Navy Aviators in a Hurry (Illus. Art. By Willard Connelly).....1320
Malone, Major William J. (Photo.)..... 675
Manufacture of Veneer and Plywood (Illus. Art. By B. D. Boulton).....1240
Manufacturers' Aircraft Association:
Banquet Huge Success..... 898
Speeches At Banquet..... 941
Machines Exhibited At Banquet (Illus.) 901
Manufacturers to Have Large Exhibits At Aero Show.....1069
Manuscripts on Aeronautics, Old.....1219
Maps:
Navigation Maps for Airmen..... 981
Woodrow Wilson Airway (Illus.).....1325
March, General Peyton C.
War Risk Insurance Information..... 757
Announces Air Service Units with Third Army 804
March Field: Turns Out 185 Aviators..... 955
Marine Flying Corps Notes..... 517
Marine Corps Aviators Return..... 894
Marmon, Lt. Col. H. C., Chief of Experimental Engineering Dept..... 296
Mars, Col. J. A.: Heads Aircraft Production 851
Marr, Major Kenneth: Decorated..... 960
Martell, A. A.: Line Reaming Crank-Shaft Bearings of Liberty Motors (Illus. Desc.) 1349
Glenn L. Martin Co.:
Develops 180 M.P.H. Bombing Biplane. 562
Martin Bomber in 450-Mile Flight.....1116
Jig for Rib (Illus.).....1027
Mauretania, First Ship to Bring Our Boys Home (Illus.)..... 701
Mayo, Admiral: Airship Report.....1170
Meenan, Daniel L., Jr. (Photo.)..... 304
Meeting Demand for Landing Places (Edit.) 606
Meisner, Lieut. James A. (Photo.)..... 851

PAGE

Memorial: Bartlett Expedition to Be Roosevelt Memorial (Edit.)..... 935
Menoher, General Charles T.
New Chief of Air Service (Edit.)..... 895
Photo 851
Receives Legion of Honor and Croix de Guerre.....1159
Miessner Airfone (Illus. Desc.).....1081
Military Aeronautics' Strength.....1266
Military Aerostatics (Art. By Lieut. H. K. Black): Pp. 65, 119, 169, 218, 325, 371, 475, 521, 576, 707, 811, 1166.
Military and Commercial Value of Permanent Air Line (Edit. By Henry Woodhouse) 59
Miller, Col. Archie, Flies to Washington.... 609
Miller, Lieut. Charles, Flight from Dayton to Pittsburgh..... 656
Miller, Max: Statement re. Aerial Mail Flight 1310
Mitchell, Brig. Gen. William, Received Legion of Honor Decoration.....1113
Model Aeroplane Building as a Step to Aeronautical Engineering (By John F. McMahon). Pp. 1331, 77, 135, 181, 231, 327, 389, 433, 483, 531, 581, 627, 677, 727, 781, 826, 869, 913, 957, 1001, 1045, 1089, 1135, 1177, 1269, 1353.
Models:
Burgess Seaplane Made of Wood (Illus.) 677
Curtiss Model "K" Triplane (Illus.)... 808
Curtiss Model "K" Triplane Scout (Illus.) 901
Curtiss J N 4 (Illus).....1269
Model Aeroplane Contest, San Francisco Model Club Holds.....1353
Monument to Aviators..... 981
Morgan, Thomas: Dinner to..... 474
Morgan, T. A.: Instruments for Cross Country Flying (Illus. Desc.).....1029
Moss, W. W. (Photo.)..... 298
Frank Mossberg Co. Joins Rice Leaders....1222
Motor Meter Opens Detroit Branch..... 939
Moy, Lieut. Gordon V.; Downs Three Germans 657
Motors:
Motor Trouble Shooting.....1351
Characteristics of Leading Aero Engines (Table) 1252
Outline of History of Aviation Engine Production (H. H. Emmons)..... 662
American Aero Engines (Illus. & Data By G. Douglas Wardrop).....1242
Motors (Types):
Aeromarine Type L 6-Cylinder Aero Motor (Illus. Desc.).....1164
Curtiss: Testing at an Aviation Field (Illus.) 625
Model K-6 and K-12 (Illus. Desc. with Line Drawings).....1030
Model K-6 and K-12 (Short Illus. Desc.) 1244
Duesenberg: New Test House (Illus.).. 66
Model H Engine (Short Illus. Desc.)..1246
Model H 850 H.P. Motor (Illus. Desc. Line Drawings) By G. Douglas Wardrop 991
Hall-Scott A-9 (Illus. Desc.).....1250
Hispano-Suiza: (Illus. Descc. Line Drawings By E. H. Sherbondy)... 766
Undergoing Test in France (Illus.). 772
(Illus. Desc. Line Drawings)..... 812
(Illus. Desc. with Line Drawings)... 856
Short Illus. Desc 1245
King-Bugatti: Illus. Desc. Line Drawings By G. Douglas Wardrop .....1074 & 1124
Illus. and Data.....1243
Line-up at the Duesenberg Factory (Illus.) 1345
Knox Twelve: Illus. Desc.....1249
Lawrance 60 H.P. Air Cooled Engine (Illus. Desc.).....1247
Le Rhone, 80 H.P. (Illus. Desc.).....1251
Liberty: Daily Output Averages 278.. 286
Builders Form Association..... 610
Tests for 608
Illus. Desc. Line Drawings By G. Douglas Wardrop.....706 & 762
How to Efficiently Use the 20,000 (Edit. By G. Douglas Wardrop)... 753
Production 809
Flag Won..... 809
Test Flight Made.....1159
Liberty Twelve (Illus. & Data)....1242
Line Reaming Crank Shaft Bearings of (Illus. Desc. By A. A. Martell)..1349
Not Affected By Weather.....1356
Napier "Lion", 450 H.P. (Illus. Desc.)..1084
Illus. Desc Line Drawing By G. Douglas Wardrop ..... .1262

PAGE

Panhard 300 H.P. Direct Type (Illus. Desc. Line Drawings By E. H. Sherbondy) 308
Thomas Morse Model 8-90 (Illus. Desc.) 1348
Union 6-Cylinder Aero (Illus. Desc.)..1248

N

Nash, C. W., (Photo.)..... 296
At Kenosha Plant..... 658
National Advisory Committee Gets New Quarters 1115
National Aerial Derby Proposed By Aero Club 558
National Special Aid Society to Aid Bartlett Expedition 1026
Naval Aircraft: Activities at Factory (Illus.) 666
Building a Human Machine (Art.)..... 823
Naval Air Patrol System..... 808
Naval Aviation:
Secretary Daniel's Report..... 806
Stations Established on European Coasts 824
Factory and Permanent Buildings..... 824
At Dunwoody Institute.....1339
Naval Orders.....1175 & 1351
Naval Radio for Aircraft.....1114
Naval and Military Aeronautics: Pp. 1326, 74, 131, 178, 277, 318, 385, 430, 479, 527, 577, 624, 674, 724, 777, 822, 869, 910, 954, 998, 1042, 1086, 1132, 1174, 1266, 1350.
Navy:
New Fliers..... 755
Starts Aero Mail Service..... 611
Plan for Coast Defense (Edit.)..... 654
Takes Over Cape Map Property.....1175
Asks for Seaplane Bids.....1219
New York:
Air-raided By Liberty Planes..... 165
Police Dept. Creates Aviation Section (Edit.) 654
Police to Have Volunteer Aero Squadron 1024
News of the Week:
Pp. 1311, 61, 115, 165, 213, 283, 367, 415, 472, 517, 559, 607, 656, 703, 755, 807, 851, 893, 937, 981, 1025, 1069, 1113, 1158, 1219, 1344.
Newson, H. H., With Standard Parts.....1346
Nieuport Scout: See Aeroplanes.
Nungesser, Lieut., To Accompany Fonck to the U. S.....1088

O

O'Brien, Lieut. Patrick, To Make Transatlantic Flight..... 852
Officers:
Can Collect Back Flying Pay.....1025
Enlistment of Discharged Temporary Officers 938
Discharged from Air Service..... 938
Of the Standard Aircraft Corp. (Illus. Group) 610
Official Status of Air Service Fields.....1087
Omaha Selected as Overland Air Port..... 518
Oneonta Field Changed to "Ream"..... 473
Organization in Charge of Aircraft Production (Illus.)..... 289
Organized College Research.....1335
Orynski, Miss Wanda (Photo.)..... 810
Outline of History of Aviation Engine Production (By H. H. Emmons)..... 662

P

Pacific Fliers Approach Washington..... 894
Packard, Major, Resigns..... 703
Packard Motor Co. to Market Biplane.....1027
Painted Picture from Aeroplane.....1312
Parachute:
Drop Thrills Washington..... 658
Prize Offered for Competition (Edit.).. 849
Used in Leap from Plane..... 853
Leslie L. Irving Jumps 1,000 Feet from Seaplane 1115
Patten, Postmaster Thomas, Handing Mail to Aviator Max Miller at the Start of the New York-Cleveland Flight (Photo.) 1311
Payne Field Has Many Possibilities.....1114
Performance of the Christmas Bullet.....1026
Performance of the Gallaudet D-4 Seaplane 939
Pershing, Gen. John:
Decorates Major Thaw..... 489
Praises American Flyers.....1321
Honors Gallant Aviators..... 472
Authorized to Grant Promotions.....1088
Personal Pars: Pp. 63, 215, 562, 1113, 1116, 1161, 1222, 1346.
Personnel:
Distribution of Aircraft Personnel in the U. S. and Overseas.....1344

PAGE

Personnel of the Air Service in Dayton (By Howard Egbert)..... 296
Personnel Board..... 852
Reduction of.....1266
Peterson, D. McKay, Promoted to Major... 538
Returns to U. S..... 873
Photographs:
A Big Photographic Map..... 517
Rio de Janiero from a Seaplane (Illus.). 560
Photo Section News..... 873
Military Air Heroes' Photos Sought....1026
Aerial Photos from the Four Corners of the Earth (Illus.)..... 524
Pigeons, Carrier..... 116
Pio, Lieut. Col. Americo (Photo.)..... 656
"Plane Talk", The Forceful Suggestion of (Illus.) 384
Plans for Air Service..... 982
Plywood:
In Aeroplane Construction (Illus. Art. By Henry Harrison Suplee)..... 945
Value in Aeroplane Fuselage Construction (Art. By Lieut. Stefano D'Amico) 1123
Manufacture of Veneer and Plywood (Illus. Art. By B. C. Boulton).....1240
Conference on Disposal of.....1346
Potter, W. C. (Photo.)..... 289
Power Curve for the Aerial Propeller (Art. By S. E. Slocum, Ph.D.)..... 522
Power Output, The Increasing of (Art. Line Drawings By Prof. Emil Schimanek). 170
Prairie Aerodromes in Canada..... 560
Price Set for Castor Oil Beans..... 474
Price Fixed for Spruce..... 474
Prizes:
For Parachute Competition (Edit.)..... 849
Curtiss Marine Flying Trophy Won By Marine Corps (Edit.)..... 849
Lieut. Thomas C. Rodman Awarded Curtiss Prize..... 937
Problems of Crankshaft Design (Illus. Desc. Line Drawings By Otto M. Burkhardt) 376
Problem Which May Interfere with International Aerial Transportation (Edit.) 935
Prodger, Clifford B., and 40 Passengers Which He Took on a Journey Over London (Photo.)..... 894
Promotions and Commissions..... 755
Propellers: Power Curve for the Aerial Propeller (Art. By. S. E. Slocum)... 522
In a Propeller Making Plant (Illus.).... 519
The Metal Airscrew (Illus. Art. By Vladimir Olhovsky)..... 622
Propeller End of the Curtiss Model K-12 Aviation Motor (Illus.).....1031
Provisional Wing at Park Place..... 284
Publications:
"On the Wing" Ceases Publication..... 893
Official Publication for Flight Surgeons..1043
New Field Publications..... 517
Pulitzer, Joseph, Joins Aero School..... 166
Pulliman, Ensign Harold A. (Photo.)..... 116
Putnam, Lieut. David E., Killed in Action.. 115

R

Radiator:
The Aeronautic (Illus. Desc. Line Drawings By S. R. Swenson).....1256
Hooven Radiator (Short Desc.).....1346
Radio:
Giant Seaplane to Make Tests..... 701
Control of Craft By Radio Proved....1220
Radio Telephone:
Aviators Talk 25 Miles by..... 755
Development 1115
Firing Commands by.....1267
At the Aero Show.....1344
Radium Substitute Discovered..... 474
Randall, L. G. (Photo.)..... 562
Range Finder, Aerial..... 474
Ratings:
For Overseas Officers.....1281
For Fliers.....1350
Recent Aero Patents (Art. By William N. Moore) 1329
Records:
New Altitude Record Set By Lieut. Kelleher 87
British Flier Sets Record for Height.... 893
Kenly in Record Flight from Washington 893
Fly 215 Miles in 75 Minutes..... 893
Record Climber Arrested..... 956
New Italian Speed Record.....1044
New Altitude Record: 30,500 Feet..... 956
600 Pound Seaplane Makes Record....1069
Curtiss Motors Make Excellent Record.1116

PAGE

De Palma Breaks Records with Aero Engined Packard Car....1220
Dirigible Endurance Record Broken....1265
New Record Flight from Washington...1219
Army Aviator Makes Record Flight....1219
Flying Record of the JN4-H....1351
Reeves, Clifton (Photo.)....299
Renault Motor Co., Final Inspection Room (Illus.)....657
Reports:
Third Annual Report, National Advisory Committee....128
Hughes Aircraft Report: Pp. 462, 511, 568, 616, 671, 820, 864, 908.
Bureau of Steam Engineering (Extract) 681
Bureau of Construction and Repairs (Extract)....681
Secretary Baker's Report....700
Director of Military Aeronautics....720
Trans-Continental Map Making Tour...756
Bureau of Aircraft Production (By John D. Ryan)....774
British Civil Aerial Transport Committee 935
Reserve Military Aviators:
Officers Rated as, Pp. 938, 981, 1113, 1175.
Reserve Officers:
To Have Annual Flight Instruction....702
Training Courses to Continue....1133
Rest Camp, American (Illus.)....115
Returning Airmen at Camp Mills....656
Review of German Aeroplanes (Illus.)....570
Rewards, Board to Review....1221
Rinehart, Howard M., Sets Dual Passenger Record....560
Rice, Major Cushman A.:
Granted Three Months' Leave....61
Photo. with Lieut. Don Hickey....528
Richardson, Commander H. C.: Aeroplane and Seaplane Engineering (Illus. Desc.)....1171
Rickenbacker, Captain E. V.:
Gets Two More Planes in Air Battle...284
Photo. with Lieut. Meisner....851
To Fly for Loan....938
Automobile Association to Hold Banquet for....981
Returned from France (Photo.)....1068
Chest of Gold for....1116
Awarded the Clarence H. Mackay Trophy....1156
Honorably Discharged from Service....1222
Proposes Memorial to American Airmen (Edit)....1326
Rockwell Field to Hold Annual Flying Circus....1220
Rodman, Lieut. Thomas C., Awarded $1,000 Curtiss Prize....937
Roosevelt:
Roosevelt Field Honors Quentin....284
Colonel Touched by French Sympathy..608
Theodore Roosevelt (Edit.)....891
Mrs. Roosevelt Pays Tribute to Quentin..1265
Want Roosevelt Cemetery in France...1221
Root, H. M. (Photo.)....298
Ross, Lieut. C. J., Details of Death....657
Rost, N. G., Returns from France....895
Rutherford, Lieut. Jack and Family (Photo.) 559
Ryan, John D.: Outlines Aircraft Policy....365
Tells Secret of Aero Radiophone....559
Says Hundreds of Planes Are Available for Mail Service....606
Resigns....607
Report of the Bureau of Aircraft Production....774

S

S. A. E.:
Winter Meeting....610
Change of Date of Annual Meeting....757
Members Visit Standard Plant (Illus.)..809
Program Taking Shape....938
Work in War....1115
Aeronautic Meeting....1344
Sabin, Charles H., Donation to the Bartlett Exhibition (Edit.)....1155
St. Louis Establishes Landing Place....1161
Schieffelin, Ensign John J., Commended....61
Schimanek, Prof. Emil: Increasing of Power Output (Illus. Desc. Line Drawings.) 170
Schools:
New Army Balloon School....1339
Class at Ground School (Illus.)....289
Schroeder, Capt. R. W.: Story of the Altitude Record....314
Seaplanes:
German Nightmare Seaplane (Illus.)....179
In Air Nine Hours....518
Carries 50 Passengers....656
Makes Speed Record....1069
Navy Asks Bids....1219

PAGE

Seaplane Engineering (Illus. Art. By Commander H. C. Richardson)....1171
Self-Starting Device for Aircraft Motors....286
Sewall, Lieut. Summer (Photo.)....625
Sherbondy, E. H.:
The Panhard, 300 H.P. Aviation Motor (Illus. Desc. Line Drawings)....308
Working Process of Internal Combustion Engines....564
Hispano-Suiza Aviation Motor (Illus. Desc. Line Drawings)....766
Shop Organization, A Simple Scheme for (Art. By W. E. John)....1316
Shotwell Electric Weathervane for Aerodromes (Illus. Desc.)....672
Signal Corps Returns on Aeronautic Property....61
Sims, Admiral, Expects Transatlantic Flight Next Summer....1221
Siren, Air Raid (Illus.)....116
Slaughter, Col. Nugent H., In Charge of Radiophone Development....1115
Slocum, S. E., Ph.D.: Power Curve for Aerial Propeller....522
Smith, Major Albert, Ends Transcontinental Flight....1266
Smithsonian Institute:
War Collection....560
To Hold Permanent Aircraft Progress Exhibit....1160
Social Events:
Lieut. J. C. Edgerton Weds Miss Mary Olive Robinette....62
Miss Katherine Register Marries Geraldyn L. Redmond....607
Society of Automotive Engineers: See S. A. E.
Soldiers, Bonus to....560
Sopwith Aeroplanes: See Aeroplanes.
Spad Aeroplanes: See Aeroplanes.
Special Orders: Pp. 1326, 74, 131, 178, 227, 318, 385, 430, 479, 527, 577, 624, 674, 724, 777, 822, 866, 910, 954, 998, 1042, 1086, 1133, 1174, 1266.
Specialists May Chose Branch of Service... 116
Specifications for Aviation Gasoline....562
Sperry, Elmer, To Address March Meeting of Detroit S. A. E....1161
Splitdorf and the Magneto Situation....574
Springfield Aero Co., Interior of Plant (Illus.)....121
Spuslock, Miss Marjorie (Photo)....810
Squadrons:
17th Aero Downed 65 Enemy Planes....150
484th Aero Construction Cited....911
Stabilizing the Aeronautic Industry (Edit. By Henry Woodhouse)....557
Standard Aircraft Corp.:
Illustrated Article on....304
Holds Rally....519
New Club Opened....757
George D. Kershaw Resigned....474
Standard Parts Co. Operating on Peace Basis....1116
Standardize Oil Specifications....63
Status of Industry When Peace Came....661
Stevenot, Major J. E. (Photo.)....657
Stevens, Major A. Leo, Under Fire....1159
Stevens, J. S. (In Group Photo.)....73
Stinson, Miss Marjorie (Photo.)....1219
Streamline Wire vs. Cable (Illus. Desc. with Tables)....1358
Student Aero Squadron (Illus.)....284
Student Aviators Can Quit or Stay....608
Sturtevant Co. Planning Airship Line....1069
Sunsted, Capt. Hugo, Seaplane Damaged....1160
Suplee, Henry Harrison: Plywood in Aeroplane Construction (Illus. Art.)....945
Swabb, Lieut. Jacques M. (Photo.)....472
Swenson, S. R.: The Aeronautical Radiator (Illus. Desc. Line Drawings)....1256

T

Tables:
Characteristics of Leading Aero Engines....1252
Streamline Wire vs. Cable (Results of Tests)....1358
Temporary Rank (Press Statement By Secretary of War)....960
Ten Thousand Aeroplanes Are Worth Half Million Troops (Edit.)....365
Ten Years of Hall Scott (Art. By James G. Stafford)....300
Tenafly, Lieut. Coleman DeWitt, Awarded Italian Medal....1221
Tests:
Theoretical Basis of Model Strength Tests for Aeroplane Structures (Art. By W. L. Cowley & H. Levy)....322

PAGE

Hispano-Suiza Undergoing Block Test in France (Illus.)....772
Conditions for Tests of Experimental Aeroplanes....1026
Thanksgiving Dinner in an Aeroplane (Illus. Art.)....655
Party in Cockpit of Handley Page (Photo.)....704
Thaw, William:
Now Lieut. Colonel....656
Returns from France....807
Squadron Has Great Record....1159
Theoretical Basis of Model Strength Tests for Aeroplane Structures (Art. By W. L. Cowley & H. Levy)....322
Thermodynamic Cycles in Internal Combustion Engines (By Wm. J. Walker)... 126
Thermal Efficiency, Importance of (Desc. Art. By Charles W. Burrage)....1168
Third Annual Report of the National Advisory Committee....128 & 174
Three Hours Gained on Trip West By Earth's Turning (Art. By F. M. Kerby)....478
Titanine Development....305
To Berlin Via Airline....213
To Dispatch Fleets of Liberty Planes (Edit.) 113
Toronto-Hamilton Airline....1219
Touchard, Lieut. G. S., Sudden Death of...1311
Towers, Commander John H., To Take Charge of Transatlantic Flight (Edit.)....1111
Transatlantic Flight:
$50,000 Prize Renewed....558
First Entry Made....780
British Plane for....1000
Italian "White Eagle"....1044
Soon to Take Place....1088
British Plans....1000
British Air Ministry Selects Machine...1088
Commander John H. Towers to Take Charge (Edit.)....1111
Film Company Seeks Photo Rights....1114
Navy May Use N C-1....1160
Admiral Sims' Opinion....1221
Preparations Being Made (Edit.)....1326
New Plane at Navy Factory....1344
Official Regulations for....1345
Handley Page Shipped to U. S....1352
R. A. F. Making Observations for....1352
Four Routes Selected By Great Britain..1352
Transcontinental Flight:
Now Completed....851
Major Macauley Completes....1069
Major Smith Ends....1266
Transportation, Aerial:
Third of People Will Travel in Air in Ten Years (Art. By Leo Stevens)... 756
Captain Lipsner Plans Extensive Lines.. 754
A Difficult Problem (Edit.)....935
Glenn L. Martin Predicts Aerial Express....895
Aerial Transportation Committee Organized By Aero Club....892
Atlantic Air Route....936
In the U. S. and Elsewhere (Edit.)....979
American Express Co. Ready to Handle Aerial Express (Edit.)....1023
Auxiliary to Land and Water Transportation....1085
Detroit-Pittsburgh Express Plan....1113
Service from Australia to London....1161
Passenger Line from New York to Atlantic City....1158
Toronto-Hamilton Line....1219
Travel Expenses, Authorization Made By War Department....1345
Trophies:
Curtiss Marine Flying Trophy Won By Marine Corps (Edit.)....849
Aero Club Offers Intercollegiate Aeronautic Trophies (Edit.)....699
Trumbull, Horace N., With Wellman-Seaver-Morgan Co....895
Types of Planes....1350

U

"Uncle Sam, We Are Here" (Edit. By Henry Woodhouse)....281
Unconditional Surrender (Poem by George L. Upshur)....414
United Aircraft Engineering Corp. Buys Canadian Equipment....1069
U. S. Airmen:
In 94 Flights....61
Down 33 Enemy Planes....214
Destroy 926 Planes in War....607
Downed 854 Enemy Planes....852
Lost 21 Balloons in Allied Offensive... 894
U. S. Army Air Program....366
U. S. Bomb Program....61
U. S. Liquidation Commission....1160
Uppercu, Inglis M. (Photo.)....303
Urband, Lieut. Edward Milton (Photo.)....61

PAGE

V

Value of Plywood in Aeroplane Fuselage Construction (Art. Line Drawings By Lieut. Stefano d'Amico).....1123
Valve Grinder. Motor-Driven.....1222
Van Arsdale, Sgt. Henry, Made President of Aerial Photographers' Ass'n.....1114
Vanderbilt, W. K.:
Dined By Flyers..... 284
Gives $10,000 to the Bartlett Expedition..1155
Van Hyning, Norman (Photo.).....1312
Vedrines, Jules:
Lands on Roof..... 981
Plans Around-the-World Flight.....1114
To Fly Caudron Plane to Rome.....1352
Veneer and Plywood, The Manufacture of (Illus. Desc. By B. C. Boulton).....1240
Vernon, Lieut. B., Plans Detroit-Pittsburgh Aero Express Route.....1113
Victor Company Makes Plane..... 610
Vincent, Col. J. G.:
Photo..... 296
To Remain on Job Until January 1... 703
At Wilbur Wright Field (Group Illus.)..1043

W

Wadman, Rex, Has Re-established New York Office 809
Walker, Wm. J.; Thermodynamic Cycles in Internal Combustion Engines..... 126
Wanamaker, Rodman, Now Colonel on Staff of Governor Smith..... 852
War Department:
Authorizes New Instruction Course.... 115
Permits Publicity on War Contracts....1025
Makes Authorization for Travel Expenses 1345
Wardrop, G. Douglas:
London Enemy Aircraft Exhibit: Pp. 1319, 68, 130, 310, 424.
To Address Detroit S. A. E..... 608

PAGE

Liberty Motor (Illus. Desc. Line Drawings) .....706 & 762
How to Efficiently Use the 20,000 Liberty Motors (Edit.)..... 753
Duesenberg Model H, 850 H.P. Motor (Illus. Desc. Line Drawings)..... 991
King-Bugatti Aviation Engine (Illus. Desc. Line Drawings).....1074 & 1124
American Aero Engines (Illus. & Data)..1242
Napier "Lion" Aero Engine (Illus. Desc. Line Drawings).....1262
Warman, Captain Clive, Given D. S. O. (Edit. and Photo.).....1122
Warner Duplex Stick Control (Illus.)..... 661
Warshouer, Cadet J. W. (Photo.)..... 778
Washington to Schenectady for Dinner..... 656
Waterproof Watch (Illus. Desc.)..... 757
Watson, Lt. Col. Henry L. (Photo.)..... 656
Weather:
First Aerial Weather Forecast Made... 702
Forecast Made Public..... 731
Weger Aeronautical Motor Co., Suggestion By 658
Welcome Home (Edit.)..... 653
Welcome Home Plan of the Aero Club... 937
Westmoreland, Capt. H. E., Returns to the U. S.....1161
Whitman, Governor Charles S.: "Nothing More Gratifying to the Nation Than to Know That the Aircraft Industry Can Say 'Uncle Sam, We Are Here'," (Art. and Photo.)..... 285
Willard, Charles F. (Photo.)..... 303
Williams, Benjamin L. (Photo.)..... 304
Willys, John N., Agrees to Build 100 Planes Daily 286
Wilson, Charles B. (Photo.)..... 299
Wilson, President Woodrow:
Speaks for Liberty Loan..... 163
With Mrs. Wilson, General Peyton C. March and Mr. John D. Ryan (Group Photo.) 607
Tests Radio Phone..... 607
Pardons Aircraft Officials..... 701

PAGE

Wings: Ingenious Mounting of Skeleton Which Makes Handling Easier (Illus.) 287
Witness Flies to Court..... 609
With the American Army in Lorraine..... 62
Women in the Aircraft Industry (Illus.)... 287
Wood, Maj. Gen. Leonard, Urges Preparedness for the Next War.....1133
Wood: See Lumber.
Woodhouse, Henry:
Military and Commercial Value of Permanent Aerial Mail Line Between New York, Cleveland and Chicago (Edit.) 59
"Uncle Sam, We Are Here" (Edit.)... 281
Stabilizing the Aeronautic Industry (Edit.) 557
Lecture Before American Geographical Society 1158
Woodworking Department in American Aircraft Factory (Illus.)..... 703
Woodworking Machines for Airplane Parts (Illus.) 306
Working Process of Internal Combustion Engines (By E. H. Sherbondy)..... 564
Wrenn, Major T. W., To Stay in Regular Army 1159
Wright, Orville:
About to Make a Flight (Photo.)..... 292
With Miss Katherine Wright and Lord Northcliffe (Group Photo.)..... 294
Wright-Martin Company:
Development of..... 305
Turns Out Combination Liberty-Hispano-Suiza Motor.....1222

Y

Yankee Air Raiders Bomb Retreating Troops 150
Y. M. C. A. School, First Annual Banquet.. 287

Z

Zeppelin Line to America Planned..... 853

GENIUS
AEA
V.8



AERIAL AGE WEEKLY

VOL. VII SEPTEMBER 16, 1918 No. 1

TABLE OF CONTENTS

PAGE

King of England pleads for more U. S. Aeroplanes 1309

Secretary Baker and John D. Ryan in France 1309

Pathfinding Aerial Mail Flight to Chicago Successful 1310

News of the Week 1311

U. S. Aerial Mail 1313

Aircraft Trade Review 1315

Shop Organization 1316

The London Exhibit of Enemy Aircraft 1319

Making Naval Aviators in a Hurry. 1320

Meteorological Conditions which Increase the Danger of Flying..... 1322

The Woodrow Wilson Airway Map. 1324

Military and Naval Aeronautics.... 1326

Recent Aero Patents 1329

Foreign News 1330

Model News 1331

Aeronitis 1332

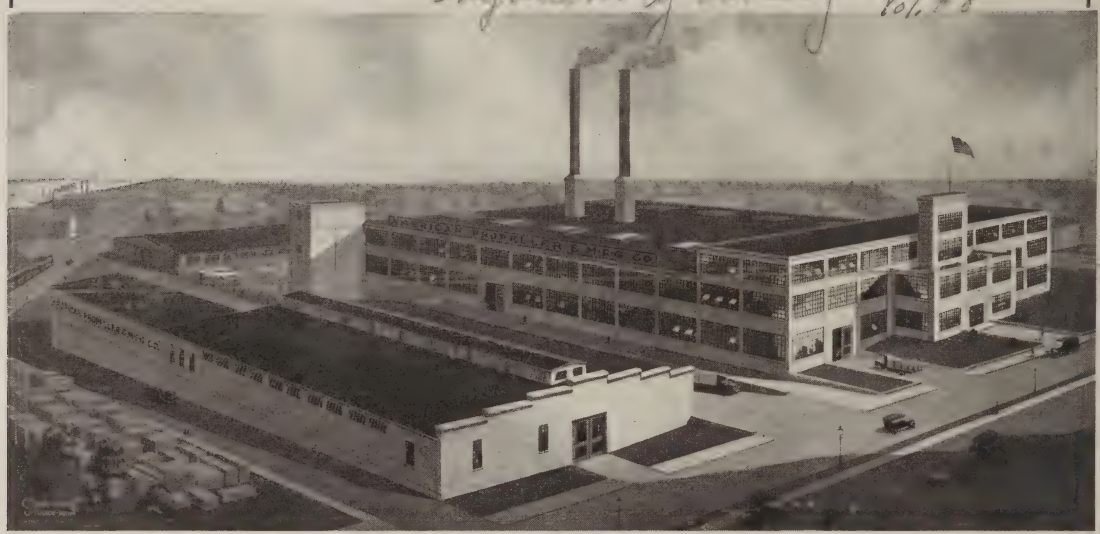
PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

588769

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AERIAL AGE WEEKLY

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Inc., Sept. 16, 1918
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, SEPTEMBER 16, 1918 NO. 1

Engineering Library 629.105 AE4 Vol 8

KING OF ENGLAND ASKS FOR MORE U. S. AEROPLANES

REPRESENTATIVE PADGETT. of Tennessee, chairman, and seven other members of the House Naval Affairs Committee, have returned from Europe enthusiastic over the work of the American Navy in the war zone. With Mr. Padgett were Representatives Hensley, Missouri; Farr, Pennsylvania; Venable, Mississippi; Browning, New Jersey; Connelly, Kansas; Riordan, New York, and Peters, Maine.

Representatives Hicks, of New York; Wilson, Texas, and Oliver, Alabama, who went over with the party, remained abroad for further observations. Representative Butler, of Pennsylavnia, another member, had returned previously.

"We examined into all the naval activities, including air stations," said Mr. Padgett. "The committee is much pleased with its inquiry. We found the naval situation excellent. We found splendid team work between the naval services of the United States and the Allied navies. We found the best of coordination between the American navy and the American army forces."

Representative Sherley, of Kentucky, chairman of the House Appropriations Committee, also returned from a trip to England and France. While away he inquired into the organization and handling of the American forces and materials overseas and conferred with officials of the Allied governments. He will give President Wilson the benefit of his observations within a day or two.

Representative Farr, of Pennsylvania, said **the King of England told members of the committee that he wished more aircraft would come over from America.** Premier Lloyd George said the American troops arrived in force just in time, while Premier Clemenceau of France, Mr. Farr said, declared that the American forces "not only brought punch but good luck."

"Our boys are doing wonderfully good fighting," continued Mr. Farr. "It was the recklessness of their dash that, at critical moments, overwhelmed the enemy. Aside from that they achieved themselves. They have put new courage and inspiration into the French and British.

"The destroyers we have over there are doing great work, but we need more of them.

"We need more aircraft, and then more. That is the cry that goes up from the Allied forces—send more aircraft."

SECRETARY BAKER AND JOHN D. RYAN IN FRANCE TO LOOK OVER AIRCRAFT SITUATION

SECRETARY OF WAR BAKER has arrived in France on a second mission in connection with the affairs of the American Expeditionary Force.

Formal announcement of the safe arrival of the Secretary and members of his party, who went abroad on a troop ship loaded with soldiers, was withheld until late September 8, following the receipt of official notice from France. It is now permissible to say that the Secretary sailed on Saturday August 31, and he crossed in approximately a week. It is apparent, therefore, that he went on one of the fastest transports.

Secretary Baker is accompanied by Second Assistant Secretary of War John D. Ryan, who is now in charge of all the army aircraft activities; also by Surgeon General Gorgas and Brig. Gen. Frank T. Hines, Chief of the Army Embarkation Service. Before leaving Washington he declined to indicate the purpose of his sudden trip, but said that this would become known after his arrival, when it could be assumed from the personnel of his party. There can be no doubt, therefore, that the primary matters in which Secretary Baker will interest himself while in France relate to aeronautics. medical and embarkation services.

The only official statement authorized regarding the mission of Mr. Baker was issued by the War Department on September 8 as follows:

"The Secretary of War has arrived in France on official business. News of the safe arrival of Mr. Baker and an official party was received at the War Department today. The voyage was made aboard a transport which carried the usual quota of United States troops. The Secretary was accompanied by John D. Ryan, Second Assistant Secretary of War; Major Gen. W. C. Gorgas, Surgeon General of the Army; Brig. Gen. Frank T. Hines, Chief of the Embarkation Service; and Lieut. Col. George H. Baird, Military Aide to the Secretary of War."

It is believed that the report filed by the sub-committee of the Senate Military Committee, which investigated allegations of failure in the American aviation program, served as the mainspring for Secretary Baker's sudden trip. This report was made public on August 22. Eleven days later Secretary Baker started for France accompanied by the man to whom the Administration is now looking, more than to any other person, for results in army aviation. On Saturday, August 25, the Senate Committee made public the testimony on which the Thomas report was based.

On Wednesday, August 28, Secretary Baker announced the selection of John D. Ryan to act as Second Assistant Secretary of War with full responsibility over the army's air service. At the time this announcement was made Secretary Baker and Mr. Ryan were packing their grips for the trip to France.

While they are in France it is expected that Secretary Baker and Mr. Ryan will go into a most careful inquiry into army aircraft matters, and that an effort will be made to reach a clearer view of the needs of the situation as viewed by General Pershing and American aviation experts and flyers abroad.

PATHFINDING AERIAL MAIL FLIGHT SUCCESSFUL, TO BE FOLLOWED BY PERMANENT LINE TO CLEVELAND AND CHICAGO

THE pathfinding aerial mail flight to Cleveland and Chicago, which was made without planning or spare machines has shown the thorough practicability of establishing a permanent aerial mail line between New York and Cleveland and Chicago, and such a service is to be established within a month.

The first trial has shown that with a few spare machines, or by employing twin-motored machines, mail can be sent from New York to Chicago and vice-versa in less than ten hours. Gardner actually made the Chicago-New York flight in 14 hours, including the stops at Bryan, Cleveland and Lock Haven!

The importance of the achievement is ably summarized in the following telegram sent to Chicago by the Aero Club of America authorities, to be read at the banquet given by the Chicago Merchant Association:

"Kindly convey the following message through Mr. Chas. Dickinson, the President of the Aero Club of Illinois, and through the President of the Merchants Association of Chicago and Postmaster Carlisle.

"The Aero Club of America wishes to express its hearty congratulations to Capt. B. B. Lipsner, Superintendent of the Aerial Mail, and to aviators Miller and Gardner upon the completion of the first pathfinding New York-Cleveland and Chicago Aerial Mail Flight.

"It was a splendid achievement in every way and has opened the way for the permanent Aerial Mail Line between New York, Cleveland and Chicago. We know that this achievement was accomplished with only few days of organization and that the weather conditions were most unfavorable. The Post Office deserves additional credit for having carried out this project under such adverse conditions.

"The people of Chicago and Cleveland are also to be congratulated for the promptness and their progressiveness in cooperating so fully in carrying out this flight, which is the forerunner of the permanent Aerial Mail Service between these cities. The aeroplane has cut down the distance between New York and Chicago to seven hundred miles and will cut down the time required to deliver mail and express to less than ten hours.

"Please also extend the Aero Club of America's hearty congratulations to General Kenly, the progressive and energetic Director of Military Aeronautics, and his aviators who have just successfully completed the three thousand mile flight, creating enthusiastic interest in aeronautics and in the war throughout the country.

"The Aero Club of America is proud of having had the privilege to cooperate in carrying out the Aerial Mail project, both because it is an epoch-making event and because of the progressive and cordial people connected with this undertaking.

"(Signed) ALAN R. HAWLEY, President,
"Aero Club of America."

The telegram from Chicago also praises the newly made maps of the Woodrow Wilson Airway, which was used by the aviators in flying from New York to Chicago.

Duplicate copies of the map were carried by the aviators, which will be returned to the Aero Club, signed by the aviators and postal authorities, and one copy will then be sent to President Wilson, one copy to Postmaster General Burleson, one copy to Postmaster Praeger, for the Government archives.

The map was made especially for use of aviators and only gives the features essential to aviators, on a scale suitable for the aviator who flies at 80 to 100 miles an hour, who would be confused by the average map.

The maps, which have been made under the direction of Messrs. Henry Woodhouse and Captain Robert A. Bartlett, the famous explorer, comprise seventeen sections, extending from New York to San Francisco. They have cost $6,000 to make, exclusive of the cost of printing.

The Woodrow Wilson Airway was named after President Wilson last year by the Aero Club of America, when the President signed the $640,000,000 appropriation for army aeronautics.

The Aero Club of America adopted a resolution to establish the Woodrow Wilson Airway and communicated the resolution to Congressman Murray Hulbert, who was prominent in conducting the campaign for the building of our aerial defenses, submitting the matter to President Wilson. The President's answer was as follows:

"My dear Mr. Hulbert:

'Thank you warmly for having let me see the enclosed telegram. It heartens me mightily. It is very delightful to have such a feeling exist and to receive such evidence of support and approval.

"Cordially and sincerely yours,
"WOODROW WILSON."

The Woodrow Wilson Airway represents a belt eighty miles in width, extending from New York to San Francisco. A line through the center of this belt touches the most important cities, through the States of New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Iowa, Nebraska, Wyoming, Colorado, Utah, Nevada and California.

The Airway belt extends forty miles on each side of the line, so the air traveller can reach the extreme part of either side of the belt in half hour of flying. Any city or community located within this eighty mile belt will be designated as being on the Woodrow Wilson Airway. Landing places for aircraft and identification marks will be placed first in the important places in direct line of the Airway, then at the approach of every community.

The maps are made especially for the use of aviators and show land marks, elevations, and other important things which an aviator must know when he flies. Each section of the map has a corresponding chart giving the silhouette of the elevations of the land over the entire route.

The map also gives the compass directions, magnetic declination, the distance between cities, and other information of value to aviators.

Statement of Max Miller, Aerial Mail Pilot No. 1

I LEFT Belmont Field, Long Island, at 7:08 A.M., Thursday, September 5, with a good wind in back of me, flew over the City of New York, the Hudson River and Hoboken, and headed west 284 degrees.

There was a bank of low clouds near the ground and another layer of clouds at a high altitude. I kept right between them and flew on my compass course. I could not see the ground, but ran for about two hours and at ten o'clock I came down through the lower strata of clouds and landed one mile from Danville, N. Y., about 155 miles from New York City. There I inquired to find out my bearings and found that I was not more than two miles out of my course. I did not kill the motor, but left it running, and after five minutes started up again and headed for Lock Haven. I entered the fog which hung low over the ground and over the tops of the mountains, and I figured that it would take me about three quarters of an hour to make Lock Haven. I came down and saw the field through a notch in the mountains and made a good landing. My motor was missing, so I changed spark plugs which took me about an hour, filled up with oil and gas, got a couple of sandwiches, and left about 11:45 A.M.

I climbed up through the fog again and went on over the mountains. I sailed on my compass course for an hour, 283 degrees, and I figured I was about 100 miles further on. Then I came down to see where I was and get my bearings, and the first thing I knew I hit the top of a tree. That sure gave me a good scare. I hustled back up again into the fog, determined to get plenty of altitude and keep on going as long as my gas held out. I went fifty miles, and then I found my radiator was leaking and I came down and I saw a town with a fair going on. There was such a mob of people that I did not land there, but went on about twenty miles to a town named Cambridge. I inquired where I was and was told "Jefferson." On looking on my map I found a town called Jefferson lying to the north of my route, so on leaving I headed toward the south again in order to cross the route again; but I found that it was Jefferson County, Pa., instead of the town of Jefferson, Ohio, and I went about 150 miles out of my way before reaching Cleveland, where I had to remain all night on account of darkness. The next morning I got my radiator fixed and rested up after being buffeted about by the storm and rain, and got away at 1:35 P.M. for Bryan on the compass course of 275 degrees, a little south of due west about 140 miles. I had to stop several times to fill up my radiator with water. The weather was very much better, and I was able to make Bryan, where I was received by Postmaster Jordan and got away at 4:35 P.M. I skirted the southern shore of Lake Michigan, and arrived over Grant Park at an

(*Continued on page* 1313)



THE NEWS OF THE WEEK



American, French and Italian Aviators Help Lafayette Day Celebration

In spite of the severe weather conditions on Lafayette Day, the American, French and Italian aviators helped greatly to celebrate Lafayette Day in New York.

Thirty-six Allied aviators participated in the celebration, including Major Yeast, who lead the squadron formation; Major Baroetta, in charge of the French Aviation Commission; Captain Boyrivien, the noted French veteran aviator; Captain Bachellier, veteran French observer, attached to Mineola Headquarters for instruction of observers; Lieut. Parvis, the Italian Ace who has nine Austrians to his credit.

The squadron formation was led over New York from Mineola by Major Yeast, and gave some very remarkable demonstrations. The aviators dropped thousands of special cards bearing the pictures of General Foch and General Pershing and the American and French flags on the other side, with suitable expressions.

Lieut. Flashaire flew under all the New York bridges, repeating the recent performance of Captain Boyrivien.

Lieut. Parvis flew the American Caproni biplane equipped with three Liberty motors, which is now being tested and from which remarkable results are expected.

The New York public was greatly interested in the aerial demonstrations and once more is indebted to the Mineola aviators for a very interesting and educational entertainment.

Sixty Army Aeroplanes in 2-Hour Manoeuvre

Mineola, L. I., Sept. 9.—Sixty army aeroplanes of five different types, piloted by American airmen of the First Provisional Wing unit at Mitchel Field, today stayed in the air for two hours without a mishap while a series of moving pictures was taken to show the public the work of training a military flier. Thirty-six planes manoeuvered for several minutes in a huge battle formation with such skill that Major W. J. East, in command of the field, received congratulations from allied aviators who saw the exhibition.

Films of every stage of the work of making a military aviator were taken for the Department of Military Aeronautics, and will be sent to Washington to be distributed throughout the country. Some of the pictures were taken from the ground and others from aeroplanes flying at great heights singly and in battle formations. The photography was done by enlisted men in the Signal Corps who have taken courses in military photography at Columbia University.

Officers at the field said they did not think a larger number of military aeroplanes had ever taken to the air at the same time above a single field in this country. When plans were made for the flights there was some apprehension about safety, but the pilots handled their machines so skillfully that no machine was forced to the ground.

Among the planes in flight were the De Haviland 4, equipped with Liberty motors; the American-built Caproni, also with Liberty motors; the Curtis J. N. D. 4; the Curtis type H, with Hispano-Suiza motor, and the Thomas-Morse monoplane scouts.

In the battle formation of thirty-six machines were several of the De Haviland machines of the type used by the American squadron on its first flight over the German lines in command of Brig. Gen. Benjamin D. Foulois. General Foulois had eighteen machines in his reconnoissance squadron. The large formation yesterday was in command of Lieutenant George Zeisner, flying at the peak. He commanded units of the machines in practice formations over New York City for several days.

The thunder of the sixty motors and the sight of the large number of machines in the air attracted thousands of spectators, and the roads were crowded with automobiles. All the other cadet fliers not in the First Provisional Wing and all the mechanics and officers at the field watched the manoeuvers with glasses.

After the films are developed they will be shown at the fields here to point out defects in flying to the men, and then will be taken to all the other grounds and flying schools in the country.

Aviators Dinner Guests of Manufacturers

Chicago, Ill.—As a part of the program of the Illinois Manufacturers' Association to stimulate interest here in the manufacture of aeroplanes and the obtaining of government contracts, a dinner was given in the gold room of the Congress Hotel in honor of visiting aviators. There were present about thirty officers of the air squadron which is taking a prominent part in the government war exposition.



Lieut. Thos. Hitchcock, Jr.

Among the speakers were General Charles F. Lee, head of the British aviation mission to the United States; Major General W. L. Kenly, director of military aeronautics of the United States Army; William B. Wilson, Secretary of Labor; Lieutenant Colonel C. K. Rhinehardt, commander of the flying circus, and Colonel George T. Buckingham.

Lieutenant Thomas Hitchcock, Jr., Who Has Escaped from Germany

Lieutenant Thomas Hitchcock, Jr., whose photograph is given above, has escaped from a German prison camp and has made his way over the border into Switzerland. He was captured on March 6th after an encounter with several German planes. He was wounded in the side and his machine fell behind the German lines. He was taken to Saarbrucken and later transferred to a camp in Bavaria. He escaped from there and walked about eighty miles to the Swiss frontier.

Before the United States entered the war he was known as a horseman and polo player. He tried to enlist in the American Aviation Corps, but was turned down on account of his youth. He went to France in June, 1917, and after training there he was assigned to the famous Lafayette Escadrille. He did not retransfer to the American forces. Last July he was made a lieutenant, though he was a prisoner at the time, in recognition of his work. He has the Croix de Guerre.

He is a son of Major Hitchcock of the Mineola Training Division. According to dispatches received he will not be interned in Switzerland and will come to the United States immediately.

Warns of Soldiers' Mail

Postmaster Patten issued a statement in which he called the attention to the ruling that soldiers' mail, both letters and parcels, must be specifically addressed.

The address on a soldier's letter must give the company, regiment and division to which he is attached.

Lieut. G. S. Touchard Dies

Toronto, Ont.—Lieutenant G. S. Touchard, former tennis champion and instructor in the Royal Air Force, died here suddenly at the General Hospital from an abscess of the brain. He entered the hospital to undergo an operation on his throat. His home was in New York City. He was a widower.

U. S. Fliers to Aid Canada

Ottawa, Ontario.—C. C. Balantyne, Dominion Minister of Naval Service, announced here the establishment of the Canadian Royal Naval Air Service, and declared that, thanks to America's aid, "machines are flyinig along the Atlantic Coast, ready to bomb hostile submarines, escort convoys and perform other services."

The United States, he said, had "consented to supply the personnel for Canada's Royal Naval Air Service until such time as a Canadian personnel could be properly trained to take their places."

Also, he said, the United States had supplied the necessary machines, which include aeroplanes, airships and kite balloons.

Our Own Planes Guard Our Men

Washington.—Confidential messages from General Pershing and other reports from France indicate that the American army now is supplied with sufficient aeroplanes of all kinds to protect its men in battle.

General March, chief of staff, gave this information to members of the House Military Committee at their weekly conference at the War Department.



Postmaster Patten of New York handing a bag of mail to Aviator Max Miller at the start of the New York-Cleveland Pathfinding Flight

Air Fighters to Use Cameras to Shoot

Dallas, Tex.—The eye of the camera instead of rapid firing guns is being used to record direct hits on "enemy" planes by aviation cadets in Texas training camps.

After the great thrill of the first solo flight, the nose dive, the tail spin and the loop, blouses are discarded and a course of study in geometry, mathematics and physics is entered into by the cadets that far surpasses that of many a scientific school.

Days of drill and study, hot mornings at the rifle range, and then comes the first b.g lesson in aerial gunnery. But the cadet goes into the air armed with nothing more deadly than the camera to put into practice the knowledge he has acquired.

An aeroplane soars near by in the guise of an enemy ship and is snapped by the cadet, whose degree of accuracy is indicated by the nearness of the picture to the centre of the lens, which is marked in circles.

The school of aerial gunnery at Love Field is turning out fliers having a degree of accuracy that will give them great confidence once they reach the battlefields of France, officers declare. This accuracy comes only after the hardest study and practice.

For the actual ground practice a hill has been built back of the target range. Thousands of pounds of bullets already have been poured into it from students' guns.

A tiny wooden reproduction of an enemy plane is the object of this practice. The target is an unindicated spot on a nearby white sheet before which the plane, flying at a given speed, would be passing when the American plane's shots reached it. The student figures out the speed and the angle of ascension and distance of the enemy, adjusts his gun and aims at the tiny plane. Then if he is accurate in his shooting and his calculations the bullet should pierce the spot marked on the back side of the white sheet.

Students also are carefully drilled in the strategy of manœuvring into the one spot in the rear of the enemy plane whence he cannot shoot. From this position they can pour their own shots into the enemy.

American Flyer Outwits 14 Hostile Airplanes

With the American Army in France.—An American observation plane while on a photographic flight was attacked on Sept. 7th by fourteen German planes. By skilful manœuvring the pilot brought the machine safely back into the American line.

British Seek Mechanics

A recruiting drive for mechanics in the British Royal Air Force, which was stopped recently because the number of men then desired had been obtained, will be resumed at once, according to a statement on Sept. 5 by Colonel Lord George Wellesley at the British-Canadian Recruiting Mission, 220 West Forty-second Street.

The applicants must be British subjects who have registered at their respective local draft boards. Compensation will be $1.10 a day while in Canada, and if the men are required to serve overseas the British rate of pay will apply from the date of embarkation.

It was explained that the mechanics now sought are as follows: Blacksmiths, metal turners and machinists, carpenters and cabinet makers, coppersmiths, upholsterers, chauffeurs, engine fitters, photographers, wireless operators and watchmakers. Applications may be made at any British or Canadian recruiting mission.

Applicants for cadet vacancies are asked either to write or call in person on the first floor of the West Forty-second street mission.



Norman van Hyning, instructor in lighter than air (Balloon and Dirigible) at the Naval Aviation school at Akron, Ohio

Many Aeroplanes Ready

Washington.—General March, the Chief of Staff, told members of the Senate Military Committee on Aug. 31 that reports received to date show that more than a thousand De Haviland aeroplanes have been completed or are in readiness to be turned over to the Government. He explained that of this number a large part had been shipped overseas to France for use by the Expeditionary Forces or have been sent to port for shipment overseas.

U. S. Pilots in Record Flight

A description of what is believed to be the longest flight made thus far by an entire squadron of battleplanes driven by American pilots abroad is contained in a letter just received here by Lieut. Leopoldo Belloni from Gianni Caproni, designer of the giant aeroplane bearing his name. The squadron of eight machines left the Caproni factories near Milan at 6 A. M. Shortly before noon they were all circling over Rome, having covered 450 miles in a little less than six hours.

The planes were all of the Caproni Ca 5 type, a reproduction of which fitted with twelve-cylinder Liberty engines is now being turned out in this country. Each machine carried a crew of five men. The commanding officers were Capt. La Guardia and First Lieuts. Mendel Hauch, William Agar and Mowat Mitchell.

The flight was made at an altitude of from 2,000 to 9,000 feet and the inhabitants of Bologna, Florence and Pisa caught their first glimpse of an American air squadron, which they cheered vociferously. Signor Caproni says the American pilots showed great skill in flying over such natural obstacles as the Apennine Mountains. The Italian press printed enthusiastic comments on the flight.

Say Allies Beat Germans

An Atlantic Port.—Several American and British officers belonging to the air forces in their respective armies arrived on Sept. 2 from the western front to give instruction to the cadets at the aviation camps in the United States. They declined to comment on the war except to say that the Allies were decidedly ahead of the Germans in aviation and artillery, and each infantryman had proved to be worth at least two of the enemy, including the much-advertised Prussian Guard.

Captain Lewis D. Boeree of Winnipeg, Man., who was on his way home suffering from shock through overflying, has officially brought down twelve Hun machines and has spent the last three months with the American soldiers on the western front. He said that he liked them immensely in every way, and it was a certainty that the American Army will continue to make its mark throughout the war.

Bolling Field to Be Improved

The Assistant Secretary of War has approved an allotment of $103,850 for improving and extending Bolling Field, Anacosta, D. C. This field is being enlarged for the aerial patrol and protection of Washington, as well as to meet the training needs of the Air Service officers in Washington. An additional hangar will be erected and quarters for twenty-three officers and 154 enlisted men provided. The high tension electrical wires at the southern end of the field and the drainage ditch, which are now dangerous to the flyers, will be removed. An aero repair shop and a machine shop will be erected and the whole field encircled by a high barbed wire fence. There will be a balloon station with one company located north of the flying field. The equipment will include captive balloons and free balloons for training observers. A photo developing hut for the developing and printing of aerial photographs taken in the vicinity, and a small radio telegraph station for the purpose of working up communication with aeroplanes while in flight will be additional features of the development of this aero flying field adjacent to the National Capital.

Painted Picture from Aeroplane

Sgt. First Class, Lawson Adams, Jr., in charge of the Landscape Department, is under orders for transfer elsewhere as a flying observer and official painter. When he leaves he will carry with him an aerial picture of Kelly Field just completed, the first canvas painted by an American using an aeroplane in the air as a viewpoint.

For several weeks Sgt. Adams has been flying daily as an observer to obtain sketches for the painting which will hang in the office of the Director of Military Aeronautics, Washington, D. C.

Enlisting in September, 1917, Sgt. Adams served for a time in the North, then was transferred to Kelly Field, where he organized the Landscape Department, which has beautified roads and grounds around buildings all over the camp. He also designed the Italian Garden dancing pavilion at the Aviation Club, Flying Department.

Britain's Part

Mr. W. F. Massey, Prime Minister of New Zealand, last week, in giving a summary of notable happenings in regard to Britain's share in the war, which was altogether above her proportion, relative to the population, quoted the following figures as showing the Empire's tremendous effort:

Men in arms, 7,500,000.

Of these, England has given 4,500,000, or 60 per cent., Scotland, 8.3 per cent., Wales 3.7, Ireland, 2.3, the Dominions and Colonies 12, and India and dependencies 13.7.

Enemy aircraft brought down in twelve months: More than 4,000.

Bombs dropped on the enemy this year: More than 800 tons.

Raids into Germany in June: Seventy-four.

Naval tonnage: Increased from four to well over six millions.

Naval personnel: Raised from 145,000 to 420,000.

War expenditure to March last: £7,014,000,000.

(*Continued on page* 1331)



Ed. V. Gardner, aerial mail pilot No. 2, receiving a bag of mail from Postmaster Patten of New York at the start of the Pathfinding trip. (Curtiss plane equipped with Liberty Motor) He made the Chicago-New York Flight in one day!

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart

George L. Conner, Chief Clerk to Second Assistant Postmaster Praeger
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
Frank Praeger, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
A. C. Danielle

(*Continued from page* 1310)

altitude of 5,000 feet at 6:55 P.M. I circled around and made a good landing and was received by Postmaster Wm. B. Carlisle, Mr. Chas. Dickenson, President of the Aero Club of Illinois; Capt. B. B. Lipsner, Superintendent of Aerial Mail Service; Mr. Thos. Downey, Assistant Superintendent of Mails; Mr. James O'Conner, Director of the U. S. War Exposition; Mr. James Stevens, Secretary of the Aero Club of Illinois, and Mr. Augustus Post, Secretary of the Aero Club of America, who had come on from New York to witness the inauguration of the first aero mail service between New York and Chicago.

The Return Flight

The weather on the return trip was much better. I started from Chicago on September 10, at 6:26 o'clock A. M. I carried about three thousand pieces of mail. The weather looked so good that I expected to make a record trip. There was some haze on the ground, but not nearly enough to prevent landmarks being distinct. Just as I was over Cleveland, I found a broken connection in the radiator and I landed there to have it repaired. This took some time, but I got away from there by 4:30 P.M., in time to make a pleasant flight to Lockhaven, one of the scheduled stops, before dark, a distance of 210 miles. I stayed at Lockhaven all night, leaving there at 7:20 the morning of the tenth. I arrived at Belmont Park at 11:22 A.M. As a pathfinding trip it was an immense success. We gathered a lot of information which will be very valuable in the future trips. The radiator trouble was the only thing that prevented me from making the trip within the ten hours set. If I had had a spare aeroplane even, I could have done it.

The First Trip

Pilot Max Miller is the first aviator to make the round trip, New York-Cleveland-Chicago-Cleveland-New York. On his arrival at Belmont Park, he made his report, and just one hour later started back on a flight to Washington, D. C.

Mr. Miller carried letters from Mr. Wm. F. Brooks, President of the Aero Club of Minneapolis, addressed to President Wilson in Washington, and Mr. Alan R. Hawley, President of the Aero Club of America, which has been brought from Minneapolis to Chicago by air, by Col. C. K. Rhinehart.

Mr. Miller left almost immediately for Washington, to carry the letter to President Wilson at the White House.

Mr. Miller says that the Aerial Mail Route to Chicago is entirely practical and feasible, and can be regularly maintained on a ten-hour schedule when relay aeroplanes are available at the different stations, or large aeroplanes with double motors are available for crossing the mountainous districts and where landing places are not easily found.

He found the air very good on his trip, and the winds were generally favorable. It was slightly hazy, but he could see the ground very well. The conditions which they encountered in going out were exceptionally stormy and such as would not ordinarily be met with.

STATEMENT OF EDW. GARDNER, AERIAL MAIL PILOT No. 2

I LEFT Belmont Park at 8:50 A.M., Thursday, September 5, 1918, two hours after Max Miller had started in a Curtiss R plane with a Liberty Motor, taking Radel, who was Miss Katherine Stinson's mechanic, with me, and carried three pouches of mail, containing about 3,000 letters.

The weather was very thick and the clouds were low, and I could not see the ground after attaining my altitude. I kept on my compass course, 284 degrees, and allowed for the drift of the winds. When I judged I was near Lockhaven, I came down and saw the river and two railroads at Bloomburg, and I knew that I was near Lockhaven. I kept on in the direction of Lockhaven, and very soon I saw through a split in the clouds a large new club house being built, and I saw a great number of people on the field, which I knew to be the Aerial Mail Station. I landed at 1:50 P.M., and spent 35 minutes in mending a broken gas line. Mr. Chas. A. Jobson, of the New York and Pennsylvania Company, did everything possible for me there, and I got away in the direction of Cleveland at 2:25 P.M.

I went on over the mountains in a terrific rainstorm and head winds, keeping the compass course of 283 degrees right over Franklin, and I was able to keep right on the course until I saw the race track just outside of Cleveland and the chimneys of a tile factory to the left, and beyond the landing field. I circled the field for some time, landed, and stayed there overnight.

Postmaster Wm. J. Murphy, of Cleveland, sent a message to Postmaster Wm. B. Carlisle, of Chicago, reading as follows:

"The people of Cleveland extend their most cordial greetings to the people of Chicago, appreciating that the Aerial Mail Service will increase the efficiency of the Post Office Department, and bring Cleveland, New York and Chicago into quicker and closer relationship."

I left Cleveland the next day and flew through to Bryan, where I arrived at 5:15. I met Postmaster Jordan, of Bryan, who was very enthusiastic and helped me on my way. I left at 5:50 P.M., and thought that I could get through to Grant Park before dark, but as I had not been on the field and knew that there was a great crowd of people at the War Exhibition and it was too dark to see, I landed at 7:20 at Westville, Indiana, 10 miles south of La Porte, and put up for the night. I left in the morning at 6:39 A.M., and flew across the southern end of Lake Michigan, landing at Grant Park at 7:30 A.M., where I found a warm reception awaiting me from Capt. B. B. Lipsner, Superintendent of Aerial Mail Division; Mr. Chas. Dickinson, President of the Aero Club of Illinois; Mr. Jas. Stevens, Secretary of the Aero Club of Illinois; and Mr. Augustus Post, Secretary of the Aero Club of America, who were on hand to welcome Radel and myself.



The arrival of the Aerial Mail at Chicago. Max Miller, Aero Mail Pilot Number 1, being greeted on his arrival with the first aero mail carried to Chicago. He is shown above (left) with Captain Benjamin B. Lipsner, Superintendent of Aerial Mail Services (right). Below are, from left to right, Mr. James S. Stevens, President Aero Club of Illinois; Mr. Dunlap, a pioneer aviator; Mr. Wm. B. Carlisle, Postmaster of Chicago; Mr. James O'Connor, Director of U. S. War Exposition; Augustus Post, Secretary of the Aerial League of America, and representative of the Aero Club of America. On the left are seen Captain Lipsner's sister and sister-in-law

Chicago to New York in One Day

I am glad that in my return trip I succeeded in making the Chicago-New York flight in one day. With spare aeroplanes it will be possible in the very near future to make the trip in less than ten hours, probably in less than eight.

I left Chicago September tenth at 6:25 A. M. with Ed Radel as mechanician, under fair conditions, and had no trouble in making Cleveland first and afterward Lockhaven in record time.

A month ago, with longer days, I could have made Belmont Park in daylight. I left Lockhaven at 5:51 P. M. and flew at about 7,000 feet most of the way. I never thought that I could miss Belmont Park, but night came along fast and it was impossible to distinguish one place from another. So, although I was over Belmont Park several times, I failed to land and continued flying over Long Island for close on to two hours when I was finally forced to land by a shortage of gasoline. I landed in a field close to Hicksville, Long Island.

As soon as arrangements are made to have electric lighting installed at Belmont Park field, flying at night will be fairly easy and it will be possible to start out or land before daylight or after dark at night, without any trouble.

I am told that I beat the best time of the fastest train from Chicago to New York by over ten hours. I am glad of it and am sure that in the very near future we will make the round trip in less time than is at present required by train to go one way.

Waiting for Gardner at Chicago

Mr. Max Miller was entertained at the Union League Club by Mr. Chas. Dickenson, President of the Aero Club of Illinois.

The mail was rushed to the Post Office in a special automobile and sent out by special messengers and delivered immediately. The Reception Committee waited on the grounds until they could hear from Edw. Gardner, who had left New York after Max Miller and was reported to have left Bryan at 5:50 P.M., that same afternoon, and was expected to land at Grant Park. Flares were prepared and lit on the field to enable him to make a landing, but a telephone mesage was received that he was forced to land at Westville, Ind., 10 miles south of La Porte at 7:20 P.M., and would come in the morning as the field was new to him and there were great crowds of people on the grounds, who had assembled to witness the Government War Exhibition. He arrived Saturday morning at 7:30 A.M., carrying 3,000 pieces of mail from New York City.

Saturday afternoon, Max Miller, Aerial Mail Pilot No. 1, took up Postmaster Wm. B. Carlisle for a beautiful flight over the City of Chicago and over the Federal Building, where the Post Office is situated. The Postmaster expressed himself as an ardent advocate of aeronautics and predicted that aerial mail service would be of tremendous value to merchants in the West when the regular aerial mail lines in all directions were fully established.

Max Miller started back from Chicago at 6 A.M. Monday, September 9, carrying 150 pounds of letters, making the run to Bryan, 160 miles, in one hour and five minutes, landing at 7:45 A.M., and continued his flight eastward at 7:50 A.M. He was forced to land five miles from Cleveland. at Woodland Hill Park, at 9:40 by a leaky radiator.

The AIRCRAFT TRADE REVIEW

A. E. J.

Dope Making Plants Nearly Ready

Washington.—Eight chemical manufacturing plants, built for the Bureau of Aircraft Production, estimated to cost $7,000,000, are now nearing completion. They will produce the necessary ingredients used in the manufacture of "dope" for coating aeroplane surfaces, immense quantities of which are used monthly, last month's supply alone running into 200,000 gallons.

There are two principal types of "dope" now in use in the U. S. Air Service: cellulose nitrate "dope," used on training planes, and cellulose acetate "dope," used on all planes shipped overseas. Acetate "dope," when properly made and applied, is believed to give a better, more permanent and less inflammable coating than nitrate 'dope." The characteristics of acetate "dope" are important in connection with the use on combat planes which are subjected to attacks with incendiary bullets.

Early in the preparation of the air program a standard "dope" was adopted and steps were taken to overcome the shortage of the ingredients and chemicals for the manufacture of cellulose acetate "dope." To-day, American plants, operating for the chemicals section of the Bureau of Aircraft Production, are turning out such materials as acetate of lime, methyl alcohol, acetone, glacial acetic acid and methyl ethyl ketone. From these materials "dope" is manufactured by several firms throughout the country for release through the chemicals section to plane manufacturers, aviation schools, fields and supply departments in this country and abroad.

The general method of doping the wing surfaces is to apply three or four coats of the "dope," intervals of several hours elapsing between the application of each coat. Because of the volatile nature of the thinners of solvents used to dissolve the "dope," the liquid portion evaporates quickly and the air in the vicinity becomes laden with the slightly injurious vapors of the solvents. On account of this evaporation the major portion of the solvents is lost, but steps have been taken to preserve the health of the workers and also to recover the solvent. Approved methods for recovery now make it possible to save from 50 to 85 per cent of the solvents lost during the process of doping and drying. Special "dope" containers are also provided which will reduce evaporation.

British Output of Aeroplanes

Writing in the War Anniversary Supplement of *Overseas*, Sir L. Worthington Evans, late Financial Secretary to the Ministry of Munitions, says: "British factories are now making in a single week more aeroplanes than were made during the whole of 1914, in a single month more than were made in the whole of 1915, and in a single quarter more than were made in the whole of 1916. The output for the whole of this year will be several times what it was during last year."

New Foot Warmer for Aviators

An electric foot warmer for the use of aviators, truck drivers, etc., has been invented by W. W. Lillard, 274 Monticello Avenue, Jersey City, N. J. Mr. Lillard, an electrical engineer, is at present on active service, and the invention is being promoted by Ernest J. King, of the same address.

The equipment comprises an insole of the same general appearance as the common slip insole, except that it has two plugs at the heel, which project about one-eighth inch from the bottom. These plugs are the terminals for the resistance wires or heating unit which is imbedded in the insole. When the insole is placed in the shoe the plugs fit snugly in two small sockets which are sunk in the heel about one-eighth inch.

There are two different ways for conducting current to the contact sockets in the heel. One consists in having two narrow metal strips extend along the outside of the sole from the heel for the distance of about an inch, these strips being adapted to make contact with contact plates in the foot board. The other method consists in bringing two very thin wires down the back of the shoe inside the back stay to the contact sockets, connection being made at the top of the shoe through two small snap-fasteners which are barely visible. A thin wire is fastened to the inside seam of each trouser leg, extending to the waist, where connection may be made with the electrical source. In making connection in this way there is absolutely no wire to get in a person's way

It is claimed that a person equipped with this device may keep his feet as warm as he wants to, and that when his feet are warm his whole body is warm. The heating element is intended to be operated from a 6-volt battery, and as each heating element has a resistance of about 6 ohms, the current consumption is only one ampere.

Overland to Make Liberty Engines

Elyria, Ohio.—The Willys-Overland plant in this city has announced it will begin the manufacture of eight and twelve-cylinder Liberty engines. The plant will operate twenty-four hours a day, giving employment to more than 2,000 men.

Giant Plane from St. Louis

St. Louis.—W. E. Workman, general manager of the Handley-Page Aeroplane Manufacturing Co., delivered a talk to members of the Chamber of Commerce at a luncheon in which he told of factories to be built in this country. Immediately after the luncheon a movement was started to raise $50,000 to build a giant plane here to fly to the war zone, where it will be offered in service. Some progress has been made in raising the fund.

Personal Pars

E. M. Beach has been appointed to the position of inspection of the Bureau of Aircraft Production. He was formerly president of the Manufacturers Foundry Co., Waterbury, Conn., and also a member of the Board of Directors and Executive Committee of the Motor and Accessory Manufacturers Association.

B. A. Guy, secretary and assistant general manager of the Curtiss Aeroplane & Motors Corp., Buffalo, resigned August 15.

A. B. Walker has resigned as representative of the Budd Wheel Corporation, Philadelphia, to join the staff of the Bureau of Aircraft Production. He has left for an Eastern station.

Orrel A. Parker, formerly manager of the wheel department of the Hydraulic Pressed Steel Co., has gone to Washington to engage in government work. He is in charge of records under W. F. Parris, chief of the oil and lubrication branch, supply section, in the office of the director of military aeronautics.

Increased Their Equipment

Continental Auto Parts Company of Knightstown, Indiana, has recently increased its capital stock from ten to fifty thousand dollars, and is now making extensive additions to its plant and installing additional machinery and equipment in order to take care of its Government contracts.

The company manufactures a line of shop and factory equipment and it has been necessary to greatly increase production on the Continental Motor Stand, which is being used by the Department of Military Aeronautics, the Navy, Quartermaster and Ordnance, and the various manufacturers now making aeroplanes, trucks, tractors for the United States Government.

List of Purchase Contracts Made by Bureau of Aircraft Production

The following is a list of purchases contracted for by the Bureau of Aircraft Production:

[NOTE.—The first number at the beginning of each paragraph is the Order Number, the second is the Contract Number.]

730146. 4414. Zenith Carbureter Co., Detroit, Mich., 50 sets No. 48 D. C. carbureter and spare parts for the Hispano-Suiza 150 horse power, Type A engine.

730147. 4415. The Silver Co., South Bethlehem, Pa., 25,000 spark plugs for use on Hispano-Suiza Type A, 150 horse power engine.

August 3, 1918

30035—A—1. 2129—3. Ford Motor Co., Detroit, Mich., spare parts according to "M" and "L" lists for 5,000 Liberty engines.

180007. 4413. The Simplex Wire & Cable Co., Boston, Mass., 3,000 miles field wire.

710107. 4423. Eastman Kodak Co., Rochester, N. Y., 50,000 gallons cellulose acetate dope.

710108. 4425. Standard Seamless Tube Co., Ambridge, Pa., 70,500 feet seamless steel tubing.

710109. 4421. Bordentown Steel & Tube Co., Bordentown, N. J., 54,500 feet seamless steel tubing.

720214. 4424. B. F. Goodrich Co., Akron, Ohio, 10 supply balloons.

August 15, 1918

140024. 4426. W. N. Matthews & Bro., 620 Southern Building, Washington, D. C., 5,000 breast reels, without spool.

370100. 4429. Wayne Oil Tank & Pump Co., 1337 Meridian Place, Washington, D. C., 93 portable oil tanks.

470115. 4432. J. C. Pushee & Sons, Boston, Mass., 20,662 brushes.

480048. 4438. Continental Car Co. of America, Louisville, Ky., services in connection with crating 350 machine-shop truck bodies.

710104. 4420. Standard Aircraft Corporation, Elizabeth, N. J., 60,700 feet gauge seamless steel tubing.

720218. 4431. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., 40 sets wings, upper and lower, right and letf, complete.

750027. 4428. Unit Construction Co., Fifty-eighth Street and Grays Avenue, Philadelphia, Pa., 2,700 air fans for driving 100-watt generator used on radio telephone combination transmitting and receiving set.

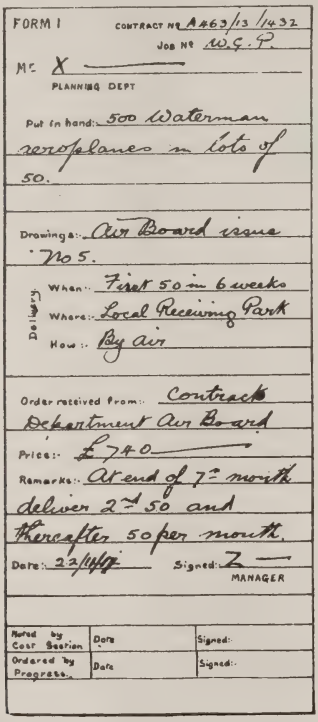


A view of the interior of the Springfield Aircraft Company's factory

SHOP ORGANIZATION: A SIMPLE SCHEME*

By W. E. JOHN

IT is my object to sketch the outline of a scheme for the organization of a factory. I neither pretend, nor is it my aim, to exhaust the subject, but shall apply the scheme to a modern factory, and hope so clearly to outline it, that it may be at least of some interest to the members. I may add that I have assisted in the mapping out and starting of two or three schemes or systems of organizations in England. A few days ago I was glad to read in a letter from an old "half section" of mine—a manager of a well-known motor-car factory and now engaged on aeroplane engines, high explosive shells, motor war lorries, etc., in which he says, "It would do your heart good to see the easy and complete way the system which cost us so many long hours



hammering out last year is now working. Visitors from other factories are frequently coming to see it in operation."

In order to illustrate the working, and in particular the flexibility of the scheme, I shall consider it applied to a factory producing aeroplanes. It will be sufficient if we consider the engine to be supplied complete and the machines made to Government orders.

At the beginning, it must be clearly understood that for successful control we must have management, and that means the existence of a real manager.

As is the manager, so will be the firm. If the manager does not take his own medicine—or, in other words, does not obey his rules, *i.e.*, the rules of the factory, framed and posted under his signature—then the whole concern will show lack of control. A manager's great qualification for his post should be that he can manage.

This question of management cannot be too strongly put. A manager to manage men must be a man in every sense of the word.

Now to the scheme; in the smallest or the largest concern, we must have a planning department. In the smallest concerns this department may occupy but a small part of the manager's brain and have very little visibility, but in a concern of any magnitude the planning department is very important.

The department should be divided into two sections—the commercial section and the productive section—or, more conveniently termed the costing section and the progress section.

* Paper read before the Aeronautical Society on March 14, 1918.

We have a cost department and sometimes a progress department in every works, but too often they are at loggerheads and have little in common with one another.

The man in charge of the planning department should have had a sound broad training and have ample initiative to meet emergencies. He should be capable of uniting the cost to the progress of the work. He should, of course, be strongly backed by the manager.

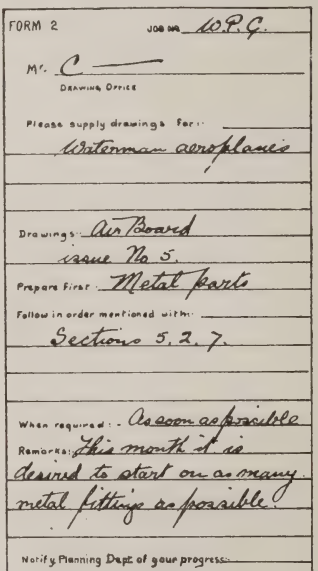
Aeroplanes are admitted to be a very difficult product for a factory, because of the number of parts of widely different materials which go to make up the complete unit, and because of the constant minor changes which are occurring in their design. They are, however, not unique in this latter respect, as those engaged in the production of various other munitions can testify.

We shall assume that an order has been received for 500 aeroplanes to be delivered in lots of 50; also that the price is considered satisfactory and that the factory is in a position to execute the order. We will call the aeroplane the "Waterman" type.

Once the order is received—through the post, by telephone, or otherwise—it must at once come to the manager, who should himself sign the order to the planning department for the work to be executed in the factory.

The order signed by the manager should be in duplicate, one copy for the planning department and one for the file.

It will be noted that the Government order number is dropped for obvious reasons and a factory number substituted, and, for convenience,



each 50 has its proper symbol. WGP in lots of 50 will mean, to the initiated, an order for "W" type machines. G.H.I.J.K.L.M.N.O.P. lots of 50, or a total of 500. The first lot of 50 will be "WG," the second "WH," and so on.

For convenience in handling and filling, all forms in use should be on the same size card or paper. They may, however, be distinguished by different colors. If the factory uses a system of time cards and clocks, with a card measuring 7 in. by 5 in., this size should be used for the order forms, for reasons which will be apparent hereafter.

The cost section of the planning department should first receive the order, and should at once open an account and make notes of the various particulars of importance to them. Having done so, the clerk responsible for the entry should sign and date the order.

The planning department now proceeds to justify its name, and at once arranges for production to commence in the works. In the first place, arrangements for the drawings should be made.

The whole machine is sectionalized—wings, fuselage, undercarriage, etc., forming each a section. Preferably, the sections should be limited to nine, to fit in with the numbering scheme hereinafter dealt with. A section of the aeroplane is next selected, preference being given to the section which will take the longest time for its production. It is minutely sectionalized and its parts properly scheduled. A copy of this schedule should be sent to the order office.

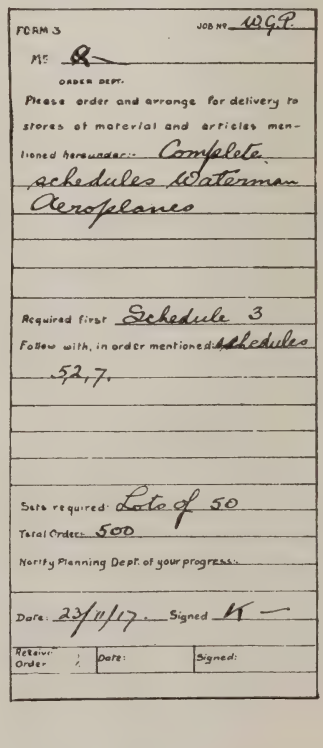
The parts which require to be bought outside complete are clearly marked on the schedule. It will be the duty of the order department to see that the rough material is actually in the stores at the earliest possible moment. The order department must clearly recognize that their duty does not terminate with the ordering, but with the actual delivery. They will also keep the planning department advised of their progress, item by item, if necessary. It is quite possible that a lot of material required for the job is already carried in stock, and the order department must advise the planning department of the position in this connection.

Meanwhile the planning department should have mapped out the production and allocated the work to the various departments. Forms for the production of each item, and in a number of cases, the part production of each item, are prepared. In fact, every operation of each part is provided with a written order. This may appear to be a stupendous task, but a moment's consideration will show that it is always done, but that, in a large number of cases, the work of wiring these forms is scattered throughout the works, such as at the desks and offices of foremen and charge hands.

These order forms are preferably made out in duplicate, one copy is filed and the carbon copy is conveniently made on the beck of the clock job card above referred to. The number or name of the department in which the work is done is filled in, and in fact every other item, of course, left to the discretion of the foreman. An order for the material required from the stores is also made out and attached to the production order.

It will be noted that there are two stores mentioned. (1) The rough stores, and (2) the departmental stores; the nature and reason for these stores will appear later.

The foreman in the department concerned will



FORM 4 Job No 129.P.

Mr. X —

PLANNING DEPT

Please note that the following can be met by stock in the stores at this date:— Kn

schedules 3, 5, 2.

for first 50.

Item	No in stock	No per set	No required
3-4	56	50	—
3-12	102	100	—
3-15	47	50	3
3-24/34	24	50	26
3-17/21	121	100	—
2-1/7	300	200	—
2-8	61	50	—
2-9/6	92	100	8

Date: 25/11/17 Signed: Q —

Received by Order Dept. | Date: | Signed:

be furnished with these orders by the planning department whenever the latter arrange for the work to be done, but never before they know that the requisite material is available in the stores. As the men under the foreman require work, he will fill in their number (or name and number if required) on the forms, and hand same to them. They will "clock on" the back of Form 5 and take Form 6 or 7 to the stores, draw the material and sign the receipt for same. On the completion of the job, the parts completed will be delivered to the proper stores and the receipt for same signed. All forms will be returned to the planning department, so sonn as they are completed, and the duplicate on file can then be destroyed. Until destroyed, these duplicates form a record of the work in progress and an automatic check against the loss of any job.

Where the rule exists to check and balance the job and time cards weekly, it will be necessary for the foremen in the different departments to have duplicates made of all job cards carried over to the following week and the card so continued should be suitably marked, preferably they should be of a different color to the ordinary job card. In this case also, all job cards will pass through the timekeeper's department for checking with the time cards before they go back to the planning department.

Should any "scrap" be made, extra material would be requisitioned through the planning department, who may issue a further order on the stores. Preferably, such orders should be on a distinctive colored paper, so that they may be picked out as orders for replacement for "scrap." Too much attention cannot be drawn to this matter if economical production is to be attained.

In order to record progress of work, use should be made of some chart. A convenient size for the card is 8 in. by 5 in. Some cards should have extra space on the back to accommodate components having an exceptional number of parts, or duplicate cards may be used for the same purpose.

Full information regarding the component and its proper classification is provided on the top of the card. The items are enumerated and, if necessary, the drawing number of each is given. A number of spaces is provided opposite each item and these are used for the different operations. The first column is headed "Stores," and the other colmuns are for the various departments in which the operations are to take place. Each department is conveniently indicated by a number permanently assigned to it. The number indicating the department should be written in red ink as large as possible. See Form 8.

Each space is divided by a horizontal line and each space so formed is again sub-divided by a horizontal and four perpendicular lines, thus providing two blocks of ten small sections to each space.

Shading with lead pencil the ten sections at the top of the horizontal line will show at a glance that the total number of the particular items called for have been received by the department indicated; whilst the shading of the sections below the horizontal line will indicate that the work on the items has been completed in the particular department and deposited in the proper stores, and that the job card has duly returned to the planning department. The date on which the particular movement of the item occurred, may be noted in ink over the shading. If, for any reason, the requisite number of any item is not received or produced by any department, the position can be shown by the number of sections shaded or parts of sections.

For instance, department 1 received material for the production of 200 side plates; owing to "scrap" 180 were produced, consequently only nine of the ten sections are shaded. As the "scrap" is not to be made up, the 180 are passed on to department 9, and this is shown by the shading of nine spaces only. Department 9 also makes "scrap" and thereby loses 10, consequently only 8½ sections are shaded, showing

FORM 5 HOLD HERE Job No Wl. 753

No

Dept No 7

Mr

THIS SIDE OUT.

Please Press out side plates

Number required 200

Material M.S. Plate

Note Flatten after pressing

Deliver to Store No 3

Date 26/11/17 Signed X —

PLANNING DEPT

Received

Item	Number	Date	Signature

FORM 9 Name and Number of Parts Waterman Aeroplanes Our Contract No W.L.

Section No Military Equipment W.L. 7 Component No Gun Bearers W.L. 75

Remarks Schedule No 3 Drawing No 1908 W

No	Description	No Off		Stores	Dept.	Dept.	Dept.	Dept.	Dept.	Dept.	Dept.	Dept.	Dept.	Dept.	Dept.
751	Arch tube bearers	200	In		2										
			Out												
752	Stay tubes	100	In		3										
			Out												
7511	Arch tubes front	100	In		3	7									
			Out												
7512	Arch tubes rear	100	In		3	7									
			Out												
753	Side plates front	200	In		1	9	7								
		170	Out	26/11/17											
754	Side plates rear	200	In		1	9	7								
			Out												
755	Front longeron clip	200	In		1	4	3	7							
			Out												
7551	Front clip starboard	100	In		1	9									
			Out												
7552	Front clip port	100	In		1	9									
			Out												
75521	C.S. strut socket	100	In												
		100	Out	27/11/17	4	2									
75522	Longeron Plates	200	In												
			Out	27/11/17	4	2	To be credited to 75521								

170 side plates passed on by this department.

Referring again to the first column, *i.e.*, the stores record, the top spaces are shaded when instructions for ordering the material have been sent to the order department. The lower spaces are shaded when the planning department has been notified that the material is in stock. The date in this space should show when the orders for the work to be put in hand were sent to the shop.

If desired, the progress card may be smaller in size and one card assigned to each item. If this is done, a ready means is provided for seeing at a glance the amount of work in progress in each department. This will be described in detail later.

It is now necessary to mention the system employed for numbering the various jobs. This is an adaptation of the decimal system in use in some libraries.

No doubt members have had some experience of the long official numbers used by the Government to designate their contracts. A number like A463/13/1432 will serve for an example. To saddle a job, and all the parts of it, with a number like this, is asking for trouble. Its use means loss of time, worry through mistakes and consequent loss of output. I believe "every little helps" in the question of output, and that, whether one is to save time in the production of battleships, aeroplanes, or packets of matches, every moment saved is a moment gained. A few moments' thought will convince anyone acquainted with the records necessary in even a small factory, that the aggregate of the time wasted in writing the long numbers such as that mentioned above must run into days.

As already stated, my method is to give the contract a certain letter. A contract for a number of "Waterman" aeroplanes is given the letter "W" and if we sub-divide the number into lots of, say, 50 each, each lot is given a second letter as "WL." The unit required in the contract—in the example under consideration, the aeroplane—is divided into a number of sections, but not more than nine, and subsequent sub-divisions are limited to ten, and are numbered consecutively, as:—Wings 1, centre section 2, fuselage 3, tail 4, undercarriage 5, power plant 6, military equipment 7, struts and bracings 8, controls and instruments 9.

Each section is divided into components limited to ten. For instance, the military equipment section number WL7, is divided into:—Gun complete 1, magazine case 2, ejector funnel 3, control gear 4, bearers 5, wind screen 6, sight 7.

Each component is sub-divided into parts. Take for example the gun bearers. These, numbered WL75, would be divided into:—Arch tube bearers 1, stay tubes 2, side plates front bearer 3, side plates rear bearers 4, front longeron clips 5, rear longeron clips 6, fork piece 7, bolts 8.

Each part is further divided into items, thus the front longeron clips, numbered WL755, may be split into:—Front longeron clips starboard 1, front longeron clips port 2.

If desired, the division may be carried still further. The front longeron clip number WL7552, may be sub-divided into units:—Centre section strut socket 1, longeron plates 2. These are single pieces and cannot be further sub-divided.

The longeron plate will be numbered WL75522.

This is not a very large number, but in the most complicated pieces no greater number of figures should be required. A moment's thought will make it clear that the long numbers are used less frequently than the others since they only apply to the units. The job card for welding up the front longeron clip would be numbered WL755. But the man who assembles the gun bearers had a card numbered WL75.

Once the main sub-divisions are made they should remain as far as possible standard for all types of machines.

The advantages of the system will be apparent. A lot of similar small parts are found in the factory in an unfinished state. The number on the label attached to them, or the job card with them, is WL726. We know from "W" that they belong to the Waterman type of aeroplane. From "L," that they are on a particular order for these machines. The 7 shows that they are part of the military equipment. This information will probably be so near a guide to one who is used to the work, that he will at once recognize the part, but if not, the 2 will show that it is a part of the magazine case.

Of course, the same system could be used in connection with traction engines, agricultural implements, or any other machine or article of manufacture.

It is impossible to deal with all problems peculiar to each factory which may occur in the working of this scheme and for which special arrangements must be made. However, there is one point requiring a little explanation. A foreman very often will desire to put more than one man on a job. To meet this emergency, each foreman should be provided with a number of blank forms clearly marked, preferably by the use of a different colored card to that used for the original order. The foreman will be responsible for the form being properly filled up. These extra cards will travel through the works and eventually back to the planning department in exactly the same way as do the original forms which they supplement.

In some concerns it may be desirable to keep track of the work almost hourly, for example, when the work is carried on by more than one shift. To meet this requirement, the progress cards should, as above mentioned, be substituted by the small size cards recording single units.

Such card, say, 3 in. by 2 in. in size, is provided with at least two pilot index clips or flags. They should bear numbers to indicate the department to which they refer. At one side of the top edges of the cards is placed the proper flag indicating the department in which the work is in progress. The other flag on the opposite end of the top edge should bear the number of the department to which it next has to go. Further flags, colored red, may be used to mark jobs which have to be "rushed." Flags colored black may be used to show jobs temporarily held up for some reason or other. These special flags may be placed towards the centre of the top edges of the cards.

A box of cards indicating all the jobs at the moment in the factory will contain perhaps as many as 1,000, 10,000, or 100,000 cards, but will show at once the position of each department so far as work in hand is concerned.

This system, in a large shop, having a central stores, view-room or inspection department, acting as a pool between each operation, may easily be worked by the clerk checking jobs in and out of said pool.

Of course, the cards should be kept in proper order so that the position of any job may be ascertained at any moment.

A final davantage in this system will be found if two files or boxes for the cards are used. At the beginning of a week, or month, or any other period, an empty file is used. The first card to be moved, say, on Monday morning on a weekly system, is taken from the old file and placed in the new one. Any new cards coming in are, of course, placed and filed in proper order and with the proper flags in the new file. At the end of the week the old file should be very thin, whilst the new file should be corresponding full. Before starting the new period, the next week, the cards which have remained stationary in the old file should be removed and handed to the superintendent or manager, who would thereby have a positive and automatic means of seeing what jobs have remained stationary for the week. He can order any card to be replaced in the current file or otherwise dispose of same, as he thinks fit.

As a final warning, no system will be good unless the head man backs it and obeys it laws; every man, boy, woman and girl in the factory and offices should have their duties defined; each should understand as far as may be necessary the system of organization so that each one may assist to make the system so simple and complete that it automatically "runs itself."

Discussion

Mr. G. Holt Thomas (The Chairman) said the lecture by Mr. W. E. John on "Shop Organization" was a little departure from the usual practice of the Society, but a very necessary one at the present time. We had good designs in England, but it was no use having good designs without good production, or *vice versa*. The lecture was particularly opportune at present as he (Mr. Thomas) thought it would be impossible to organize any aircraft factory in England under the conditions which existed before the advent of the Air Board and the Air Ministry. It was impossible to organize without material, or if sufficient orders were not received, or if the authorities did not know what they wanted. But under the Air Ministry we had now departments for material inspection, and things had much improved. Another thing that stopped work was that the output of aeroplanes was formerly largely controlled by the number of times the Germans bombed London, the result being that works had to be doubled just when organization was contemplated. He thought that had now probably come to a standstill and that the present was a most opportune time for the discussion. He was always striving at organization, which, as Sir Henry Fowler would tell them, they had never got. The paper by Mr. John, he thought, would help them to obtain it. Sir Henry Fowler (Assistant Controller of Aircraft Production) said he was compelled to take part in the discussion by the remarks the chairman had made. They must all appreciate that there had been no more difficult matter placed before the engineering world than the construction of a machine like the aeroplane, which was developing almost from hour to hour. In time af war it was absolutely necessary to give the fellows who were fighting and risking their lives for us the very best. From time to time something happened which pointed out that some slight alternation would give advant-ages, and that was one of the most damning things that could happen from a constructional standpoint. Mr. John had not put down for absolute comparison what would happen to his second set of figures if there were more than nine parts in any of those sections into which he had split it up. He would have found himself running in competition with the long figure he had given as an example of a shop number used in another system. Mr. John had shown them an excellent example of the kind of man it was necessary to put into the shop with his proposed organization. The manager must be whole-heartedly on the job. A fellow who had had to deal with a more simple proposition said this organization was needless, and he got through his work, but not in the time he ought to do. There was not only the difficulty with the managers and the foremen, but also with the men themselves, who thought if they left out a number or put in an extra number or a wrong number they would be paid just the same, and it was a matter of difficulty and patience to teach them to use the system. Anyone who had had to deal with aeronautical work had realized the importance of such a system.

Major Heckstall Smith said the system proposed departed from the majority of the existing organizations, but the departure was a good one. It established the great importance of a planning department and of dividing the work up into small sections. It was a great thing to divide aeroplane works up in that way, and it was not done universally. The author put the costing department under the planning department. Would he say why he had done that? He (the speaker) had hoped that he would have gone further into the real valuable functions of that department, as it was the brains of the works. Highly skilled people must be employed in that department, otherwise they would do more harm than good, and its personnel was the most important of the whole works. He took it the author meant the planning department would not act in the old fashion that used to exist when the foreman gave instructions to the workman as to how work was to be done—it still held in many works in England—but that the planning department took away from the foreman the clerical and instructional work he used to do and only left to him the selection of the men and the watching of the work of the men. Would the lecturer give a few words on the primary functions of the planning department and the class of men he would employ?

With regard to checking the work in progress and the material he did not agree with using quite such small cards for watching material which came in in driblets, or for the progress of the work. They wanted something large to hang on the wall and which would hit you in the eye, and a color scheme might show whether you were up-to-date, the work behind being indicated by red and the up-to-date work by black. Supposing the planning department had put the work through and the progress department was told to watch for a certain number of items every day or week, and when the progress sheet was passed one would see whether the articles were or were not coming in and would indicate by red or black whether the foremen were up-to-date with their promises or not. Otherwise he approved of the scheme, which was an excellent one.

Captain Hiscocks, R.F.C., thought the paper should show the conditions applying to the works into which the author was putting this organization; also the size of the works—500, 5,000, 50,000 hands—was a consideration. Did the author make the whole of the aeroplane in his own works, or how much did he buy outside? For a works of 500 men the system was a suitable one, but with 5,000 men the paper record would be so large that the whole thing might fall to pieces, and he would have to change over from a paper progress system to a minimum and maximum stock system, which would be more accurate. The dividing up of aeroplanes into main parts and groups seemed to him to fall to pieces in some respects. There might be half a dozen orders in the shop for manufacturing the same parts, and probably the foreman would overlook them and put them through in half a dozen batches instead of one batch. There were many parts which it did not pay to put through in batches of 50; they would have to be put through in batches of 500 for economical production.

The progress charts did not take into account that a large number of parts might have been withdrawn for spares, emergency orders, etc., and that threw out of balance the progress sheets, and the progress sheets could not show exactly where all the different parts were going. They might show what was coming in, but they might be withdrawn from the stores and certain parts might be found short when one came to the finished aeroplane.

Mr. E. C. Gordon England said there was a great tendency to view organization from the point of view of organization, and not from the point of view of the work about to be tackled. A system could apply to a small or a large works equally, provided the main thing was kept in mind—viz., the job to be produced. The organization should center round that, and not round the works of the men employed. Every branch of engineering required a special organization, a different one being required for aeroplanes from ships. A point which upset him was the question as to how one dealt in Mr. John's system with any one part, as it appeared in these days of standardization that that part would have several different numbers in the one machine. One of the main things to do was to cut down the different references to one item to an irreducible minimum, otherwise, a field was opened up for enormous error, because the foreman would be greatly upset

THE LONDON EXHIBITION OF ENEMY AIRCRAFT

By G. DOUGLAS WARDROP

IN arranging the exhibition of enemy aircraft at Islington, London, the Technical Department of the Aircraft Production Department of the Air Ministry have done the British aeronautic industry and the Allied air service a distinct service by making available for inspection the latest enemy developments. Through special permission of the Air Ministry AERIAL AGE was permitted to visit the exhibition and to make complete notes concerning the machines, engines and accessories for the benefit of the American aircraft industry.

The arrangement of the various exhibits is excellent. To facilitate examination the machines are stripped from one side of the center line of the fuselage, and left covered, as in flying condition, on the other, this enabling one to gain an impression of the general appearance of the machine, and also the internal details of the planes and fuselage. In most cases the machines are shown minus engines, this being rendered necessary by the fact that, owing to the methods of construction generally adopted for the fuselage, the stripping of this item detrimentally affects the strength of the structure.

The engines are shown in a separate section, and include an example of almost all the types of motors employed by the enemy. In this section there are two motors of each type, one completely set up, and the other dismantled and sectionalized for the closest inspection. This is of immense value to the student of the principle and practice of aero-engine construction. The most striking lesson here is that, no matter what one's views may be concerning enemy aircraft practice, it is very evident the motors, as exemplified by Mercedes, Benz and Argus, have been developed to a stage of great reliability. Engines of a very recent date of construction are shown, and the falling off in finish which might be expected of the manufacturers in a country which would logically be expected to be under considerable duress, is undistinguishable. The workmanship is excellent, and the metals, with but one or two exceptions, are of a high grade.

The total weight per horse power and the performance generally of German aero engines are not of extraordinary merit. As a matter of fact they are a fairly light weight per horse power, higher considerably than has been accepted in Allied engineering channels as desirable.

Reliability has been the sole goal of the constructors, and the records would indicate that they have succeeded in no small measure. In the exhibition are shown the 120-, 160- and 260-h.p. Mercedes; the 160- and 120-h.p. Benz; the 120- and 220-h.p. Benz; the 120- and 200-h.p. Argus, the 110-h.p. Oberursel and the Maybach airship engine, concerning all of which we shall have something to say in subsequent issues.

With the exception of the Oberursel (which is a German modification of the Gnome), all the types of engines were in use before the outbreak of the war, but it is worthy of note that whereas now the dominating motor is the Mercedes, before the war the majority of the German aeroplanes were engined with Argus and Benz motors.

The various aeroplanes shown demonstrate very clearly the chief characteristics of the German aircraft.. The types shown include the Aviatik, L. V. G., Albatross, Ago, Hannover two-seater, Halberstadt, Pfalz, Albatross D1, Albatross D3, Austrian Berg, Fokker triplane and Friedrichshafen bomber. The latter is twin-engined and fully rigged, 78 feet span, with 260 Mercedes motors.

This bomber is one of the most interesting types in the exhibition, and affords some new examples of constructional details. In addition to the complete machine there are also parts of similar machines, showing to greater advantage the various span and strut sections, details of wings, controls, tanks and metal fittings generally. All of these we shall deal with in detail.

There is a representative collection of instruments, machine guns, bomb dropping devices, and aviators' clothing equipment.

In a cursory mention of building practice there are a few things that stand out noticeably. For instance, there is an extensive use of plywood, the laminæ varying from three to fourteen, and in thickness from 1/32d of an inch to 1 inch. It is used for built-up box wing spars, ribs, leading edges (very considerably), brackets, supporting engine bearers, and almost without exception for the body covering. There is a pronounced tendency towards the use of steel tube for all control surfaces, and also for the under-carriage. In many cases oil and gasoline tanks are made of brass. The fabric used seems to vary in quality very decidedly, and some of the machines are indeed very poor. The use of helical coil springs as shock absorbing media might suggest a scarcity of rubber.

A noticeable detail of enemy design is the method of washing out the wing tips, until, in most cases, this portion of the wing forms a negative angle to the horizontal. Perhaps it is due to the early influence of the Etrich or Taube monoplanes. While the modification of Etrich tip has still been retained, the sweptback type of plane has been entirely superceded by the plane of rectangular plan form.

In some of the types the great care taken in forming a good entry to the fuselage, by the attachment of a revolving spinner to the propeller, is nullified by the exposed radiators, water pipes and exhaust manifolds.

In one or two of the more recent German machines, however, the radiators are of the flat-tube type, and are mounted in the center section of the top plane, conforming in shape to the wing section.

The workmanship in the various machines is of a very varied nature. But in none of the machines shown does it call for ultra-favorable comment, while in one or two it most decidedly would not pass muster here.

But the notes which will follow this article will be of considerable interest to American aeronautic engineers.

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by the fact that one part was known in the works by three or four different numbers. If it were reduced to one everybody would always recognize it. There would be less errors on the clerical side, and less mental effort would be applied to remembering and identifying that part. There were great risks if a part had several different numbers or references of putting those parts through separately instead of in one bunch. He suggested that the best method of dealing with those parts was to let the planning department put them through as parts of a whole order, and not with reference to any one section. That would obviate setting up a machine to produce a few of them and then breaking down the machine and setting it up for some totally different article. The first duty of the planning department was to see how much labor they had under any one head in the works. For example, how many skilled men or unskilled women they had on any one operation. They could then state definitely what their output of any one article could be, and it enabled them to balance the whole works in such a way that no one section would be producing more of one article than was required to balance the production of the various other items in an aeroplane. He found that practice was possible and that it paid.

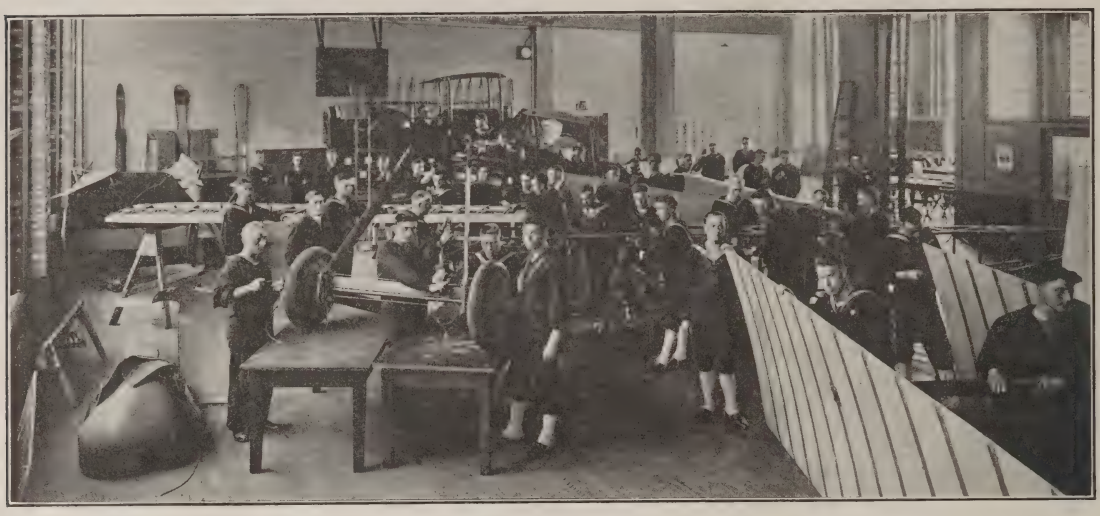
Mr. R. Borlase Mathews said he would like a little more information as to how the lecturer used and applied his cotsing. In many works the costing figures were not available as quickly as they might be to serve their turn in reducing the cost of production of further batches.

He had been interested in mechanical methods of calculation, and one of the best examples he had seen was at the R.A.F. works, which Sir Henry Fowler lately controlled. They had a system of machine whereby detailed costs could be analyzed rapidly. Such machines were known as the Burroughes machine, which was used for the wages portion, but for the works analysis and costs of operation the Powers counting machine carried the thing out in careful detail. He would have liked greater detail as regarded the planning of the work along the line of putting what might be called more brainwork into the arrangements for facilitating the work of the foreman and the men. That was an application of what was known as Taylorism in workshop management. As regards the woodworking portion of aeroplanes, there was great scope for the use of jigs in the manufacture rather from the view of the management—that is preplanning—rather than letting the planning slide to a later time when the work actually got into the shops. The lecturer had remarked that he went ahead with the work if the order received were satisfactory. That reminded him that some American firms if they found the price was not satisfactory re-designed the job, but possibly the Air Board would stop that sort of thing here. He had used the decimal system of classification in engineering for fifteen years, and found it very useful. He had even introduced it into the Air Board, which was rather apt to act on conservative, War Office lines. He divided the aeroplanes into nine parts and one general miscellaneous part, and took them alphabetically. The parts were armament, ballast, engineering fittings, fuselage, instruments and fittings, landing gear and anchorage, main planes, tail, tanks and pipes. This system of numbers was not appreciated quite as it might be in this country, and it was most useful that a number instead of being a mere number should tell something definite about the thing being dealt with. In America and on the Continent they had this system in use more generally than we had in England. The question had been asked how one managed if the article were only divided into nine parts? But when one knew the system it was not difficult. There was a standard size bolt used on the main planes, fuselage, or anywhere else. It went on a quantity basis, and it was a thing with regard to which the planning department would have started out on that basis. Works that produced bolts of a certain size on a batch basis would not show evidence of much brains in the planning department.

Mr. W. E. John said with regard to the remark about dividing into nine sections, anything could be divided into less or up to nine different sections. He did not use ten because the "O" was a figure the workman did not like. The workman, if he had no experience of decimals, dropped the "O" if it began a number. With care, anything could be divided into nine. He was asked by a lady in one of the factories, who had charge of the filing of the correspondence, to adapt this for her filing, and he found one could divide her filing into nine main sections, and from that it was again divided into ten, and the sub-division increased as far as necessary. Sir Henry Fowler referred to the fact that the above system would be up against having the wrong numbers put on the job by the men. In the system he had sketched every order was written, in the first place anyway, by the planning department, and if there were any copies it was due to two men being put on one man's job, to meet an emergency. It was a plain copy made by the foreman, and if the number was dropped or there was anything wrong with the copy it was not hard to trace it when it came through the shops, because they had the original which was made out by the planning department.

Another speaker asked why the costing section was put under the planning department—why the planning department was divided into cost and progress. It was really the obvious thing to do. The cost had to be cut to fit the cloth, and the planning department should have some say in the way the progress of the job through the shops was planned. The type of man he would put in charge of the department would be a man who had served an apprenticeship and had very wide experience of the actual production in the workshop. It was very difficult to get the right man, as apprentices were not often good office men. The man must have passed through the real details of a factory and know something of accountancy or costing.

Major Heckstall Smith said he wanted his records posted large, but this meant papering the walls of a very large room. The number of jobs in an ordinary factory would want a lot of room to be readily visible at the same moment. A scheme of this kind used to be in operation at a place where he worked at the time in the West of England. They had a system of flaps, such as were used for advertising postcards, and these were used to show the different positions of jobs. With regard to small parts of aeroplanes being numbered twice over, wood screws, for instance, were used in all parts. Few aeroplane factories would produce these screws. That would be a stock job. If the numbering scheme were to be applied to small parts bought inside or small clips, or anything used in quantities, they would give it "Sk," which meant "stock," and number it accordingly. It was true that spares came in and that there were emergency orders, but if an emergency order came in for fifty sets of wings it should not interfere with the original contract, which went on just the same. The emergency order was put through separatel,y and the right clip put on it, and it was sent as a separate order through the whole organization. Coming back to the stock, the screws might be different sorts, and after "Sk" one could add the figures 1 for round head, 2 for counter work, 3 for metal thread or anything else. If it were a wood screw it might be No. 8 or start in any size which was suitable to the factory, so that the "1" might be divided into 1, 2, 3, 4, 5, and so on, for different carieties. Or one might use 1 for iron and 2 for brass, and then divide those numbers into 1, 2, 3, and so on. They knew No. 1 was a round head, and if it was 11 it was iron right through. This could also be done with turnbuckles or anything else used in quantity.



The big gymnasium at Dunwoody has been turned over entirely to the aviation classes. Here the students assemble and dismount, rig and repair

MAKING NAVY AVIATORS IN A HURRY

By WILLARD CONNELY, U.S.N.R.F.

AMERICA had been in the war about two months when Ensign Colby Dodge, U.S.N., conceived the idea of introducing naval aviation fifteen hundred miles inland. At that time he had been ordered to duty in Minneapolis, where he was instrumental in starting the Dunwoody Naval Training Schools, now sending to the fleets four thousand expert craftsmen annually. To local civilians he proposed an aero club, to back a unit of pilots. The club was organized with a rush, but like all our war preparations it took some months to gain momentum. The first class of student officers went in April to Boston Tech for examination. All passed with "flying" colors, meaning among other things that they doffed their blue jackets for the forestry green uniform of the air corps. Then they were detailed for solo flight practice to Atlantic and Gulf air stations.

A second class of pilots, quickly authorized by the Navy Department, complete ground training in September, after which it is contemplated to enroll twenty-five men every fortnight, keeping one hundred students under continuous progressive instruction, so that twenty-five graduate every two weeks as well. This scheme, providing for a highly concentrative two months' training in the preliminaries, is believed to be about the peak of velocity in developing navy birdmen.

To those familiar with the ground work for the Naval Reserve Flying Corps an analysis of the separate studies would unfold nothing new. There is the usual prescribed schooling in the four major subjects—navigation, rigging, motors, gunnery. The planes, which are torn down and reassembled by the students as fast a a youngster builds castles with his stone blocks, are a Burgess-Dunne, a Sturtevant, and the two Curtiss types, J-N-4 and J-N-3. The engines are a Curtiss O. X. ninety, a Sturtevant 145, a Gnome hundred, and a Hall-Scott hundred. An adequate supply of Lewis and Colt machine guns takes care of the gunnery classes, and Colt automatics and Springfield rifles supplement with target practice. With the best features of the original Dunwoody electrical and radio courses as a foundation the work in signalling, complete with blinker, semaphore and wigwag equipment supplied by the Government, is unusually thorough.

Seamanship as given student officers at Dunwoody, however, presents some novel points. A lake about a mile and a half square is the medium of imparting fundamentals concerning boats and water manoeuvres. This branch of the curriculum is in charge of chief petty officers—boatswain's mates and gunner's mates—who were old in the service when our little controversy with Spain was in bloom. They know all species of boats, guns and water, and an inland lake gives ample opportunity to teach the rudiments.

War canoes, motorboats and ten-oared navy cutters are employed to train the pilots in handling small craft—gangway, dock landings, coming alongside, hoisting, lowering, sea anchors and parts, lead line, knots and splices. Each cutter mounts a Lewis gun, and is fitted with fore and main sails. Daily after indoor training hours at school the fledglings march to the lake, to row, sail, race motorboats, or swim. A swimming instructor is on duty at the lake, and it is his job



In the carpenter shop the men learn to make each part of the woodwork necessary for aircraft, how to dope the fabric, and how to build pontoons



On Saturday morning the student officers don their dress uniforms and make ready for inspection by the Commandant at their barracks. Meantime, in a corner of their armory, they have an opportunity for some extra study of the workings of the Lewis gun

to see that every student proves himself at home in the water.

But the seamanship instruction does not end here. Every night after mess, at barracks in the aero club, the chief petty officers who drill the tyro pilots at the lake give lectures and blackboard talks on such subjects as lighthouses, buoys and beacons for American and European coasts, code flags, storm signals, lights on ships and seaplanes at anchor, tide tables, recognition of ships of various nations, with models and silhouettes.

Naval indoctrination is also taught at this hour, so that the men learn something of ship organization, honors, and the value of initiative.

A course in photography embodies map making from photographs taken in flight, with rectification and the scale equalizer considered. The men are taught how to prepare aero cameras for flight, also the formula for calculating the area obtained in pictures. Every student must know, too, the photographic processes for developing and printing.

In a short course on aerial observation, map reading, communication codes (to artillery), the zone call system, pre-arranged shots, and the use of the aeroplane aerial are studied. Enough astronomy is given so that the flying aspirants understand the apparent movement of the heavens, polaris, and the distinction, for example, between the Pleiades and Cassiopeia.

The daily routine for these student officers, once started at quarter of six in the morning, never lets up until ten at night. Not a moment in the interim is unocupied. The aero club, where the men both mess and lodge, seems like a merry enough clubhouse, or fraternity house, if you happen to step in about three minutes before the nonday meal. Then you may hear a couple of banjos, a raggy piano, and something more or less vocal. At any other hour the place is as quiet as an actors' club at breakfast time. The future aces are either at Dunwoody, at the lake, or studying in small groups within their rooms, or in the basement armory taking down a lecture. No liberty is granted except on Saturday afternoon and Sunday, and a man delinquent in any of his work is restricted even then.

Whenever Commander Warren J. Terhune, U.S.N., commandant of all U. S. Naval Training Schols in Mineapolis, issues a call for new aviation recruits it is surprising how many of the applicants are found to be under the minimum age of 20 years. They come in dozens, aged nineteen, or nineteen and a half, some of them younger than that.

"What's the difference?" they protest. "We'll be twenty by the time we get through training, won't we?"

It is difficult to refuse these spirited youths, for they are usually splendid physically, and they have the education. It is futile to ask them to "come back in six months." They join some other branch. Still, it is hoped that some of them will reappear for the autumn class.

(*Continued from page* 1312)

With the American Army in France

The Americans in the fighting line north of Soissons had a quiet day on September 3.

There was considerable aerial activity in the Vesle region and several combats in the air. One German machine is reported to have been downed by Allied airmen.

American airmen successfully bombed Longuyon twice on September 3.

About thirty aeroplanes flew over the German lines and dropped a few bombs.

Pershing Praises American Flyers

With the American Army in France.—General Pershing has sent a letter to the Chief of the Air Service, commending the First Pursuit Group. The letter says:

The Commander in Chief has learned with great satisfaction of the work of the First Pursuit Group of the Air Service and desires to commend it especially for its praiseworthy record.

The handicaps under which this unit of the American expeditionary forces has been organized and begun the discharge of its duty are well known and recognized. With fine spirit and determination it has overcome obstacles and already achieved an enviable record. Its commander and personnel are congratulated for their effective and daring work.

9 American Aces Are Now in France

Paris.—American aviators are playing a large role in Allied aerial actions. Fighting German aviators, bombing troops, depots and aerodromes during the day and bombing the centres of enemy activity behind his lines at night, all form part of the work undertaken by the young American pilots. Their air victories are numerous and they are showing themselves to be excellent pupils of the French flying aces.

Among the American aces is Lieutenant Tobin, who, since July 11, has gone from success to success. On that day Tobin, who had been at the front only a few days, spotted an enemy machine making for the American lines. He immediately attacked and shot his adversary down in flames.

Five days later he brought down his second victim in the same circumstances. On August 1 he added another German flier to his bag and yet another on August 10. A day later he accounted for his fifth German. So Tobin became an ace.

To date the American aviation aces are Lieutenant Putnam, with twelve victories officially counted; Captain David Peterson, with six; Major Thaw, Sergeant Major Parsons, Lieutenant Douglas Campbell, Lieutenant Meissner, Lieutenant Rickenbacher, Lieutenant Tobin, five each. Lieutenant Porter has shot down four.

All these fliers operate scouting or fighting machines, while there are many others, of whom very little is heard, who fly heavy bombing machines which are in the air just as often, if not oftener, than the scouting machines.

Italian Army Headquarters.—One of the first exploits of the American hydroaeroplane pilots trained in Italy was that of J. H. Hammond of Baltimore, who saved Lieutenant Ludlow during a raid on the Austrian naval base at Pola. While Ludlow was dropping bombs his machine was riddled by the Austrian fire, and he was compelled to alight on the Adriatic three miles from Pola. When Hammond saw his plight he swooped to Ludlow's rescue, braving the concentrated Austrian fire and the attacks of five enemy aeroplanes.

Hammond hit the water near Ludlow's machine, ran alongside, took Ludlow aboard and stowed him under the motor of his one-seater plane. He then set Ludlow's machine afire.

Meanwhile the enemy aviators were keeping up a steady fire. Hammond with his own gun kept the Austrians off and got away safely, although pursued halfway across the Adriatic. Finally his machine gave out while near the Italian coast and the two Americans were forced to swim ashore.

Recruiting Stopped

The following statement is authorized by the War Department:

General March, Chief of Staff, has directed the discontinuance of voluntary enlistments for the Army, except as authorized by act of Congress in certain cases.

General Harris, the acting Adjutant-General, has issued instructions by telegraph to all recruiting officers in charge of recruiting districts to close up the recruiting stations as soon as practicable, in accordance with detailed instructions previously sent by mail. The enlisted men at the recruiting stations are to be sent to the nearest recruit depot, where they are to be physically examined and their qualification records made out, with a view to their assignment to appropriate duty. The six recruit depots, namely, Fort Slocum, New York; Columbus Barracks, Ohio; Fort Thomas, Kentucky; Jefferson Barracks, Missouri; Fort Logan, Colorado, and Fort McDowell, California, are to be utilized during the continuance of the war as mobilization places for selective service men, whence these men will be distributed to organizations.

The only original voluntary enlistments hereafter authorized will be of men over forty-six years of age and under fifty-six years. The enlistment of these men is authorized only for Staff Corps and Departments. There are few applications for enlistment from among this class of men and the enlistment of such as are found qualified can be effected at the mobilization depots enumerated above, or any one of the military posts or encampments throughout the country.

(*Continued on page* 1338)

SOME METEOROLOGICAL CONDITIONS WHICH INCREASE THE DANGER OF FLYING*

By Captain C. J. P. CAVE, R.E.

Introduction

IT may seem rather presumptuous for one who does not himself fly to discuss the dangers that may be met with in the air as though a landsman who had crossed the Channel a few times were to write on the navigation of a ship across the ocean. At the same time, it may be of some use to point out certain conditions of the atmosphere which seem to me to constitute dangers, although I may be mistaken in my estimate of some of these, and would welcome any information from pilots bearing on the subject. In fact, my paper is meant to elicit information rather than to give it.

At the same time I should like to protest very strongly against the idea that we have made so much progress in the science and art of aviation that we can afford to disregard the weather altogether, except perhaps in the case of fog. The idea is a common one, and has been often stated, but it seems to me that it is a most dangerous idea to foster. An airman cannot afford to disregard the weather any more than can a seaman. A seaman puts to sea in almost any weather, but the fact that storms take their toll of shipping is a proof that seamen cannot entirely disregard these things. Neither are airmen immune. Only last summer it was stated in our official *communique* that five of our aeroplanes had failed to return owing to a severe rainstorm.

Probably what is meant when it is stated that airmen can afford to disregard the weather is that somuch progress has been made in the construction and design of aeroplanes that they can go up in almost any wind and can fly safely in winds that would have proved fatal to machines in a few years. But there remain some conditions that are dangerous, and many that are severe hindrances to aeroplane work in war.

The chief conditions that suggest themselves to my mind as increasing the risks of flying are the following:—(1) Gales; (2) squalls; (3) bumps and eddies; (4) clouds; (5) rain, hail and snow; (6) fog; (7) lightning. It is possible that the number might be added to by experienced pilots, and it is also possible that some of the conditions that seem to me to be dangers may not really be such, but I suggest them in the hope of getting more information.

*Paper read before the Aeronautical Society of Great Britain.

Gales

In the early days of flying strong winds were more formidable than to-day, but there are still occasions when the wind is so strong that machines are able to make little or no headway against it, and such a strong gale may arise with great suddeness and sometimes without much warning.

An example occurred on December 28, 1914, when a small depression formed over the Bristol Channel and passed across the south of England, causing a gale that did a considerable amount of damage. In the south-east of England it was nearly calm before the onset of the gale, which sprang up with great suddenness. At Farnborough, for instance, an anemomter exposed 140 feet above the ground level registered a velocity of 80 miles per hour, when only a quarter of an hour previously it had been quite calm. I do not know that there were any aeroplanes flying when the gale began; probably not. The gale began in the afternoon in the southwest of England, but it did not reach the southeastern counties nor the northeast of France till after dark. But a gale of 80 miles per hour 140 feet above the ground must have been considerably more at a height of 1,500 feet, and I venture to think that if aeroplanes were flying when such a wind sprang up many would have failed to return to their aerodromes. If at the same time there were a development of low clouds when such a gale came on aeroplanes would be likely to lose their bearings entirely.

Besides the loss of aeroplanes actually flying, a gale such as the one under discussion would cause severe damage to hangars and tents, and I believe that on this occasion considerable damage was caused in this way.

Gales may spring up with great suddenness at all times of the year; in fact, I think that a summer gale may often give less warning of its approach than a winter one. Anyone who has done any sailing round our coasts must remember cases where they have been caught in gales a couple of hours or so after having been lying becalmed. I think that easterly gales in the summer are apt to spring up suddenly in this way.

A gale, however, usually gives warning of its approach, and may often be forecasted many hours in advance, and the weather map for the day will usually indicate when a gale is likely.

Squalls

A squall is a temporary rise in wind above the mean velocity that preceds and follows it, the rise in velocity being continued over some minutes at least, and is thus distinguished from a gust, which only lasts a small part of a minute. Squalls are of innumerable degrees of severity. On a day of blustery northwest winds, when there are large cumulus clouds about, one may have a succession of squalls, whose approach can be seen at sea some time before the onset. Such squalls are probably not of any particular danger to aeroplanes, as at sea they are not of much danger to shipping, except in the case of small open sailing boats, but in peace time at seaside resorts they take their toll of holiday makers who are sailing with the main sheet made fast.

More intense squalls are associated with thunderstorms, and they are all the more dangerous since they are often preceded by very light winds or even by a complete calm, and within a minute or so from their onset the wind is blowing at the rate of even 60 to 80 miles per hour. A typical example of such a squall occurred on August 2, 1906. As seen in the east of Hampshire, this storm came up from the direction of the Isle of Wight in the shape of a huge cumulus cloud with a great extension of false cirrus at the top, giving it the appearance of a giant mushroom; the day had been very hot and the air was very still. As the storm approached it was seen that heavy rain was falling, but there was no sign of wind to the untrained eye. A few minutes before the rain reached the observer a continuous roar was heard, and as the first drops fell a furious blast of wind arose; the wind only lasted a few minutes, and in three-quarters of an hour the storm has passed and the weather was fine again. The storm passed over the South Downs, and the same storm or another moving parallel to it reached Guildford, where the damage done by the wind was very great. An airship would have been in the very greatest danger and could hardly have weathered the storm.

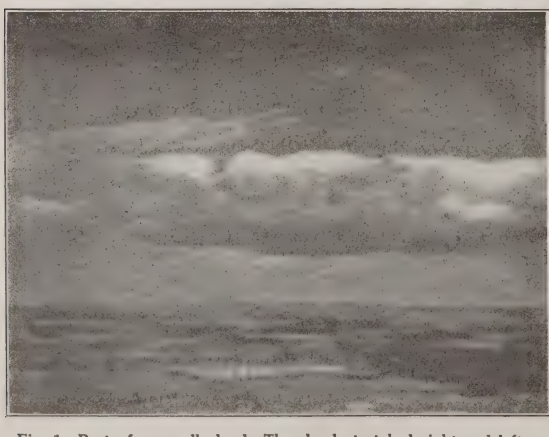


Fig. 1. Part of a squall cloud. The cloud stretched right and left as far as could be seen. When it came overhead there was a moderate squall with snow



Fig. 2. Very small cumulus clouds beginning to form

The squall in front of an ordinary thunderstorm is probably a modification of another variety known as the line squall. The sequence of events in a line squall is somewhat as follows: A bank of clouds is seen extending along the horizon, the upper parts being white and in shape like ordinary cumulus, though the whole cloud usually appears of a more uniform height, and not broken up into such distinct peaks as is ordinary cumulus. (Fig. 1.) As the cloud approaches it is seen to be extremely dark below, and it usually extends in a long line, stretching from horizon to horizon, but owing to the effect of perspective it appears like an arch in the sky, the summit of the arch coming nearer and nearer overhead. As the cloud reaches the observer a violent squall springs up, the wind veers rapidly or even suddenly, rain falls in torrents and is often accompanied by hail, and there may be thunder and lighting; at the same time the temperature falls considerably, a fall of five or ten degrees being common, and it is sometimes as much as 20 degrees. When the cloud is approaching and is nearly overhead a curious sinuous line is seen at its base extending right along the front of the cloud, and it is this line which gives the name of line squall to the disturbance. After the first blast the wind blows strongly for a time and the heavy rain lasts for half an hour, more or less; this is followed by a less intense fall of rain and by decreasing wind, and after an hour or so the weather often clears up and becomes fine.

A line squall is only a few miles across, but it may be several hundred miles long, and it advances across the country broadside on at the rate of 20 to 40 miles per hour; one such squall has been traced from Cape Wrath to the centre of France, another from the northwest of Ireland to the centre of Germany. The list of disasters caused by line squalls is a long one; the best known case is that of H.M.S. *Eurydice*, a training ship homeward bound, that was struck by such a squall when off the Isle of Wight on March 34, 1878, and foundered with heavy loss of life.

Besides the blast of wind in front of the squall, there are great up currents in front and down currents near the middle of the squall, with much eddy motion between them. Such conditions could hardly fail to be dangerous, and, though an aeroplane might possibly come safely through them, it is hardly likely that an airship would.

The onset of a line squall is generally sudden, though anyone with a very little training in meteorology can see it coming while it is still some way off. On January 20, 1916, a line squall passed across the country from northwest to southeast, reaching Farnborough at 10:30 A. M. The morning had been fine, and a number of machines were out on the Common; the squall came on suddenly, and several machines were damaged before they could be got back into their sheds. A storm such as this one can be predicted with some success if the machinery is ready for the purpose. The general conditions favorable for line squalls can usually be forecasted from the Daily Weather Map prepared at the Meteorological Office, but unless a line squall occurred at one of the Meteorological Office observing stations at the time of the taking of the meteorological observations or shortly before, the existence of the squall may not be noticed on the map. The squall of January 20, 1916, which was not particularly severe, was first observed in the south of Ireland at about 4:30 A. M. It was accompanied by much thunder and lightning. It crossed the Irish Sea and reached the coasts of Cornwall and Wales at about 7:30 A. M., and moved across the country in a line 100 miles long or so, the movement being, as usual, at right angles to its length. Now this storm did not affect any of the Meteorological Office observing stations, and hence its existence was not known officially, as one may express it But, since a squall of this type is perfectly easily recognized, its coming might have been foretold if the proper machinery had been in existence to deal with it; such a warning might have been received in plenty of time for the aeroplanes on the Common at Farnborough to have been put in their sheds in safety.

That there is time for such warnings to be given is shown by the fact that recently I had a telegram from Upavon telling me that a line squall had just passed over; the telegram was received about ten minutes before the squall, which was not at all a severe one, reached Farnborough. Ten minutes is doubtless too short a time for the warning to be acted upon, but a station further west than Upavon could have sent a warning that would have been received in plenty of time.

It appears to me that it would be quite feasible for an observer at every aerodrome to send a telegram to some central office when a line squall took place; at the central office the general weather conditions would be well known, and therefore the direction of motion of the squall could be foretold. In addition, other reports would come in as the squall reached other aerodromes, and the rate of travel could be obtained with some accuracy. Warning could then be sent to all aerodromes which were likely to be affected, and some signal might be hoisted in a conspicuous place where it could be seen not only by those who were responsible for machines on the ground, but also by pilots who were flying in the immediate neighborhood of the aerodrome. Some such organization would not be complicated, and would only occasionally have to be put into use, but it might be the means of saving machines, and possibly lives also. If the information were to be sent out by wireless the warnings would be received still earlier. But weather forecasts are looked on in some quarters as the subjects for jokes, and it will take some serious accident caused by line squalls before anything practical is likely to be done. A severe line squall is generally accompanied by lightning and thunder, and an automatic lightning recorder would indicate its approach, especially in winter, when thunderstorms are almost entirely of the line squall type. The lightning recorder at Farnborough began to record lightning at about 5 A. M., on January 20, 1916, and it was quite evident from the chart that something quite out of the ordinary, for the winter, was occurring.

Bumps and Eddies

I do not propose to deal with these at any length. The danger from bumps is small with modern aeroplanes, though in the early days of flying they were a great source of danger. Pilots are far better qualified to speak of bumps than is a meteorologist who has only been taken in the air a few times as a passenger. Bumps are mostly due to rising currents of air over surfaces of the ground that are at different temperatures and to eddy motion due to the wind blowing over irregularities of the surface. They also seem to occur at the cloud layer when there is a sheet of cloud, and they occur, of course, with cumulus clouds.

In this connection there is a point on which pilots could give some information. At Farnborough an easterly wind is far more bumpy than a westerly wind. Is this due to some local configuration of the ground, or is it something inherent in an easterly wind? I suspect that there is some connection between bumpiness and easterly winds, but what it is I cannot attempt to explain. An easterly wind has, seemingly, peculiarities of its own; it is said, for instance, that there is always more sea in the Channel with an easterly wind than with a wind of corresponding strength from other quarters.

Clouds

Clouds may be a danger in several ways. In the case of cumulo nimbus clouds the heavy rain, and possibly hail, or the snow in winter, may prove extremely dangerous. Such clouds, too, are often of great extent, and are the sea of very rapidly ascending currents of air. A pilot might have to fly a considerable distance before getting clear, and might easily lose his bearings. A cumulo nimbus cloud is one that should be avoided if it is possible to do so, and, as these clouds often occur in isolated masses, it may be at times possible to fly around them. A cumulo nimbus, the true shower cloud, from which rain, hail or snow is falling, may be distinguished from simple cumulus by the fact that the top of the former cloud, instead of being rounded and hard-edged, is brushed out into a soft-looking mass of fibrous cloud called false cirrus. It is true that showers fall from simple cumulus clouds, but the really heavy falls are from cumulo nimbus.

Cumulus clouds are more common in summer than in winter. They usually begin to form in the morning as the day gets warm, and reach their greatest development about two or three in the afternoon, after which they generally begin to disappear, and by sunset or soon after the sky may be quite clear even after a day of great development of this form of cloud. But they may be met with at other times, and they form after sunset in the summer when shallow depressions, bringing thunderstorms, are approaching.

Low sheets of clouds may prove a hindrance to work with aeroplanes, and if they are very low they may cause difficulties for a pilot in finding his way back to the aerodrome, or even difficulties in landing at all. The possibility of low sheets of cloud forming after a clear morning, especially in winter during unsettled weather, should always be borne in mind. A glance at the latest weather map will often be a valuable guide as to whether a fine morning is likely to last. Take, for instance, map for 7 A.M., on December 24 last. This shows that the sky was clear in northeastern France, but subsequent reports show that it became overcast and rainy, and that there was a great extension of low cloud. Anyone who had in the least followed the weather on the days preceding this date and who had seen the map for the day, or even for the preceding evening, would have realized that the fine morning was not likely to last beyond a very short time. I maintain that aeroplanes going up on such a morning would have been extremely likely to find low clouds extending to within a few hundred feet of the ground before their return, and they would therefore be in some danger. It might be that it would be necessary to incur the danger, that it was worth incurring the danger for the results that might be obtained, but it would be absurd to say that such meteorological conditions would not add to the risks of flying.

(To be concluded)

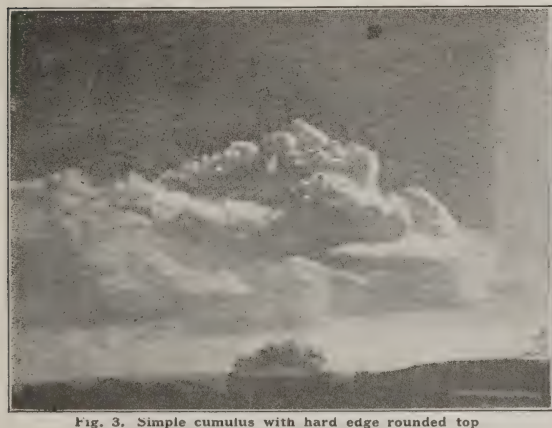


Fig. 3. Simple cumulus with hard edge rounded top

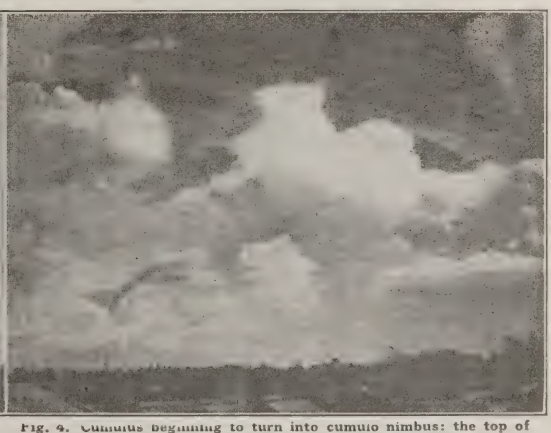
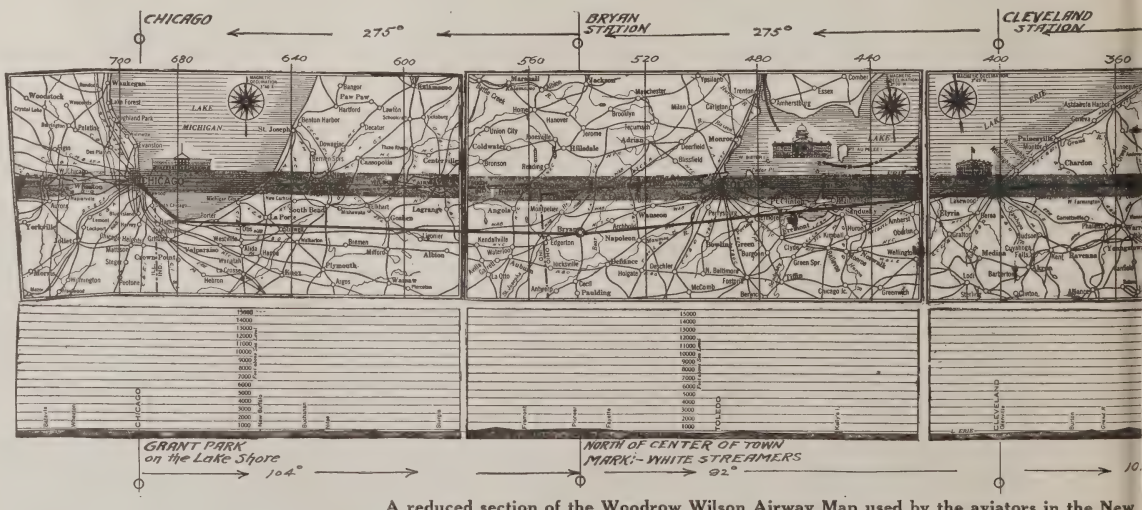


Fig. 4. Cumulus beginning to turn into cumulo nimbus: the top of the cloud in the centre is becoming soft edged fibrous



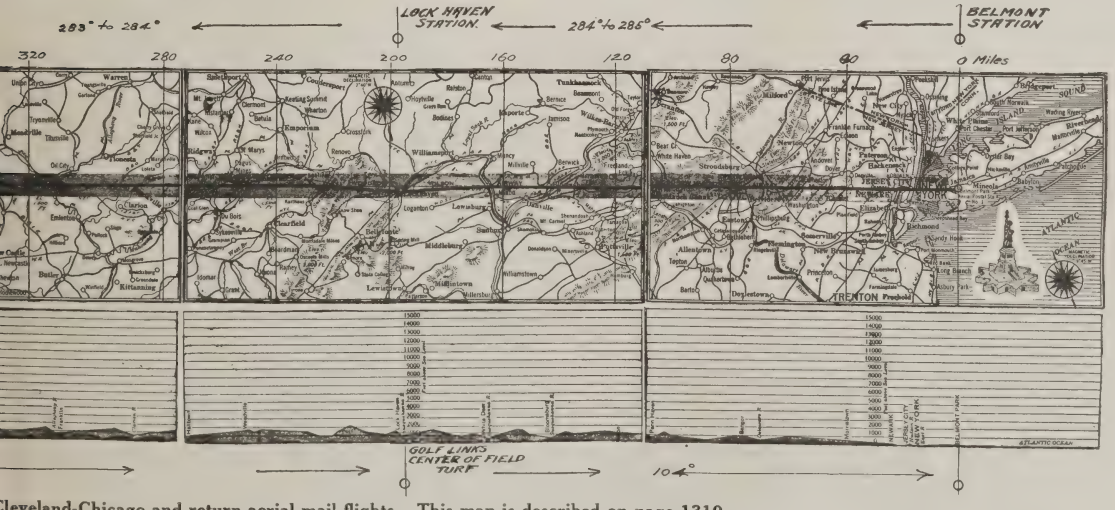
A remarkable photograph taken at Belmont Park at the start of the aerial mail, showing the threatening clouds and forecasting the adverse weather conditions which prevented the aviators completing the New York to Chicago flight within ten hours The machine is the Curtiss Liberty used by Pilot Gardner in making the Chicago-New York flight in one day



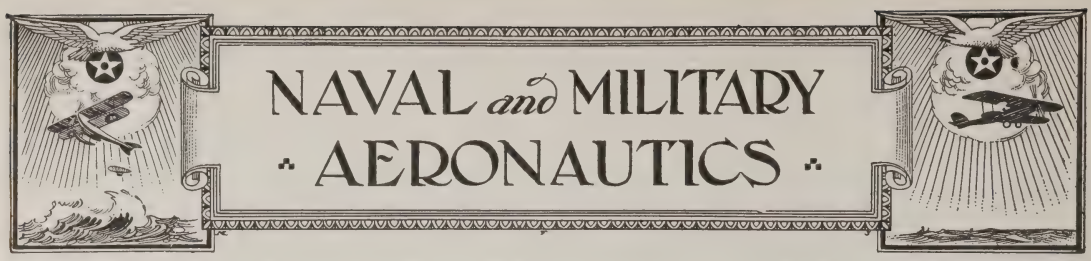
A reduced section of the Woodrow Wilson Airway Map used by the aviators in the New



At the start of the aerial mail at Belmont Park. From left to right: V. M. Norris, C.S.K.U.S.M.; E. M. Norris, superintendent aerial mail for New York City; Captain Robert A. Bartlett, famous arctic explorer; Lieut. Eytinge, Canadian Air Service; Lieut. Pennypacker, U. S. Air Service; Mr. Alan R. Hawley, president Aero Club of America; Mrs. May Brown-Dietrich, daughter of ex-Governor Brown of Maryland; Ed. V. Gardner, aero mail pilot No. 2; Postmaster Patten of New York; Max Millar, aero mail pilot No. 1; Robert Shank, aero mail pilot; Maurice A. Newton, aero mail pilot; C. De Hart, aero mail pilot; Mr. George L. Connor, chief clerk to Mr. Praeger; Henry Woodhouse, editor and publisher of Flying and Aerial Age Weekly; Harry L. Hartung, Belmont Park representative of the postoffice



Cleveland-Chicago and return aerial mail flights. This map is described on page 1310



Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Chief Technical Section, Dayton, O.
Note 3—Report to Park Place, Houston, Texas.
Note 4—Report to Akron, Ohio.
Note 5—Report to Sacketts Harbor, Madison Barracks.
Note 6—Report to 713 Lindsey Bldg., Dayton, Ohio.
Note 7—Report to School Military Aeronautics, Mass. Inst. Tech., Cambridge, Mass.
Note 8—Report to 480 Lexington Avenue, New York City.
Note 9—Report to Recruit Receiving Depot, Fort Wayne, Mich.
Note 10—Report to General Supply Depot, Americus, Ga.
Note 11—Report to Dis. Mgr. Finance, Bur. Aircraft Production, Detroit, Mich.
Note 12—Report to Dis. Approvals Office, Buffalo, N. Y.
Note 13—Report to Det. No. 3, Springfield, Mass.
Note 14—Report to Standard Aircraft Corp., Elizabeth, N. J.
Note 15—Report to Gen. Supply Depot, Middletown, Pa.
Note 16—Report to Gen. Supply Depot, San Antonio, Texas.
Note 17—Report to A.Q.M.G., Washington, D. C.
Note 18—Report to Western Electric Co., Chicago, Ill.
Note 19—Report to Jacksonville, Fla.
Note 20—Report to Fisher Body Corp., Detroit, Mich.
Note 21—Report to Students Army Training Corps, Harvard Univ., Cambridge, Mass.
Note 22—Report to Det. No. 6, 1550 Woodward Ave., Detroit, Mich.
Note 23—Report to Army Balloon School, Lee Hall, Va.
Note 24—Report to Aviation Repair Depot, Dallas, Texas.
Note 25—Report to Det. No. 2, Air Service Production, New York City.
Note 26—Report to Det. No. 4, Air Service Production, Buffalo, N. Y.

Special Orders Nos. 190 to 197, Inclusive

A

Ainsworth, Frank Wesley.....SLA; HHN
Ambler, Harold H.....CPA
Arter, Theodore.....CPA
Aubrey, Stanley Freeman.....SLA; CGC
Allison, Ernest McConnell.....SLA; RSD
Abbott, Louis H.....SLT; ALF
Archer, Ralph Curtis.....SLA; HHN
Ankeny, John C.....FRF
Anspach, Paul P.....FRF
Abbey, Perley Loring.....MJA; VBW
Atkinson, William Terrell.....SLA; CAF
Ames, Harold Taylor.....SLA; CFT
Amsden, Sherman C.....LDT
Amory, Roger.....DMA
Anderson, Orvil Arson.....SLA; FOB
Ackerman, Edgar M.....KST
Adams, William Jacques.....FLA; Note 8

B

Bunce, Ralph Lyman.....SLA; PMT
Burke, Malcolm C.....FLA
Beckett, Ralph Edwin.....SLA; RSD
Bassi, Andrew Blain, Jr.....SLA; KST
Boller, George Walter.....SLA; EOT
Bourman, Charles A.....LHV
Belknap, Clifford B.....DIK
Blaich, Ernest G.....DIK
Birkelund, George Rasmussen.....SLA; DAF
Bartlett, Edward Charles.....SLA; DAP
Brophy, Norman Delroy.....SLA; KST
Browning, Lorenzo Dow.....SLA
Blanchard, Charles Barnes.....SLA; DAP
Berens, Fred William.....SLA; HHN
Brokmeyer, Albert F.....HHN
Beaven, Joseph Carey.....SLA; APR
Barrett, James T.....BST
Benjamin Hamilton F.....DMA
Baker, Ernest B.....SMM
Buckland, William E.....LDT
Bell, Cecil K.....CGC
Bruce, Jerald Joy.....SLA; CJW
Barker, John D.....LDT
Bolting, John T.....LDT
Burtis, Edwin S.....LDT
Burdick, Harold B.....LDT
Biscayart, Jules Dominique.....SLA; HHN
Brown, Howard Condit.....SLA; LDT
Bufkin, Wesley Ford.....SLA; HHN
Barker, Stephen Ray.....SLA; WFO
Brown, John Earle.....SLA; CUI
Balsinger, Elis C.....FRF
Baker, Quin Kenneth.....SLA; CRI
Bishop, Edward Payson.....SLA; WFO
Baxter, Howard Francis.....FLA
Betz, Charles F.....DMA
Boudreaux, Auguste Emile.....FLA
Babcock, Howard Clark.....FLA
Bly, Merwin Cluxton.....SLA; LDT
Bierman, Hugh Eastwood.....SLA; LDT
Burton, Charles Humphreys.....SLA; KST
Briney, Wilton Moore.....SLA; KST
Bonnell, Harry Mortin.....SLA; KST
Benson, Ray M.....LDT
Browne, Lucien W.....LDT

Buford, Bennett G.....LDT
Belt, Dean B.....FRF
Bennett, John C.....FRF
Brown, Sewell.....WFO
Bennett, Frank P.....TFT
Beswick, John S.....TFT
Brady, Frank L.....TFT
Brennan, Edward W.....TFT
Brown, Harry G.....TFT
Blevins, Beeler B.....SLA; CAF
Baker, Cecil Carlyle.....SLA; LDT
Belt, William S.....BFT
Butler, Joseph F.....PUP
Barnard, Frank Lee.....SLA; GLC
Bassi, Andrew B., Jr.....BST
Blaim, James J.....BST
Bissonet, George H.....BST
Banchor, Gordon H.....SMM
Brown, Birch L.....SMM
Brown, Chalmer E.....SMM
Bucklin, William N., Jr.....DMA
Berndes, Walter Oscar Bernhard..SLA; Note 15
Bowne, Francis D.....CGC
Behse, Joseph Edward.....SLA; DAF
Burr, Kinsey.....Note 4
Barone, Tony.....SLA; WFO
Benson, Matthew Martin.....SLA; CRI
Bornhold, Herbert John.....SLA; FOB
Baxter, Robert K.....EOT
Ban, Ollie L.....EOT
Bolz, Adolph C.....EOT
Burmeister, John C.....EOT
Buchtenkirch, George C.....Note 23
Boggs, Willis A.....Note 20

C

Crawford, Robert Harold.....SLA; CRI
Clark, Lucius I.....WFO
Chamberlain, Willis Arden.....FLA
Clark, William Dorman.....SLA; HHN
Clarke, Frederic Leslie.....SLA; PMT
Cutting, Aaron Barrows.....SLA; PMT
Church, Elliott S.....CPR
Crissy, Dana H.....DMA
Cull, Edwin E.....FRF
Chisholm, Henry.....SLA; PMT
Colgate, Henry Auchincloss.....SLA; CRI
Cunningham, Samuel D.....ELA
Chenoweth, Bertrum W.....EOT
Czarniecki, Myron J.....CGC
Coles, Barry Fearn.....SLA; PMT
Clarke, DeFrance.....FRF
Christensen, Jens Tinus.....SLA; BFT
Colton, Deane W.....PFO
Cooley, Arthur B.....PFO
Copeland, Jay M.....PFO
Curtis, Erland L.....PFO
Curtis, Thomas Carson.....SLA; ELA
Chrisman, Thomas L.....DIK
Clopeck, Frank.....DIK
Campbell, Lloyd K.....DIK
Cragin, Arthur B., Jr.....FOB
Cochran, Emory E.....FLA
Coe, Alfred L.....SLA; HHN
Cole, John Abbott.....SLA; CGC
Collins, Roy Parker.....SLA; CGC
Chalfant, Harvey O.....TFT
Chamberlain, Leo W.....TFT
Chapman, Harold C.....TFT
Charrom, Arthur B.....TFT
Clark, Horace.....TFT
Cole, Robert A.....TFT
Collier, Trezerant.....TFT
Crawford, Frank H.....TFT
Campbell, Robert B.....FRF
Colliver, Harold E.....FRF
Chrisman, Thomas Love.....SLA; CAF
Culley, Oscar L.....DMA; HHN; Note 1
Curry, James Philip.....SLA; LDT
Clark, Chester R.....FRF
Crede, Lloyd S.....FRF
Curtin, James C.....FRF
Cowan, Robert S.....LDT
Cook, Frank F.....LDT
Cushman, Robert G.....WFO
Couzens, John C.....CAF
Chute, Aubrey Jay.....SLA; GLC
Chamberlain, George Slayton.....SLA; Note 24
Coffman, Don M.....Note 14
Cantey, Samuel M.....EOT
Carter, John O.....EOT
Corsaut, Jesse H.....EOT
Coble, Paul L.....FLA; DAP
Cox, Lester Edmund.....SLA; SBI
Caldwell, Percy.....FLA; PUP
Cook, Sam Jacob.....FLA; Note 14
Cheston, Daniel M., Jr.....Note 10
Crim, William D.....WFO
Christiansen, Charles Emal.....SLA; EOT
Cutler, Herbert J.....FLA
Cole, Raymond T.....SMM

D

Davis, Paul J.....WFO
Davis, Elmer Clarkson, Jr.....SLA; RSD
Diemer, William Sorber.....SLA; EOT
Dooley, Peyton Young.....SLA; PMT
Draper, Harold D.....PFO
Dent, Magruder.....DMA
Dickson, Charles M.....DMA
Dougherty, James E.....SMM
Day, Dana Court.....FLA; DAP
Davis, Claude A.....LDT
Duke, John F. S.....LDT
Devers, Philip Knoderer.....SLA; CJW
Davis, Clarence Andrews.....SLA; KST
Dillon, Milton S.....HHN
de Podesta, Anthony.....SLA; CRI
Daddow, Samuel H.....RSD
Dodge, Cecil P.....LDT
Dohr, James L.....FLA
Douglas, Bernard M., Jr.....TFT
Daniels, Albert J.....FRF
Dwight, Charles Stevens, Jr.....SLA; DAP
Daniels, Thomas L.....FOB
Davidson, Harry Thompson.....SLA; PMT
Douglass, Norman James.....SLA; WFO
Dunham, Carroll.....Note 21
Devers, John M.....UIU
Dickens, George Ronald.....SLA; SBI
Deuel, Thorne.....RWT; WDM; Note 1
Drebry, Ernest Egbert.....SLA; PMT
Dodge, Vernon Montgomery.....SLA; EOT
Dunbaugh, George Johnston, Jr.....SLA; CJW
Dugliss, Malcolm.....SLA; KST
Davis, Leland Worthen.....SLA; KST

E

Eagan, Edward Francis.....SLA; LDT
Evans, Christopher C.....SLA; RSD
Everett, Charles.....FLA
Evans, Christopher James, Jr.....SLA; PMT
Erickson, Fridtjof C.....MAT
Everett, Robert.....SLA; PMT
Ellitt, Alexander.....FRF
Egge, Harrison Robert.....SLA; CWT
Edmiston, Hugh C., Jr.....CGC
Estabrook, Frederick Reed.....FLA
Eby, Samuel H.....LDT
Evans, Dean P.....WFO
Earley, George E.....LDT
Earle Murray.....Note 3
Evans, Nelson Frazier.....FLA; Note 8
Ezell, Wallace Dean.....SLA; WFO
Eshelman, Gordon Louis.....SLA
Elliott, Lawrence M.....SLA; OSU

F

Forshee, Clarence Welch.....SLA; KST
Fenstermacher, Nevin.....SLA; CGC
Fish, Farnum Thayer.....SLA; RSD
Friberg, John Thompson.....SLA; MAT
Foster, Thad Victor.....SLA; TFT
Frewer, John W.....APR
Finch, George Edwards.....SLA; CGC
Fountain, Ray C.....SMM
Fallon, William Prescott.....SLA; CGC
Faxon, Warren Ellis.....SLA; DAF
Fisher, Floyd C.....SLA; LDT
French, Irvine.....LDT
Ferris, James J.....FRF
Freedman, Mark A.....FRF
Finnegan, Thomas Ledwith.....SLA; VBW
Farnsworth, Tom D.....LDT
Farnsworth, Harold T.....LDT
Foltz, Joseph R.....LDT
Fleming, Carl S.....LDT
Farris, Homer V.....EOT
Fee, Ray E.....PFO
Faulkner, Charles James.....SLA; KST
Frick, Childs.....Note 2
Fleming, George A.....Note 3
Fisher, Robert T.....CPA; DMA
Fowler, Lee T.....Note 16
Ferguson, Melvin D.....Note 13
Ferris, Gilbert Bishop.....SLA; CFT
Fazel, Charles Stever.....SLA; UIU
Ferris, George M.....FLA
Freidman, Harry B.....Note 6
Fancuf, Leo Joseph.....SLA; LDT
Fernald, James Gordon.....SLA; KST
Farmer, Leroy, Jr.....BST
Faulkner, Charles J.....BST
Field, James M., Jr.....SLA; AAD
Fisher, Philip Stafford.....SLA; GLC
Fischer, Arthur Philip.....SLA; VBW
Fisher, Ewing B.....TFT



Air mechanics of the Royal Air Force arming a British bombing plane with their explosive eggs. The bombs are fastened under the lower plane and released by the pilot or observer by means of a bomb release lever

G

Greene, Charles C.....LHV
Gambrill, Richard, Jr.....SLA; WFO
Greenslade, Russell Molland.....FLA
Gleaves, Richard D.....SMM
Gorman, Aiden J.....N.....PFO
Greene, William J.....FRF
Grier, John C., Jr.....FLA
Glogau, William Emile.....SLA; CGC
Ganny, Ralph G.....DIK
Graham, Harvey Laslay.....SLA; CJW
Giroux, Elroy Arthur.....SLA; WFO
Gathings, James C.....FRF
Grisemer, Walter.....FRF
Geisler, Clement G.....LDT
Guttersen, Granville.....FRF
Grayson, Forrest.....SLA; CRI
Gaylord, Paul Childs.....SLA; WFO
Goldin, Guillie Benjamin.....FLA
Goodnight, Harry L.....LDT
Grolman, Aaron.....SLA; GLC
Gardner, James Eldridge.....SLA; CWT
Gahris, Leroy E.....CPA; APR
Gulgard, Frank Henry.....SLA; CJW
Gurvine, Richard J.....Note 15
Greene, Bertram Robertson.....SLA; MAC
Geraty, Thomas Joseph.....SLA; LDT
Gillet, Charles B.....KST

H

Harthorn, Lawrence Dell.....FLA; BST
Hill, Ployer Peter.....SLA; CRI
Hallock, Roy E.....DMA
Hutton, Harry Irving.....SLA; CAF
Haigh, Henry W.....WFO
Hearne, George M.....WFO
Haddock, James P.....EOT
Harrison, Elbert I.....EOT
Henderson, Jacob E.....EOT
Henderson, John S.....EOT
Helgesson, Henry T.....EOT
Hodge, Glenn B.....EOT
Howard, Harold H.....EOT
Hammond, Lowell W.....CUI
Houck, Roland John.....SLA; DAP
Hale, Lawrence I.....CAF
Hartman, Harrison Jay.....SLA; PMT
Hall, Hartwell L.....DMA
Hartz, Rutherford S.....RSD
Halverson, Harry Arthur.....SLA; RSD
Hartwell, Cushman.....DMA
Hamer, Robert S., Jr.....DIK
Houghton, Frank C.....DIK
Holtzendorff, Preston B., Jr.....DIK
Hough, Walter B.....DIK
Hutton, Harry I.....DIK
Houghton, Junius H.....DAF
Hurd, Leland C.....ADT
Healy, William R.....FOB
Hornsby, Aubrey.....SMM
Hands, Julius M.....FRF
Hawley, Herbert.....FRF
Hawkins, Kenneth Clarence.....SLA; CJW
Hauck, John.....SLA; PMT
Holtzclaw, Henry Fuller.....FLA; VBW
Hirsh, Charles Louis.....SLA; KST
Hansen, Frank Alfred.....SLA; LDT
Hotaling, Harry D.....FRF
Hart, Howard Matthew.....SLA; HHN
Haldeman, George William.....SLA; PMT
Hanchett, Frederick W.....LDT
Henning, William H.....RSD
Hull, Justus N.....LDT
Haggerty, Stewart A.....LDT
Houser, Percy T.....FRF
Hannum, George T.....ELA
Harrison, George Hyman.....SLA; TFT
Hart, Victor Key.....SLA; MAC
Harmon, Jack.....SLA; RSD
Hedrick, Edward James.....SLA; LDT
Headrick, Edward J.....BFT
Hawkes, Francis M.....BFT
Handy, Homes A.....CFT
Honigman, Joseph Knight.....SLA; PUP
Horney, Reid Bunn.....SLA; KST
Harrell, Benjamin Francis.....SLA; KST
Hawkes, Francis Monroe.....SLA; LDT
Hadley, Earl Gilbert.....SLA; CJW
Holliday, William Fleming.....SLA; FOB
Hoffman, Malvin G.....EOT
Hoggatt, Floyd L.....EOT
Hoffman, Albert J.....WFO
Hearne, George Marion, Jr.....SLA; CWT
Houlton, Raymond C.....TFT

I

Immel, Paul P.....KST
Ilet, Edward W.....FRF

J

Jennings, John Dillard.....SLA; KST
Jesse, William Rodes.....SLA; PMT
Jones, Aaron.....BST
Jones, Raymond W.....FLA
Jamison, Ross P.....EOT
Jones, Howard H.....EOT
Jordon, Ira W.....SMM
Jesup, Richard Mortimer.....CPA; AAD
Jacobi, Herbert Jay.....SLA; APR
Jenks, Henry I.....FRF
Johnson, Clare T.....FRF
Jackson, John Sidney.....HHN
Jones, Byron Q.....Note 2
Johnson, Jerome Benjamin.....SLA; EOT
Jewell, Sidney L.....PFO
Jacobi, Benjamin Ross.....SLA; CAF
Julian, Rupert.....SLA; CFT
James, Roy P.....TFT
Johnson, Laurence S.....EOT
Jackson, John W.....DIK
Juett, John C.....SMM
Jensen, Karl.....SMM

K

Kranz, Irwin Baron.....SLA; WFO
Knickerbocker, Harry C.....WFO
Kelty, William Richard.....SLA; HHN
Kelly, Earl C.....PFO
Kinkade, Kennish C.....PFO
Kelly, James Joseph.....SLA; KST
Kitchen, John Hill.....SLA; CGC
Kirshner, Robert Fairchild.....SLA; HHN
Kerr, Frederick M.....WFO
Knode, Thomas Edson.....SLA; RSD
Kurtz, John Winfield.....SLA; FOB
Kramer, George E.....FRF
Kuhn, Herbert R.....LDT
King, Edward R.....LDT
Kent, Everett F.....LDT
Kesemann, William, Jr.....FRF
Kane, Hoyt R.....Note 9
Kipp, Joseph A.....Note 9
Kilcup, Norman L.....Note 22
Kenly, Henry C.....MAC
Kenly, William L., Jr.....MAC
Kraft, Lester L.....BFT
Kelly, Roland Dillon.....SLA; CWT
Keightley, George Martin.....SLA; RSD
Kelly, Carl D.....CPA
Kane, Thomas Francis.....SLA; KST
Kennady, Emile Tisdale.....TLA; SBI
Krug, Frank W.....WFO
Kern, John T.....WFO

L

Larson, Westide T.....EOT
Lane, Orlando H.....EOT
Livesay, George B.....EOT
Looram, Lucien Appleby.....SLA; HHN
Lahti, Matthew.....FLA
Lawton, Edgar H.....SMM

(*Continued on page* 1334)



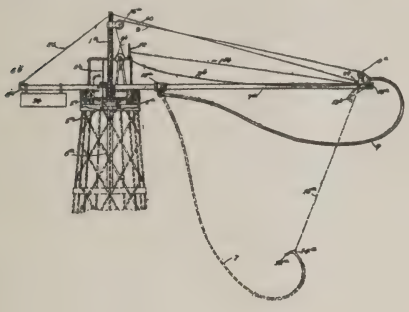


When an aeroplane squadron moves. The photographs show the chosen location of an aeroplane squadron for its new aerodrome. A number of mechanics arrive at the place chosen in motor trucks and from then on the place is a scene of tireless activity. One of the first things done is to erect the hangars for the planes. These are sometimes made of steel and sometimes of wood, but no matter of what kind of material they are made to be put together in a hurry. The material arrives in pieces, fitted, and all that remains to be done is to erect and put those pieces together. The wooden skeleton is covered with heavy tarpaulins which are heavily camouflaged according to their surroundings. In the right photograph may be seen the rolled tarpaulins and in the left photograph a hangar nearly ready for the tarpaulin covering. In the distance may be seen the aeroplanes waiting for their home to be completed. The whole move can be completed in less than a day.

RECENT AERO PATENTS

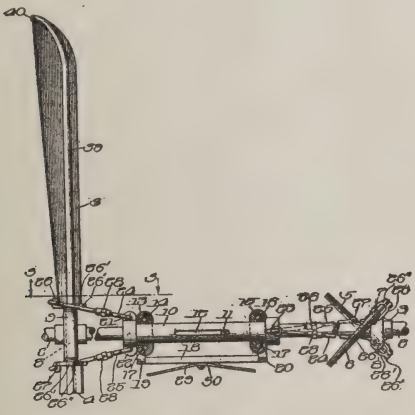
BY WILLIAM N. MOORE

1,144,505. AERIAL LANDING AND LAUNCHING APPLIANCE. FRANK STEFFAN, San Diego, Cal. Filed Feb. 18, 1914. Serial No. 819,402. (Cl. 244—2.)



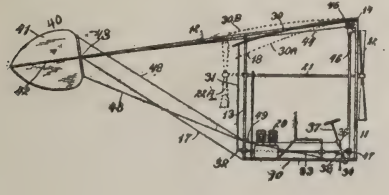
1. In a device of the class described the combination of a rigidly mounted base, a member revolubly mounted in said base, a horizontal member rigidly secured to said revolubly mounted member, a curved arm pivotally and revolubly mounted at its one end on said horizontal member and means for raising and lowering one end of said curved arm.

1,144,521. AERIAL PROPELLER. WILBER S. BARROWS and ASAHEL H. BARROWS, Chicago, Ill. Filed Mar. 24, 1913. Serial No. 756,304. (Cl. 170—163.)



1. The combination with a propeller shaft, of a pair of propellers, a hub on said shaft into which blades are swiveled, a member slidably mounted on said shaft and stationary relative to said shaft's rotary movement, levers upon said blades, connections between said levers and said member, means for varying the lengths of said connections, and means for varying the length of throw of said levers.

1,145,972. AEROPLANE. HARRY B. CHALMERS, Dedham, Mass. Filed Aug. 3, 1910. Serial No. 575,218. (Cl. 244—29.)

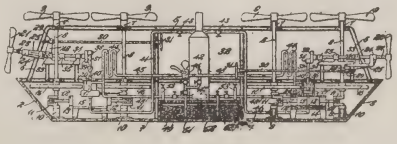


1. In an aeroplane, a frame therefor comprising a transverse spar in the front thereof and a longitudinal spar running rearwardly therefrom, a pair of supporting wings projecting rearwardly from the transverse spar at either side of the longitudinal spar, a control shaft, a supporting shaft upon which said control shaft is mounted, and connections between said supporting shaft and the wings whereby the positions of said wings may be simultaneously adjusted in opposite directions by moving the control shaft sidewise.

2. In an aeroplane, a frame therefor comprising a transverse spar in the front thereof and a longitudinal spar running rearwardly therefrom, a pair of supporting wings projecting rearwardly from the transverse spar at either side of the longitudinal spar, a horizontal rudder mounted upon the rear end of the longitudinal spar, a control shaft, a supporting shaft upon which said control shaft is mounted, connections between said supporting shaft and the wings whereby the positions of said wings may be simultaneously adjusted in opposite directions by swinging said control shaft as a whole sidewise and other connections between the control shaft and the horizontal rudder whereby the rudder may be moved up and down by swinging the control shaft forward and backward.

3. In an aeroplane, a frame therefor comprising a transverse spar in the front thereof and a longitudinal spar running rearwardly therefrom, a pair of supporting wings projecting rearwardly from the transverse spar at either side of the longitudinal spar, a rudder mounted upon the rear end of the longitudinal spar, a control shaft, a supporting shaft, a tilting member on the end thereof in which the control shaft is mounted, connections between said supporting shaft and the wings whereby the positions of said wings may be simultaneously adjusted in opposite directions by moving said control shaft sidewise, and other connections between the tilting member and the rudder whereby the rudder may be tilted by moving the control shaft back and forth.

1,149,218. AEROSTAT. JOHN COOPER PORTER, Northampton, Mass. Filed Sept. 3, 1913. Serial No. 787,860. (Cl. 244—19.)



1. An aerostat comprising a hull adapted to float on the water, a pair of elevating propellers mounted at the upper ends of parallel vertical shafts, provided with cranks near the lower ends, a horizontal fluid pressure cylinder mounted in said hull between said shafts, said cylinder having two oppositely facing pistons arranged therein, and driving rods attached to said pistons and connected to the cranks of said shafts to rotate the latter.

2. An aerostat comprising steering and propelling means, a pair of gyroscope wheels mounted on parallel vertical shafts for rotation in horizontal planes, elevating propellers mounted at the upper ends of said shafts, the lower ends of said shafts being cranked, and a horizontal fluid pressure cylinder mounted between the lower ends of said shafts, said cylinder having two oppositely facing pistons arranged therein and operatively connected to said cranks to rotate said gyroscopes and propellers.

3. An aerostat comprising and propelling means, a pair of parallel vertical crank shafts having gyroscope wheels fixed thereon and adapted to rotate in the same horizontal plane, elevating propellers mounted at the upper ends of said shafts, and a horizontal fluid pressure cylinder mounted between said shafts, said cylinder having two oppositely facing pistons arranged therein and connected to the cranks of said shafts to rotate the latter.

4. An aerostat comprising a hull adapted to float on the water, a framework erected upon said hull and supporting parallel vertical crank shafts, a plurality of pairs of elevating propellers mounted at the upper ends of said shafts, and a horizontal fluid pressure cylinder mounted between the shafts of each of said pairs of shafts, each of said cylinders having two oppositely facing pistons arranged therein and connected to the cranks of said shafts, respectively, to rotate the latter, and a third cylinder operating in synchronism with said horizontal cylinders, said last named cylinder containing a double acting piston for rotating a horizontal propeller shaft unprovided with a gyroscope wheel.

5. In an aerostat, in combination with a hull, one or more pairs of elevating propellers, driven by vertical shafts having step bearings in said hull, each shaft carrying a gyroscope, and being operated by fluid pressure upon one of two oppositely facing pistons in a single cylinder.

FOREIGN NEWS

AUSTRIAN

The War Office statement of August 30 says:

Yesterday our aeroplanes dropped fifty bombs on Monte Belluno Station.

BRITISH

During the last week no fewer than seventeen separate raids into German territory have been carried out by the allied independent air force, which is under the command of a British general.

While extensive damage is known to have been done to important military objectives, such as the railway junction at Treves, the station at Frankfort, and the chemical factory at Saaralben, the most striking feature of the week's work was the raid on the Mannheim poison gas factories, where British airmen, flying at a height of 200 feet, narrowly avoided collision with the factory chimneys.

Although this manœuvre necessarily increased the personal risk of the airmen, it enabled them to direct their bombs with great accuracy toward the more vulnerable parts of their objective. Every bomb released was seen to hit its target.

The drastic moral effect produced by the bombing aeroplanes flying at the housetop levels may easily be imagined, and the German defense tactics were for the time paralyzed by the totally unexpected and, indeed, unprecedented nature of the attack, as is shown by the fact that all the British machines returned safely.

In the northern coastal region, Bruges has been bombed nine times, and successful raids have been made upon military works at such places as Zeebrugge and Ostend.

The almost monotonous frequency with which these names appear in the official communiques tends to blunt the imagination of the public to the real magnitude and significance of the effort which Great Britain is making against this formidable sector of the western front. Scarcely a day passes without at least one raid upon these vital German strongholds. Sometimes three or four raids are made in a single day. Often a squadron attacking one of the objectives, say, at 11 o'clock in the morning, will be relieved by another squadron, say, at noon, which will carry on until relieved by a third squadron, and this over one of the most strongly fortified military positions in Europe and against defensive organizations of the most formidable kind.

Although figures can convey only the slightest notion of the intensive character of the British aerial attacks upon these coastal fortresses, it may be noted that during the last three months the following raids have been made: Upon the German works at Zeebrugge, 72; at Bruges, 63; at Ostend, 64. In addition to these 199 raids, an immense number of separate attacks have been delivered upon other military works in the coastal area.

While German Headquarters reports continue to make claims of German successes in the air fighting on the western front, the official tally made on the British side for the last week shows 74 enemy machines destroyed and 34 driven down out of control, while 32 British machines are reported missing.

An official statement issued by the Air Ministry on bombing and raiding operations says:

The morning of August 30 our machines attacked the railway station at Conflans and a hostile aerodrome. Direct hits were made both on the hangars at the aerodrome and the railway at Conflans. In the course of fighting one enemy aeroplane was destroyed. All our machines returned safely.

Another attack was also carried out by one of our squadrons on the stations at Conflans and Thionville. This squadron engaged a largely superior number of hostile machines. Fierce fighting ensued, in the course of which one enemy aeroplane was destroyed and one sent down out of control. Four of our machines are missing.

Eleven hostile machines were shot down by us on August 29 and ten were driven down out of control. One German balloon was set on fire. Nine of our machines are missing. Our airmen were actively engaged in all departments of their work throughout the day.

Fifteen and a half tons of bombs were dropped on a variety of targets, including the Bruges Docks and many railway connections beyond the battle zone. Unfavorable weather prevented night flying.

Fifteen German aeroplanes were destroyed and five others brought down on August 30th in aerial fighting by the British and French forces, according to the statements of the War Offices. The British destroyed twelve German machines and put five others out of control, and the French put three craft of the enemy out of commission.

The weather was cloudy on August 31 but the various activities of our air service were fully maintained all along the front. There was much useful observation by aeroplanes and balloons. Twelve enemy machines were destroyed during the day and five driven down out of control. Four of our machines are missing.

The Bruges docks and the Zeebrugge mole were heavily bombed, as well as a number of selected targets opposite the battle zone. In all, twenty-five and one-half tons of bombs were dropped during the twenty-four hours.

This information was received September 1 from the "Rhine front":

In the air raid in Cologne, August 21, the casualties were 45 killed and 176 wounded. In the last raid on Frankfort the railway station was badly damaged and twelve killed. In Cologne and elsewhere considerable damage has been done by the Germans' own shell fire.

A Turkish official communication received September 1 reports that an aeroplane was brought down in flames during a raid on Constantinople on August 28. It says the captain of the machine, a British officer, was wounded and made prisoner.

The operations of the British aviators in the fighting zone are described in an official communication on September 2 as follows:

After the heavy rain of August 31 the weather improved and our aeroplanes and balloons carried on their work in a clear atmosphere and high wind.

In spite of the opposition of enemy machines, over 1,000 photographs were taken by our aviators and many reconnoissances effected. Contact with our advancing troops was closely maintained.

Our observation balloons were constantly pushed forward, and these, with our artillery patrols, kept our batteries informed as to numerous targets, which were successfully engaged.

Throughout the day the area in which the Germans were entering was searched by our low-flying airmen, who everywhere attacked enemy troops and transports with bombs and machine gun fire, causing heavy casualties and much confusion. Bridges and railway connections were heavily bombed in the enemy back areas.

In the air fighting eight enemy machines were destroyed and four driven down out of control. Six hostile balloons were brought down in flames by our aeroplanes. Eight of our machines are missing.

On the following night bombing was continued both in the zone immediately behind the battle line and further east. A German aerodrome beyond St. Quentin was heavily attacked and direct hits were observed. We lost one night bombing machine.

During the twenty-four hours over thirty-four tons of bombs were launched on different targets.

In addition to the hostile machines already reported to have been accounted for on Friday last, our anti-aircraft fire brought down a German night bombing machine on that date.

Six hostile machines were destroyed in air fighting on August 31 and three driven down out of control. Seven of our machines are missing. In spite of low clouds the work of the British air forces along the front was carried on throughout the day in close co-operation with the troops on the ground by our aeroplanes and balloons. A large number of photographs were taken and enemy movements kept under observation. Twelve and one-half tons of bombs were dropped between dawn and dusk. At night flying was impossible.

FRANCE

The French official report of August 30 contains the following:

Our bombarding machines have attacked the Pinon forest and the railroad station at Anizy-le-Chateau (both between Soissons and Laon) and crossings of the Ailette located in this region. More than forty-eight tons of explosives were dropped.

Twenty enemy machines have been downed or sent down out of control. An enemy captive balloon was set on fire.

The French, the despatches say, brought down five enemies within the Allied lines, forty-seven German machines were seen to fall within their own lines and ninety-three others, if not destroyed, were badly damaged. On August 30, during the day, three enemy aeroplanes were brought down and two captive balloons were set on fire. During the night our aeroplanes were able to drop 3,150 kilos of projectiles on objectives in the region east of Conflans Station, Chambray, and Thiaucourt, and factories at Thionville.

The official communique of September 1 on aviation says:

"Eight enemy aeroplanes were brought down or fell in a damaged condition. From a low altitude our bombing aeroplanes to-day dropped twenty-three tons of projectiles on enemy concentrations and convoys in the region of Vauxaillon, Neuville-sur-Margival, Laffaux and Nanteuil-la-Fosse (all northeast of Soissons).

"Thousands of cartridges were fired in the same regions on enemy troops."

An official dispatch from Paris furnished an idea of the tremendous aerial activities conducted by the French Navy, principally in operations against submarines. It says:

"In June the aerial patrols of the French Navy covered 447,040 miles, 59,100 miles being by airships, which made 256 flights and 1,481 hours of navigation. Aeroplanes and seaplanes were in the air 5,758 hours and made 3,365 sorties. Captive naval balloons accomplished 66 patrolling errands and 114 scouting flights for dredges, amounting to a total of 4,408 hours of flight.

"In July the activity of the various aerial organizations of the French Navy was equally intense. Captive balloons were engaged 5,520 hours, airships 1,311 hours, and aeroplanes and seaplanes 7,432 hours. The naval aerial patrols in their flights covered 485,330 miles."

Enemy submarines were attacked fourteen times and numerous groups of mines were discovered.

GERMANY

Frontier correspondents of the *Telegraaf* assert that travellers from Germany report heavy damages from recent air raids in towns along the Rhine. Forty persons were killed in the last aerial attack on Cologne, and entire streets in Mannheim were laid in waste. At Bingen the aniline works were levelled.

On September 2 we shot down thirteen enemy balloons and fifty-five aeroplanes, thirty-six on the Arras battlefield. Twenty-six of these were brought down by the Chaser Squadron No. 3 under the leadership of First Lieutenant Lörzer, who achieved his thirty-fifth aerial victory.

On September 3 we shot down twenty-two aeroplanes and seven balloons. Lieutenant Rumey won his thirtieth aerial victory.

On September 4 we shot down thirty-two enemy aeroplanes.

ITALIAN

The official communication issued by the War Office on August 30 says: Two hostile aeroplanes have been brought down.

The official report issued September 1 upon aviation says:

"Yesterday morning our aeroplanes reached Franzensfeste (Tyrol) and, flying very low, dropped bombs with accuracy on the important railway establishment there.

(This is the junction of the railway from Trent with the line running down the Drave Valley. The planes had to go about seventy-five miles over high mountains.)

"Other bombarding operations were carried out during the day on the enemy's front lines and back areas by our own and Allied aviators.

"Last night army and navy airships bombarded the military works at Pola and the station and depots at Primolano. Seven hostile machines were brought down in air fighting."

A telegram to the Italian Embassy on Sept. 3 stated that during recent enemy raids on the Italian front the Austrians lost numerous machines and several of their best pilots. Eight of these had been mentioned in Austrian dispatches for special bravery.

The dispatch said that in August Lieutenants Oppocher and Schuffs were killed over Levico. Lieutenant Linke and Count Salm, belonging to the 13th Dragoons, also were killed in air encounters. Lieutenant Hebra, who had been decorated several times, was brought down after a fierce duel over Klagenfurt. Lieutenant Eprfeld also has been killed and Baron Kutchers has had both legs fractured.

A communique to the Belgian Legation stated that Lieutenant Willy Coppens of the Belgian Aviation Service had brought down in flames three balloons, achieving his twenty-sixth, twenty-seventh and twenty-eighth victories.



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

THE metal for the tank should be at least five thousandths of an inch thick and no more than eight thousandths, or the tank will be too heavy.

The metal is wrapped around the mandrel, lapping the edges about ¼ of an inch, then held in place by wire and soldered where lapped. After soldering the metal should be slipped off the mandrel and the ends clipped off to make the cylinder the proper shape for soldering the caps in place.

Slip the metal back on the mandrel and wrap with very thin piano wire about ⅛″ apart. The wire should then be soldered along the dotted line before the caps are soldered in place.

The air "shut off" from the tank is made from a gas cock. The excess parts are filed away to lighten up as shown.

The bicycle valve is next soldered into the other cap, after which holes are drilled and a 1/16″ steel axle soldered in place as shown in the sketch at the right.

The tank should be tested for leaks by blowing up to about 40 pounds pressure and placing in a tub of water.

When sure that tank is O. K., solder the intake into the air cock as shown.

The general arrangement of the motor and tank assembly is shown at the right bottom of the cut.

The tank should be painted a dull black for effect.

The tank should be blown up by the use of a large foot pump, such as automobilists carry, to a pressure of about 150 pounds. The will take about one hundred strokes of an ordinary 1¼-inch diameter pump. A tire gauge will be needed to determine the proper pressure as it is dangerous to put more than 150 pounds in the tank. The engine should be run under pressure a few times to work it in, keeping it well oiled up. A small fly-wheel can be put in place of the propeller for this preliminary test.

The construction of the model is such as to provide a support for the motor and tank and also to hold the wings and landing chassis. The engine is fastened to the end of the frame members by the use of two strips of brass bent around the cylinders and fastened with thread and glue.

The tank is fastened by drilling holes in the frame and by inserting the ends of the bolts projecting from the side of the tank and the nut fastened on. This makes the frame stronger and keeps it from twisting out of shape, at the same time being the neatest way to fasten in place.

The front landing chassis is made up from umbrella ribs. Where the ends are fastened to the frame the rib is heated red hot and when cool flattened out with a few strokes of a hammer and fastened with thread and glue.

The wheels are of cork or wood 2″ in diameter. The tail skid is made up of steel wire as shown and is fastened as before.

The rear wheel can be smaller in diameter and is also cork or wood. The wings should be made as light as possible and are built up of bamboo strips and dowel stick 3/16″ in diameter. They are of the single surface type, the silk being fastened with glue to the top surface and doped.

The main spars of the wing should be planed to a half round section. The bamboo strips being fastened to the flat side of the spars. The trailing edge of the wings is formed by stretching strong linen thread from rib to rib as tight as possible. When the silk is fastened in place it will form what is known as a feathered edge and is very efficient.

The main planes have a total spread of 54″ x 8″, chord elevator is 18″ x 4″. When constructing the elevator the centre rib runs to the rear spar only to allow the plane to set at an angle of incidence to the line of flight.

The pylon or brace over the main planes is made of thin steel wire and fastened at the point shown in the drawings. When ready to fly the model be sure it is balanced properly. It is better to set the entering edge of the plane about 3″ back of the centre of gravity. The elevator can be moved back or forth according to the glide.

It is better to start the model from the ground rather than from the hand, as it is almost impossible to spin the propeller, turn on the air and throw the model at the same time without a chance of mishap.

The model builder can construct a sort of a trigger arrangement for turning on the air, such as an arm soldered to the air "shut off" and a spring fastened to the tending to hold the valve open, to close a sort of dog is fastened to hold the valve closed and when pressed by the finger it moves away, allowing the arm to swing back to the open position.

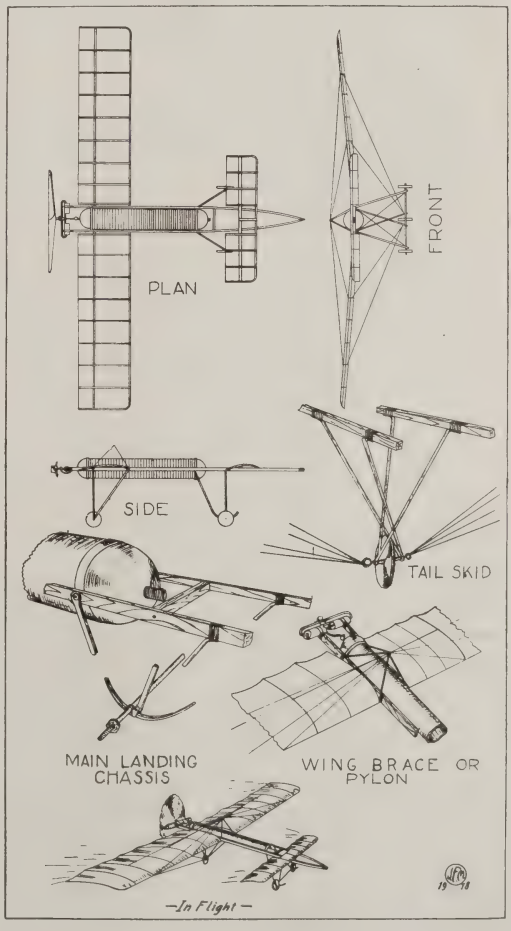
I might call attention to the size of the propeller. This should be from 12 to 16″ in diameter, the proper size can be determined by experiment.

The landing chassis must be made long enough to hold the model properly the correct distance from the ground to keep the propeller from striking when getting off.

Flights of compressed air models vary. Some engines I have made showed no leakage of air and the model would not fly as well as when the leaking of the air could be heard distinctly. Of course, I do not say that the engine that leaks is the best, but I do believe that if the model builder is unfortunate enough not to make his apparatus air tight he can still get some reward for his work.

Some pretty scale models can be made powered with a compressed air motor. The famous Continental Aircraft Companies' pusher is very well suited for this purpose. The tank, which must be made shorter and larger in diameter, takes the place of the body and resembles it a great deal. Drawings of the Continental machine appeared in a previous issue of AERIAL AGE.

(To be continued)





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Barracks Aviator

By Jim

(*With Apologies to Rumyard Tipling*)

I've taken my work where I've found it;
  I've roved and I've roamed in my time;
I've had my pick of positions,
  And three o' the lot—they was prime.
One was with pick and with shovel;
  One on a soft, easy chair;
The third was to ride, like a devil, astride
  O' a ship into space through the air.

Now I ain't no hand at hard labor,
  And sittin' still isn't my game.
The first is too hard on the back-bone;
  The second too hard on the brain.
There's things that you know that you might do,
  And some that you guess that you might;
But what you can learn from the H and the Dep
  Will help you a lot in a fight.

I was a wild young beginner,
  Stepped with the best on the ground,
Strutted in helmet and goggles,
  Swellest that ever was found.
Up in the air like a rocket,
  Back down I came like a stone;
Oh, the air it was blue, when the tutor came to,
  And found I had ne'er broke a bone.

The first time I went up for solo,
  I stood all alone in midair;
The earth down below me was rolling,
  And acting most awfully queer.
My stomach in unison mocked it,
  A queer lump rose up in my throat.
Says I to myself, "If I ever get down,
  I'll work on the ground when I'm broke."

I went for a ride on cross country,
  The day was quite clear and dead calm.
The ship floated on quite an angle,
  Then suddenly dropped like a bomb.
First she fell into a tail spin,
  Then came out of it flat on her back.
Perhaps you have seen Baird and Salmon,
  They're Aces—I'm only a Jack.

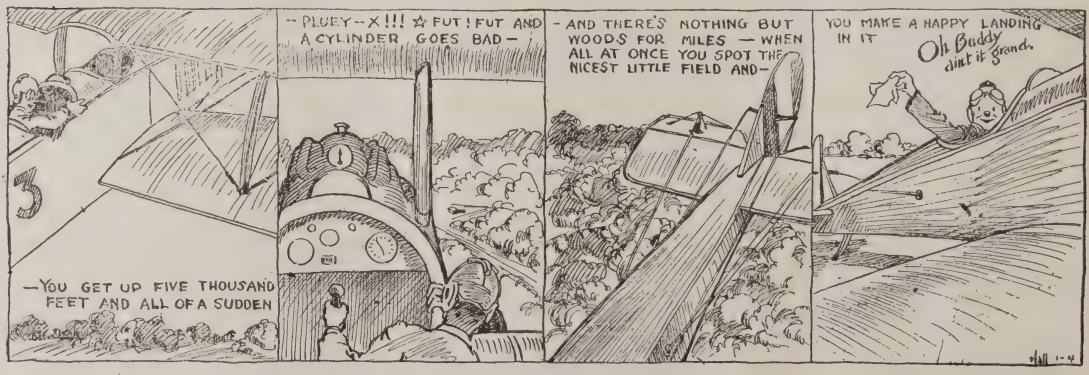
The vision I had when I hung there,
  On life belt, with head hanging down,
Was not a nice thing to remember,
  So I'll just pass it by with a frown.
Miss Phoebe, of Tale Spins, stood weeping,
And Marge, in her languishing way,
  Said, "Kid, here's your lid, come on now let's skid.
  For Marshall is due back today."

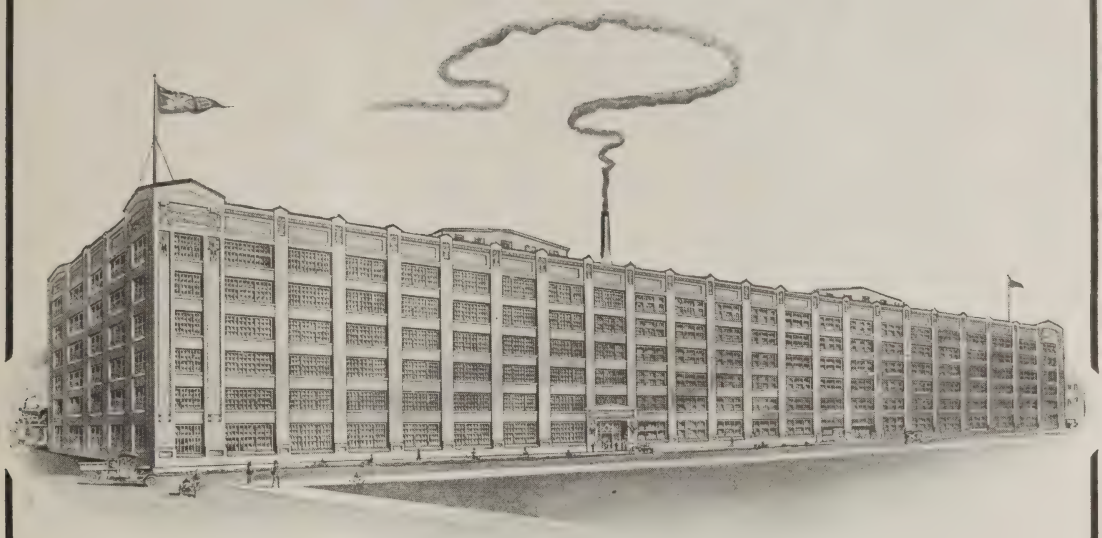
With a comical flip of her rudder,
  The ship straightened out and sailed home.
I was met by a man in a side car,
  With a heart that was built out o' stone.
He told me in old-fashioned English,
  The things that I never should try;
But I was so sick, his advice wouldn't stick,
  I thought that I surely would die.

I've taken my work where I've found it;
  My work and pleasure were one;
But now that I'm here in the army,
  I work like a son-of-a-gun.
It's better than pick and the shovel,
  It beats that old, soft, easy chair;
For my Uncle, I ride, like a devil astride
  O' a ship, into space, through air.

June

OH, June,
You month
Of War Brides
And Vacations
And Peek-a-boo waists,
Transparent hosiery
And Swimmin'
With Wimmin,
Hay Fever and
Nice, cool
Rin Gickies—
Oh, Damn the Kaiser.
And Then
The Average man imagines
That
There are only
Ten Commandments
Until
He gets Married.





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Lederer, Lewis G....DMA
Lamborn, Charles W....SLA; DMA
Lyon, Charles Edward....FLA
Lester, Hodge....WFO
Logan, David M....SMM
Lippman, Joseph Leonard....SLA; LDT
Lamond, James J....DIK
Leddy, Edward F....DIK
Likly, Henry Kenneth....SLA; CGC
Lahey, William Patrick....SLA; AAD
Lawrence, Henry D....FRF
Lawson, Dudley B....LDT
Lindsay, Charles Edward....SLA; CFT
Lawson, Norman....CAF; WIM; Note 1
Lawrence, Almon R....FRF
Levy, Saul....SLA; Note 18
Lee, Everett Samuel....SLA; UIU
La Parle, Walter Enders....SLA; DAF
Levick, John Newton....SLA; PMT
Ludwick. Frank M....Note 5
Lindsley, Dan L....TFT
Liggett, Arthur G....EOT

M

Merkle, Chris A....DIK
Middelton, Ellis S....DIK
Micander, Herbert C....DIK
Mott, Louis C....DIK
Moss, Fulton C....DIK
Murnen, George J....DIK
Mezley, Warren M....WFO
Montgomery, Robert C....WFO
Meyer, Charles L....WFO
Miller, Euclid D....SMM
Mitchell. Parker....FLA; ASM
Moon, George M....BST
Mann, Adolph Harless....SLA; CAF
Metcalf, William Henry....SLA; CAF
Mason, Chauncey C....PFO
Morley, John E....MJA
Myers, Ray Gregson....SLA; CRI
Merkle, Chris Arnold....SLA; CAF
Meyer, Philip....PFO
Moniger, Arthur V....FRF
Montieue, Verne Martin....SLA; HHN
Mayo, Robert C., Jr....SMM
Myers, George Gernest....SLA; EOT
Maurer, Paul Gard....SLA; WFO
Moser, William Charles....SLA; WFO
Miller, Reuben, Jr....MJA
Mahan, William J....FRF
Mackie, Robert F....FRF
Merkel, Louis J....WFO
Martin, James C....FRF
Megahan, Donald B....FRF
Miller, Galen....LDT
Moon, Charles M....DMA
Merrill, Patterson D....Note 19
Moore, James M....CFT
Melican, George D....FRF
Mahoney, Frank H....FRF
Moore, John M....DAF
Monroe, Harry H....DMA
Marks, James Christopher....FLA
Miller, James Carlyle....SLA; EOT
Murray, James Burch....SLA; DAP
Mosier, Orval McKinley....SLA; RSD
Monroe, Harry H....DMA
Miller, Daniel W....TFT
Moore, Walter M....TFT
Myers, George I....SLA; AAD
Myers, Devereux M....DMA
Moulds, Millard H....Note 3
Merriken, Wilbert Lacy....SLA; CJW
Marshall, John Humphreys, Jr....SLA; MAC
Marshall, Furber I....ASM
Munn, William T....SMM
Marsh, Ralph A....TFT
Morris, Thomas K....SMM
Mayer, Herbert C....WFO
Meyer, Frederick H....TFT
Miller, Max B....WFO

Mc

McCullough, Howard John....SLA; DAF
McKee, Ralph Spencer....SLA; DAF
McGaffigan, Bernard Aloysius....SLA; KST
McPike, George Vaneman....SLA; HHN
McClure, Paul Herbert....SLA; CFT
McAlister, Thomas Earl....SLA; WFO
McCollough, Max L....FRF
McDonald, John Quincy....SLA; EOT
McKinnon, Morton Howard....SLA; RSD
McKeever, James L....LDT
McIntosh, Henry Payne, Jr....CPA; VBW
McVey, Richard K....SLA; RSD
McGeary, John E....ELA
McClure, Colin B....LDT
McKernon, George E....LDT
McMahon, James Edward....SLA; GLC
MacDonald, Neil C....DMA
McNamara, John Francis....SLA; KST
McMillan, James Errol....SLA; GLC
MacMechan, Dunbar....EOT

N

Nusser, Adolph Ferdinand....SLA; KST
Nash, DeLloyd D....SMM
Nelson, Francis O....WFO
Nussle, Frank Etienne....SLA; PMT
Newell, John Robinson....SLA; KST
Nichols, Charles Rodney....SLA; WFO
Nicholson, George Mason....SLA; WFO
Noel, Olen W....FLA; KST
Nagle, Clarence D....FRF
Nasief, Benjamin John....SLA; WFO
Noyes, George Franklin....SLA; DAF
Nienhauser, Ralph Phillip....SLA; MAC

O

O'Brien, Thomas Francis....SLA; CAF
Olds, Fred Hartman....SLA; HHN
Overton, Robert E. L....SMM
Oaks, Harry C....LDT
Owens, Michael F....CGC
Overstreet, Thomas Jefferson....SLA; WFO
Obendorf, Walter J....SLA; DAP
Opel, Selmar Taylor....SLA; EOT

P

Pearson, Clarence W....SLA; AAD
Price, Edward F....DIK
Pierson, Karl D....SLA; EOT
Pollard, Alfred Leon....SLA; EOT
Page, Henry L....FLA
Poorman, Robert Boyd....SLA; CAF
Peake, Junius B....SMM
Powell, James F....SMM
Pierce, Lester W....PFO
Porterfield, Allen Wilson....FLA
Pierson, Earl Leslie....SLA; CRI
Pratt, Herbert Gordon....SLA; PMT
Parsell, Charles C....DMA
Perkins, Edward Adolphus....SLA; HHN
Pyle, Albert F....RSD
Perkins, Erwin Fontaine....SLA; UCR
Plummer, Harold Omar....SLA; EOT
Pinckney, Dunbar W....LDT
Perkins, Fred Joseph....SLA; WFO
Phipps, John S....MJA
Page, John H....FRF
Parker, Herbert W....FRF
Parish, William L....FRF
Paulson, Carl F....WFO
Peterson, Vance C....WFO
Parr, Elza W....SMM
Pearson, Arthur M....SMM
Pharr, Query....SMM
Powell, Orlo Allen....SLA; CAF
Poore, Owen Pierce....SLA; EOT
Polk, Claude Albert....SLA; EOT
Patrick, Albert Iverson....SLA; SBI
Purdy, Harold Sifton....SLA; HHN
Pearson, Alexander, Jr....SLA; RSD
Porter, Victor W....TFT
Perry, Gerald Leo....SLA; GLC
Pross, Edwin C....Note 25
Pearson, James Arthur, Jr....FLA
Patton, Edward J....Note 7
Porter, Louis H....BFT

(Continued on page 1338)

Organized College Research

THE House Committee on Education has recently given a hearing on House Bill No. 9686, known as the Smith-Howard Bill, which proposes to establish engineering experiment stations in the states and territories and the District of Columbia in connection with state-supported universities or engineering schools for the promotion of engineering and industrial research as a measure of industrial, military, and naval preparedness in times of peace or war. A large volume of the most enthusiastic endorsements was presented at the hearing, and it is expected that the Committee will shortly report the bill favorably to the House.

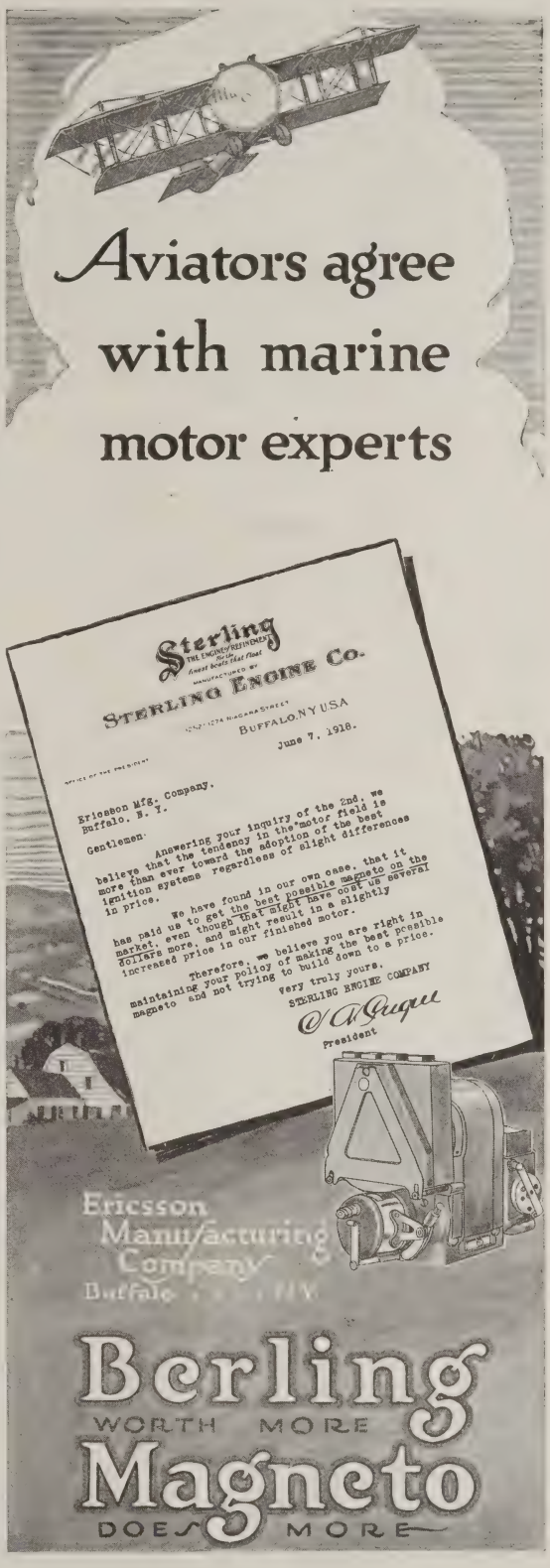
This legislation will fill a long felt need in America. It is considered a war measure of first magnitude because it will immediately establish the greatest organization of research and experimental facilities in the world. The best equipped technical school in each State is to be selected as the location of the proposed state Engineering Experiment Station. $15,000 per annum is appropriated to each state to establish this work. As was the case with the Agricultural Experiment Stations, it is expected that each state will appropriate an amount equal to that provided by the Federal Government. In many instances states have appropriated two or three times as much money for the agricultural experiment stations as is regularly appropriated by the government; and since the great productive value of the proposed stations will quickly become obvious, the stations will undoubtedly be provided with reasonably ample appropriations.

The same bill was introducted at the last session of Congress. Appreciating the tremendous possibilities of such a system of organized research, the officials of the Aero Club of America recommended that researches in aeronautics and aero-dynamics be included in the provisions of the bill. In the new draft of the bill, Mr. Phinehas V. Stephens, the author, has accepted these suggestions, and the board of governors of the Aero Club of America recently passed a resolution giving their unanimous endorsement of this legislation.

The Bill provides $25,000 annually in addition to that given to the colleges, to the Secretary of Commerce, who is to establish in the Bureau of Standards a department of college research for extending as far as practicable the facilities of the Bureau of Standards to those engaged in the work of the



Mr. S. S. Jerwan, veteran American aviator, who has been chief instructor of Guatemalan Air Service for the past four years. The photograph, reproduced herewith by courtesy of Mr. Charles Jerome Edwards, shows some of the trophies Mr. Jerwan has won in Guatemala



The big guns at the front are mounted on money. Don't forget that! And they will hold the enemy back only so long as their foundations last. Don't forget that!

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AERIAL AGE WEEKLY

(*Continued from preceding page*)

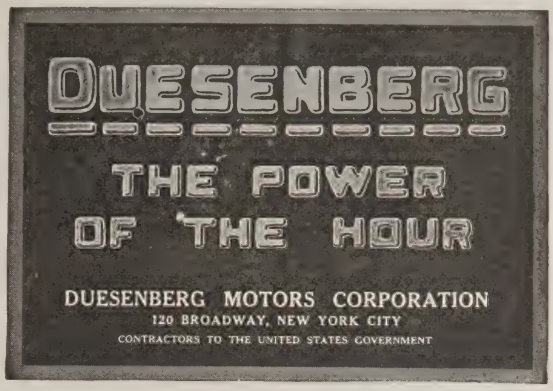
proposed experiment stations. The Department of Commerce will have general supervision of all of the stations, which supervision is intended to secure uniformity of methods, efficiency and the most economical expenditure of funds, by avoiding as far as possible useless duplication and by making available to each station the results of the work of other stations and that of the Bureau of Standards.

As a war measure this will bring into the use of the Federal Government more than $50,000,000 worth of the best scientific and research laboratories of the country, and this should constitute a very important stimulus to invention and research relating to our military air program and also the utilization of flying machines for commercial and social purposes after the war. The art of flying and the construction of aircraft is in its infancy. The establishing of these engineering experiment stations in each state will invite the inventive genius of the youth of America. It will also encourage such work by the members of the faculties of these engineering schools who are, as a rule, experienced in research and experimental work, but are without the financial support necessary for exhaustive research.

There will also be provided the opportunities for the manufacturers in each state to readily secure the solution of the multitude of problems that confront them in their various manufacturing processes. Each state has more or less natural resources now needing development, and these stations will serve the industrial development of the states in the same way that the agricultural experiment stations have helped to make America the greatest agricultural nation in the world.

Advanced List of Men and Colleges Agreeing to Cooperate in Securing the Passage of the Smith-Howard Bill

Dr. Jacob G. Schurman, Pres., Cornell University, New York.
Dr. E. E. Haskell, Dean, Cornell University, New York.
Dr. Richard McLauren, Pres., Massachusetts Institute of Technology, Mass.
Dr. Edmund J. James, Pres., University of Ill.
Dr. Edgar F. Smith, Provost, University of Pennsylvania, Pa.
Dr. K. G. Matheson, Pres., Georgia School of Technology, Ga.
Dr. W. R. Whitney, Director, Research Lab., General Electric Co., and member, Naval Consulting Board, N. Y.
Dr. W. F. Durand, Chairman, National Advisory Committee for Aeronautics.
Mr. Henry A. Wise Wood, Vice-Pres., Aero Club of America, New York.
Mr. Henry Woodhouse, Editor and Publisher, *Flying* and Aerial Age.
Dr. G. M. Butler, Dean, College of Engineering, University of Arizona.
Dr. Guy Potter Benton, Pres., University of Vermont.
Dr. Melvin A. Brannon, Pres., University of Idaho.
Dr. Irving Fisher, Yale University, Conn.
Dr. H. A. Bumsted, Sloane Laboratory, Yale University, Conn.
Dr. Joseph F. Merrill, Director, School of Mines and Eng., University of Utah.
Dr. Harold S. Boardman, Dean, College of Eng., University of Maine.
Dr. Frank L. McVey, Pres., University of Kentucky.
Dr. Frank J. Goodman, Pres., Johns Hopkins University, Maryland.
Dr. Robert Sharp, Pres., Tulane University, Louisiana.
Dr. Victor C. Alderson, Pres., Colorado School of Mines, Colorado.
Dr. J. R. Benton, Dean, College of Engineering, University of Florida.
Mr. George J. Baldwin, Vice-Pres., American International Corp., N. Y.
Dr. William McClellan, Director, Inter. Collegiate Intelligence Bureau, University of Penna.
Dr. Harold Pender, Board of Managers, Am. Inst. of Electrical Engrs.
Mr. W. H. Wiley, Pres., John Wiley & Sons, Scientific Publishers.
Dr. A. W. Brown, Prof. of Chemistry, Cornell University, New York.
Dr. Adelbert P. Mills, Prof. of Materials and Testing Lab., Cornell University.
Dr. Geo. P. Pegram, Dean, School of Mines, Eng. & Chemistry, Columbia University.
Prof. Henry S. Jacoby, Cornell University.
Dr. Charles E. Locke, Massachusetts Inst. of Technology, Mass.
Dr. W. L. Burton, Pres., University of Minnesota.
Dr. Samuel Avery, Pres., University of Nebraska.
Dr. E. E. Sparks, Pres., Pennsylvania State College.
Prof. R. L. Sackett, Dean, College of Eng., Penn. State College.
Dr. E. C. Persio, Pres., South Dakota State College.



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(*Continued from page* 1334)

R

Ratcliffe, Kent E.....EOT
Reavis, Carlos L.....EOT
Rohm, Homer.....SLA; CGC
Rose, James A.....SLA; VBW
Raque, Carl Philip.....SLA; PMT
Reed, Paul Spencer.....SLA; EOT
Ruggles, Francis W.....MAT
Russell, Everett P.....FOB
Reese, John Calvin.....SLA; CGC
Robinson, Fernando Albert.....SLA; TFT
Rierson, Thomas P.....DAF
Redding, Robert D.....DAF
Ralston, William H.....LDT
Runkle, Charles G.....LDT
Roche, Walter J.....LDT
Reichert, Edward T.....RSD
Reed, John H.....WFO
Read, Joseph Frederick.....SLA; CAF
Rice, Frank G.....APR
Reid, Herbert Wesley.....SLA; FOB
Rennebaum, Ernest H.....LDT
Russell, Clinton W.....DMA
Richards, John A.....FRF
Reading, Clyde W.....FRF
Robertson, William M.....FRF
Reitmann, Henry Dietrich.....SLA; CFT
Reicks, Frank C.....TFT
Rowe, McClendon Gladstone.....SLA; GLC
Ryan, John H.....DMA
Rowley, Enos Jennings.....SLA; CAF
Renfro, De Grimm.....DAP
Rowley, George Irving, Jr.....CPA; DAP
Rooney, Albert W.....BFT
Rinker, Harry Monroe.....SLA; CFT
Robins, Edward John.....SLA; RSD
Robertson, Hugh Biron.....SLA; VBW
Ragatz, Edward G.....TFT
Robins, Augustine W.....JMA
Reyburn, William Stuart.....CPA

S

Singleton, John D.....DIK
Skerratt, John W.....DIK
Stauyer, Frank L.....DIK
Staerker, Otto.....DIK
Spiers, Robert H.....DIK
Stevens, Henry Harmon.....FLA
Smith, William H.....DIK
Smith, Paul S.....DIK
Steller, Adolph W.....DIK
Sneed, Albert L.....LDT; WDM; Note 1
Schmidt, Herbert Walter.....SLA; WFO
Schlaich, Frederick W.....PFO
Shattuck, Ray A.....PFO
Stone, Alonzo E.....PFO
Speck, Frank Caspar, Jr.....SLA; PMT
Smith, Vernon Virgil.....SLA; CRI
Stevens, Clifford C.....DUP
Simons, John W, Jr.....LIV
Stetson, John Minor.....SLA; DAP
Strauss, Sidney Harold.....SLA; CRI
Stuckey, Arthur Ray.....SLA; LDT
Scott, Allison Fendall Hannay.....CPR
Scott, Stanley Hough.....SLA; HHN
Safro, Victor Irving.....SLA; CGC
Salisbury, Earle Edwin.....SLA; CRI
Smith, Clyde H.....EOT
Strickland, Chauncty J.....ADT
Sale, William E.....SMM
Sauter, Raymond J.....BST
Sweeney, David Robert.....SLA; DAF
Stanton, Arthur Heath.....SLA; KST
Sedgwick, Alfred.....SLA; EOT
Seitner, Harvey.....SLA; CGC
Schary, Harry A.....FRF
Sexton, Charles S.....FRF
Stein, Carroll V.....ASM
Smith, Dean C.....ELA
Smith, Wesley Lott.....SLA; WFO
Spencer, William Warren.....FLA
Sebree, George McClellan.....SLA; HHN
Seabury, William W.....PUP
Spence, Dewitt T.....SLA; VBW
Spannagle, Guy Edward.....SLA; TFT
Scott, Elmo Carlyle.....SLA; KST
Steele, Richard W.....FRF
Schofield, Aubrey W.....FRF
Stumpf, Charles B.....LDT
Schreeder, Goodson.....SLA; VBW
Sullivan, Thomas L.....LDT
Starrs, Joseph V.....TMA
Scofield, Edward E.....WFO
Schafer, Alfred G.....WFO
Splane, Alvin William.....SLA; WFO
Sharpe, Karl E.....EOT
Schroeder, John A.....WFO
Scott, William, Jr.....CAF
Smith, Raymond W.....CFT
Scobey, Reuben B.....TFT
Swinson, Casper D.....TFT
Steele, Austin Bristol.....SLA; KST
Swift, Arthur Dean.....SLA; AAD
Slye, Ernest Cecil.....SLA; CWT
Sibbald, Bruce F.....SMM
Stevenson, Raymond V.....SMM
Stevick, Guy L.....SMM
Seabury, Paul Richardson.....SLA; Note 14
Sharon, Leon Edgar.....SLA; EOT
Sealy, Neagle Podgere.....SLA; VBW
Shafer, Alfred George.....SLA; MAC
Shrader, Myron Rupert.....SLA; MAC
Stover, Allen Roswell.....FLA; DAP
Smith, Wallace Gordon.....SLA; CWT
Smits, Larry Ame.....SLA; CWT
Shield, Lansing Peter.....SLA; CWT
Shaw, Donovan L.....HHN
Selberg, Arthur E.....EOT
Smith, Harold A.....EOT
Sullivan, Charles W.....EOT
Schuman, Fred Williams.....SLA; MAC
Silver, Bertram Eugene.....SLA; EOT
Sessions, Charles Carroll.....SLA; Note 12
Smith, Eugene Gardner.....SLA; WFO
Smith, Paul Sherman.....SLA; CAF
Swanson, William N.....Note 26

T

Tozer, George Austin.....SLA; DAF
Trusler, Harold Milton.....SLA; KST
Terry, George F.....DIK
Tilbrook, Milton A.....DIK
Thornton, Arthur L.....DIK
Thweatt, William Kavanaugh, Jr....SLA; AAD
Thomas, John E.....CUI
Truscott, Frederick W.....FLA
Thiele, Carl Louis, Jr.....SLA; GLC
Thornton, Arthur Leslie.....SLA; CAF
Tower, Robert R.....LDT
Tebcrek, Joseph E.....LDT
Terry, George Franklin.....SLA; CAF
Tanner, Howell, Moffette.....SLA; CJW
Tait, Trevor Spottiswoode.....SLA; LDT
Thornton, Ernest G.....FLA
Thalman, Charles H.....UTA
Tutnall, Emmett R.....DMA
Tilson, Howard F.....DMA
Trickle, Ralph E.....Note 6
Terry, Mead Meehan.....SLA; LDT
Tidd, Luzerne M.....SMM
Tissot, Thomas P.....SMM

U

Utley, Charles B.....CWT

V

Vawter, David Dobyns.....SLA; CRI
Vail, Edgar Landon.....CPA
Vrooman, Samuel B.....DAP
Vernon, Charles C., Jr.....LDT
Vines, John O.....LDT
Volintine, Daniel.....SLA; CRI
Voelker, Frank F.....FLA
Van Bibber, Ray Odin.....SLA; EOT
Veach, Thomas F.....DMA
Vinson, Clyde.....SLA; EOT
Vickers, Edward William.....SLA; CWT

W

Wells, Volney Hunter.....SLA; DAP
Waterbury, Neil Marr.....SLA; PMT
Wilbur, Clifford Henry.....SLA; RSD
Waterman, Herbert William.....SLA; PMT
Windham, Jesse Madison.....SLA; PMT
Wright, Paul P.....HHN
Widenham, John Maxwell.....SLA; DAF
Wagner, Ralph P.....SMM
Wagoner, George A.....EOT
Waite, Herbert E., Jr.....LDT
Whitehouse, William Edwin.....SLA; LDT
Wilcox, Philip Wakeman.....CPA; DAP
Watson, Minor Shelton.....SLA; LDT
Wade, Alston Boyd.....SLA; EOT
Winters, Verne William.....SLA; UCB
Weed, Frederick B.....FRF
Wells, Edward Pierce.....SLA; CFT
Wood, Benjamin F.....LDT
Wohlgemuth, Bruno Edward.....SLA; PMT
Warner, Carmi Lewis.....SLA; LDT
Wales, William Chauncey.....SLA; LDT
Weiler, Raymond Lewis.....SLA; LDT
Wright, Charles Nelson.....SLA; WFO
Whitney, Richard Skinner.....SLA; RSD
Waltham, Ralph O.....FRF
Williams, Glenn E.....FRF
Wincote, Charles B.....FRF
Wightman, Norman H.....PWM
Wilson, Alexander H.....WFO
Winsor, Frederick.....CPA; DMA
Wilson, Leroy Alonzo.....SLA; UIU
Witt, Joseph Bouidin.....SLA; DAF
Walker, Thacker V.....Note 9
Wilde, Robert John.....SLA; LDT
White, James F.....Note 11
Walker, Stephen P.....CWT
Wrenn, Theodore W.....MJA; DMA
Woodard, Henry Guy.....SLA; EOT
Wilson, John L.....SLA; CGC
Wilson, Edward Everett.....SLA; CFT
Weisenborn, Stanton M.....BFT
Wood, Ben Brown.....SLA; CJW
Wales, Edward V.....MAT
Wilson, Clarence Chamberlain.....SLA; CWT
Wilcox, Clyde Edwin.....SLA; CWT
Whitely, Felix Elbert.....SLA; CWT
Wilkinson, John Sherfey.....SLA; RSD
Wolff, Herman D.....SMM
Wood, Robert V.....SMM
White, Oscar.....EOT
Williams, Luther B.....EOT
Woodard, James W.....EOT
Woolson, Lionel M.....FRF
Williamson, Cleburne M.....TFT
Whitehouse, William E.....BFT

Y

Young, Evan D.....WFO
Yerkes, Lawrence A.....LDT
Yoeman, Chauncey DeWitt.....SLA; LDT
Young, Carlton E.....TFT

Z

Zeller, Max John.....SLA; LDT
Zollman, Martin W.....LDT
Zacharias, Allen Howard.....MJA; Note 17
Zimmers, David Franklin.....SLA; TFT
Ziegler, John W.....LDT

(*Continued from page* 1321)

Capt. Puckett is Field's Official Chaser of Flies

Capt. Carl Puckett, official "fly chaser" of the Kelly Field Flying Department, walked 303 miles during the month of July, trying to find a fly in the kitchens and mess halls of his "beat." His pedometer tells the tale.

Every day Capt. Puckett visits every kitchen and mess hall in the Flying Department, which means that he walks ten miles every day. If he saw a fly during the entire month, Capt. Puckett has no recollection of it now. The field is remarkably free from them, according to his statement.

This condition has been brought about by the constant warfare waged against flies by every mess sergeant, cook and "K. P." in the Flying Department, under Capt. Puckett's supervision. Traps and swatters are the weapons used in fighting flies, but eradication of breeding places has worked the worst hardship.

Capt. Puckett also serves as Herbert Hoover's right-hand man in the Flying Department. It is a part of his business to check up the food wastage and to see that it is reduced to the minimum. Through the hearty co-operation of mess sergeants and cooks and the men themselves, food waste is negligible, and could hardly be further reduced, Capt. Puckett says.

The Flying Department's "official fly chaser" is the second oldest man at Kelly Field in point of service at this camp. He is outranked only by Capt. S. R. Evans. He has been at Kelly Field eleven months and has been in the sanitary inspection department since February 1.

Capt. Puckett was a practicing physician in Pryor, Okla., for thirteen years before he came into the army. He was physician for the State Orphans' Asylum for seven years and County Superintendent of Health for three years.—*Kelly Field Eagle.*

Use Movies to Train Pilots in Gunnery

An American Aviation Training Camp in England.—The moving picture is being widely used in the training of American pilots in this country. The young flying officers who are sent to the armament school here to acquaint themselves with the use of aeroplane guns and gun-gears find their three-weeks course a most interesting one, owing partly to the large share which the moving picture machine plays in the instruction.

The pupil is not required to sit out a lengthy lecture read aloud from the notes of an instructor. Instead, the various branches of gunnery training, such as the stripping and assembling of guns, and the various points to be observed before, during and after flight, are demonstrated by films, accompanied by concise explanations by competent officers.

Frequently a film is run over the screen several times at different speeds so that the pupil gets a very intimate idea of the process being illustrated. Monotony and complexity finds no place in this method of training.

The films standardize the correct methods, and their instructional value is far-reaching. The film work is not confined to gunnery alone, but is continued in the other technical courses, such as aerial tactics and bomb dropping. According to British instructors, the use of the film has shortened and improved the course of training in these departments very materially.—*The Fly Leaf.*

Open Camp John Wise Hospital September 1

The new field hospital at Camp John Wise was formally opened September 1 with appropriate ceremonies. The program included a concert by the new cantary band and speeches by camp officers and leading citizens and physicians of San Antonio. The hospital is equipped with every known modern device and its erection was personally supervised by Capt. Phillip J. Lipsett, Post Surgeon. Four wards consisting of the general, surgical, isolation, and officers, compose the hospital. It also has a dental room with full equipment. It has a capacity of 60 patients.

Aircraft Board Needs Men

Washington—The Bureau of Aircraft Production has been authorized to make a limited number of voluntary inductions of men registered under the present draft. An urgent need exists for accountants and manufacturing cost clerks who have had either office or factory experience. Induction is open only to men in Class 1A, who are classified for limited service or who are in the remediable group, and to men placed in deferred classes on account of dependency.

The work to which applicants will be assigned is declared to be not only of great service to the Government in the production of aeroplanes, but it will prove of benefit as well to the individual in the training which he will receive. Applicants should communicate with the Personnel Officer, Finance Division, Bureau of Aircraft Production, 119 D Street, Washington, D. C.

Location of Forty Air Squadrons

Of the forty air squadrons, whose organization was recently authorized, four will be located at Houston, Texas, and thirty-six, or a training brigade of three wings, on Long Island, N. Y. The

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base of this Long Island training brigade, as now planned, will be Hazelhurst Field, near Mineola. The squadrons will be quartered in groups of four on nine outlying fields. These squadrons are to serve under field conditions, simulating as nearly as practicable the conditions behind the lines in France. They will train as organizations, and it is hoped to furnish them completely with personnel and equipment so that when they have finished their training in the brigade very little additonal training will be required before they take their places on the front. This will also enable them to be sent to Europe in complete squadrons instead of detachments as heretofore. The outlying fields on Long Island, which will be used for the new enlarged training operations, will be Brindley Field, at Commack; Lufbery Field, at Wantaugh; Mitchel Field, at Mineola, and Henry J. Damm Field, near Babylon. Five more will be occupied eventually.

New Army Balloon School

To complete the construction of the new balloon school at Lee Hall, Va., the allotment of $203,000 has been approved by the Assistant Secretary of War. This balloon school is for the training of officer observers in the control of artillery fire from observation balloons. Lee Hall will be a finishing school for Air Service officers in aerial observation and will co-operate with artillery stationed there. In this manner the officers will receive actual experience in artillery fire adjustments, directing the same from observation balloons in the air, just as they will do at the front. The completed plans for the new school include about sixty buildings, among them a balloon shed, aero repair shop, garage, firehouse, photo laboratory, as well as mess halls, barracks, school buildings, etc. The capacity of the school will be more than 1,000 men. Major Harry R. Vaughn is the commanding officer. It is expected that the buildings will be completed and that the school will be in full operation within two months. It is also announced that in order that the work of training men for heavy artillery may be developed as rapidly as possible and under the most favorable conditions, it has been decided to increase the size of Camp Abraham Eustis at Lee Hall at once. Orders have been issued to the Construction Division to proceed with the work. It is estimated that the additions will cost $1,940,000. The enlargement calls for motor transportation schools for 500 students, garages, repair shops, a short railroad, concrete roads, new ranges and barracks and quarters for one trench mortar battalion and one anti-aircraft battalion.

Naval Aviation at Dunwoody

Minneapolis, Minn.—Following close on the inspection of Dunwoody Naval Training Schools last month by Capt. Thomas J. Senn, U.S.N., Assistant Chief of Bureau of Navigation, came the request from Washington for Comdr. Warren J. Terhune, U.S.N., commandant, to submit a prospectus on facilities available in Minneapolis for expansion of the work in aviation. The result of this move is the authorization by the Navy Department of the third regular ground school for student flight officers. The two ground schools previously established are at Massachusetts Institute of Technology, Boston, and at University of Washington, Seattle.

Since last November, when Lieut. Colby Dodge, U.S.N., initiated student pilot training at Dunwoody, aviation activities in Minneapolis have swiftly matured. The second class of "near officers," rated CQM (A), depart for naval air stations on the east coast early next month, while the third quota (25 men), detailed to Minneapolis from outside points, arrives this week to begin training. The first two classes were all enrolled locally, and while many additional students will continue to be ordered here from elsewhere, it is hoped to obtain from the Twin City community further contingents of excellent material as soon as Navy recruiting re-opens.

According to the new schedule of ground school instruction recently issued by the Department the course is limited to eight weeks. For the present it is the intention to maintain the Dunwoody pilot classes to the strength of 100 men, four classes of twenty-five men each, and as the senior class is transferred East for flight training, what might be called the freshman class begins, while the other classes advance correspondingly. Ens. William Eastman, U.S.N.R.F., aviation officer, is now in Boston receiving further instructions for handling new men.

Dunwoody is reckoned particularly fortunate in having as instructors for the four principal ground school subjects (navigation, rigging, gunnery, motors) four former officers of the British Flying Corps, three of whom were naval aviators on duty in the North Sea and the other a member of the Royal Flying Corps at the front in France.

Field at Ellington Is Enlarged

Washington.—During the coming winter Ellington Field is to be one of the busiest aviation camps in the country. Plans to this end are now being worked out by the aviation branch of the signal corps.

The new draft act, which paves the way for the induction into the army of more than 2,000,000 men, means the increased use of all of the army camps and cantonments in the Southern States. It will be impossible to give the character of intensive training in the Northern camps which the army contemplates in order to have these new fighting forces ready for transportation to Europe in the early spring in readiness for the great drive that is to be made through the Hun lines in the expectation of bringing the world war to its closing stages in 1918. The Southern camps will be filled to their capacity and kept at that stage throughout the winter months in order that there may be no let up in the training of the men. Winter weather in the Northern camps will prevent this character of training.

Ellington Field has been reorganized into one of the big bombing fields of the country. The six new steel hangars now being erected there by troop labor are intended to afford added facilities to meet this new and extended field of operations at Ellington. These steel hangars will cost between $9,000 and $11,000 each and are to be completed with all possible speed. The 333 acres of land recently added to Ellington Field have been designated as the site for the bombing practice to be afforded the cadets. This new land added to the extensions at Park Place and San Leon makes Ellington Field one of the very largest in the country.

Cadets who are drilled in bombing work will be flyers who have passed through their preliminary training at other aviation fields and are then detailed to Ellington on their work.—*Houston Post.*

Finger Prints

In compliance with general orders from Washington the post surgeon at Ellington Field will take all the finger prints of the officers of the field. These records will be forwarded to Washington and placed on file, giving the department a means of positive identification.—*Talespins.*

New Honor Medal Open to Everyone

America's new medal of honor may be won by officers and men of the American Army who have performed in action "deeds of the most distinguished personal bravery and self-sacrifice," under orders issued by General Pershing and made public by Secretary of War Baker.

The distinguished service cross and service medal may be awarded officers and men of the Allied as well as the American forces and also to nurses and other women serving with these forces. The service cross will be awarded to anyone who distinguishes himself or herself by exceptionally meritorious service to the Government in a duty of great responsibility in time of war in connection with operations against the armed enemy of the United States.

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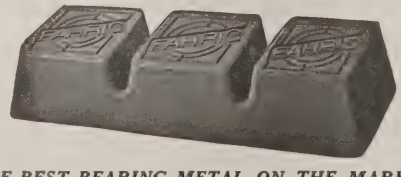
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AERIAL AGE WEEKLY

Vol. 8, No. 2 SEPTEMBER 23, 1918 10 CENTS A COPY



The departure of the Aerial Mail. The mail plane just after leaving the ground, picking up the course for Chicago. Max Miller pilot, Standard plane equipped with Hispano-Suiza motor

De Haviland Fours Meet Battle Test in Reduction of St. Mihiel Salient

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AERIAL AGE WEEKLY

VOL. VIII SEPTEMBER 23, 1918 No. 2

TABLE OF CONTENTS

PAGE

De Haviland Fours meet battle test in St. Mihiel Salient 59

Military and commercial value of aerial mail lines 59

News of the Week 61

The Aircraft Trade Review..... 63

Some meteorological conditions which add to the danger of Flying..... 64

Military Aerostatics 65

The new Duesenberg Aero Engine Test House 66

The Fokker Bi-plane 68

The U. S. Aero Mail 69

The De Haviland V. Single seater... 70

The New York-Cleveland-Chicago Aerial Mail in Photographs..... 72

Naval and Military Aeronautics..... 74

Foreign News 76

Model News 77

Aeronitis 78

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879



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AERIAL AGE WEEKLY

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Inc., Sept. 23, 1918
Subscription Price, $4.00 a year. Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, SEPTEMBER 23, 1918 NO. 2

DE HAVILAND FOURS MEET BATTLE TEST IN REDUCTION OF ST. MIHIEL SALIENT

AMERICAN-MADE aeroplanes, driven by Liberty motors, played an important role in our reduction of the St. Mihiel salient. Edwin L. James writes about their performances in the New York *Times* as follows: While we owe thanks to the French, British, and Italians for the major part of the great aeroplane concentration, a considerable proportion of it was Simon-pure American.

The machines in use were De Haviland fours, two-seated biplanes. We used them primarily for bombing, but our intrepid aviators also used them for pursuit machines and for strafing the German lines.

To the work of our airmen was due in great part the large number of prisoners captured. The main avenue of the German retreat was the highway from Vigneulles to (name of town deleted). Because of mud this road became jammed Thursday and Friday and offered a good mark for our aviators, flying low, who sent machine-gun bullets by the thousands into the German lines along the highway, achieving very good results. In this work our American-made machines also did effective work, dropping small bombs and making many direct hits.

Our pursuit machines proper, of course, were of French make. But, as a test of the Liberty motor planes, a number of our pursuit squadrons Thursday and Friday included De Haviland fours, which gave a most excellent account of themselves, being credited with part of the bag of (deleted) Germans we got Thursday. These machines were not able to dive and manoeuvre with the pursuit planes, but, having guns at both front and rear, they did not have to do so much diving out of the way as the pursuit machines, which are single-seated, with only one gun pointing forward.

But where the Liberty motor achieved the biggest success was in the development of speed against the German pursuit planes. One instance illustrates this. Three of our De Haviland fours at an altitude of 6,000 meters spied two Fokkers. The Fokkers fled with the De Haviland machines after them. The American machines had better speed than the Germans, and drew down on them. The Germans dived. Our machines got one and the other escaped.

This is a most hopeful development, for in view of our admitted present shortage of pursuit machines, the possession of a bombing or observation machine which can take care of itself against German pursuit planes will go a long way toward remedying the defect.

This was the first battle performance of American machines equipped with Liberty motors, and our air officers are enthusiastic over the results.

Our machines bombed Conflans and several other German strategic points north of our new line. Three ammunition dumps were set on fire, and other damage was done. Thursday and Friday we dropped sixteen tons of bombs in the St. Mihiel salient. The next few days promise interesting air fights. We still have the supremacy of the air in this sector, but it is no longer undisputed.

MILITARY AND COMMERCIAL VALUE OF A PERMANENT AERIAL MAIL LINE BETWEEN NEW YORK, CLEVELAND AND CHICAGO

By HENRY WOODHOUSE

BY demonstrating that mail can be sent from Chicago to New York by aeroplane in eight hours the Post Office has emphasized the military and commercial value of a permanent aerial mail line between New York, Cleveland and Chicago.

Government orders, specifications for war materials, contracts, bids, authorizations of various kinds can be sent by aerial mail at a saving of over one day. This means truly a day gained in the production of the things needed to win the war.

It means that the regular office correspondence which, in accordance with business routine, is mailed late in the afternoon in New York will reach Chicago the following morning, thus saving a full day. By the fastest train it would only arrive there twenty-four hours later, too late to be attended to that same day.

Makes Quicker Train and Boat Connections

The initial saving of one day in the transmission of mail from Chicago to New York and vice versa is greatly increased when the letter is destined to make train connections for the West or the North or boat connections for Europe or South and Central America and the Pacific possessions and China and Japan.

Then it means a saving of days and weeks.

$50,000,000 Worth of Aerial Mail Business Waiting Development of Aerial Mail Service

It means a great deal to the thousands of military and naval aviators who are fighting or preparing to fight this fight for Democracy and Civilization to know that there is a field being developed where they can continue their work after the war; and it means much to the Aeronautic Industry to know that the aerial mail service will use thousands of aeroplanes and motors after the war.

To run the 200 aerial mail lines already defined would take over 2,000 aeroplanes. To run a fairly complete aerial mail service in the United States, with lines across the Atlantic and to Canada, Cuba and Central and South America will take tens of thousands of aeroplanes.

To run a single line across the Atlantic will mean sending out two large aeroplanes every hour, with relays from New-

foundland to the Azores and from the Azores to Portugal, England and France. As they will be large machines, it will keep a large factory busy to supply the machines for a single line.

This will be equally true if the line is to be direct from the United States to Ireland, using large flying boats which may land at intervals to get fuel.

Here are a few points worthy of special consideration:

(1) If we all help the Post Office, within twelve months a dozen additional aerial mail lines can be established, and the Post Office will be able to send by aeroplane at least half of the one hundred million day and night letters and of the fifty million special delivery letters that are being sent each year in the United States.

(2) The day and night letters average close to $1 each, and special delivery letters thirteen cents each, making a total of over fifty million dollars worth of business which is waiting for the development of the aerial mail service.

(3) Aerial mail day letters are most effective within distance of 400 miles. Night aerial mail letters are effective over any distance, because the aeroplane can carry mail over 1,000 miles between 6 P. M. and 8 A. M.

(4) The aerial mail system will be much more efficient and cheaper than the present telegraphic night and day letter system can be, because the sender can send a letter written in his office which does not have to be transcribed by an operator, who may make mistakes, and the message will reach the person to whom it is addressed without anybody else reading it, thereby insuring greater privacy. The cost of an aerial mail letter will be only sixteen cents, for which price there can be sent a message that would cost $5 or more by telegraph.

(5) Twenty-five million dollars worth of parcel post can be sent by aeroplane, and about as much of trans-Atlantic mail.

(6) As you probably know, the Post Office pays eighty cents a pound to steamships of American registry to carry mail across the Atlantic. Charging one dollar per letter sent by aeroplane across the Atlantic, will make mail carrying across the Atlantic and across the Continent a paying proposition even now. The super Handley Page or the 2,100-h.p. Caproni could take easily in the fuselage fifty bags of mail, weighing fifty pounds each, making a total of 100,000 letters each trip.

Passenger Carrying Between New York and Chicago in Six Hours at $150 Per

Passenger carrying between New York and Chicago at $150 each is going to be a fair business proposition. A great many people would be willing to pay even more to cut the journey between the two cities down to six hours. We may predict that within two years we will see air lines between New York and Chicago having to run an aeroplane every half hour, having stations along the route, and having express and "local" service.

Liberty Giving Eight Miles to the Gallon of Gasoline

The Liberty motor is giving eight miles to the gallon of gasoline!

This is good news. This and other motors may be developed during the year to give ten miles to the gallon. This is true with land aeroplanes; with seaplanes, where the head-resistance is greater and the speed less, the mileage is somewhat less.

Marvelous developments have taken place since, which shows that even a single motored aeroplane can be made to operate daily for months without interruption, on schedule time.

During the month of August the air mail service between Washington, Philadelphia and New York was conducted without a miss, hitch or serious delay of any character.

The operations for the month were perhaps the most remarkable in the history of aviation. There were twenty-seven flying days on which 108 legs of the journey had to be performed, and in that month there were but two forced landings. One with a delay of seven minutes and the other with a delay of less than ten minutes. One forced landing was made within four miles of Belmont Park at the end of a journey. It was caused by the break of the magneto shaft. The other forced landing was made on a flight where fog and haze obscured the round and for the purpose of picking up the course because the compass failed to work.

The total possible miles of flight was 11,961, of which 11,957 miles were completed.

During the first ten days of the month, the routes were flown by Lieuts. Edgarton, Kilgore, Bonsal, Webb, Culber and Miller without a miss, hitch or forced landing. During the last twenty days of the month the routes were operated by the civilian flyers of the Post Office Department. The perfect scores were made by aviators Max Miller and E. V. Gardner. Aviators Maurice Newton and Robert Shanks on the Philadelphia end of the route, each had one forced landing, giving them a score of 99 per cent.

A total of 5,879 pounds of mail was carried on these trips.

This perfect record was performed with a very small but efficient organization, at such small cost that the aerial mail service can be made to pay for itself if there is sufficient aerial mail to carry 50 per cent. of their carrying capacity.

The aerial mail service is destined to be a very important factor in the war and in the reconstruction which will follow the war.

As these are not so much days of prophecy as they are days to clearly visualize things to be done, and to do them as fast and as thoroughly as they humanly can be done, the world is eager to get an idea of what it may expect, the hope being, of course, for a speedy success in winning the war, and hope that the reconstruction will give us a better world.

Aeroplanes Lifting 40,000 Pounds Possible

It is hardly necessary to point out that now that we have aeroplanes capable of lifting fifteen tons and going at a speed of about 100 miles an hour, the general application of aircraft for transportation is to come fast. A few days ago a despatch quoted Mr. John D. Ryan, the energetic Director of Aircraft Production, as saying that there is a type of aeroplane under consideration, which is to be equipped with four Liberty motors, or 1,750 horsepower. Such an air cruiser would probably be capable of lifting close to 40,000 pounds, and the limit in size has by no means been reached. A 5,000-horsepower air cruiser may cleave the air in a year.

Delivery of mail across the Atlantic and across the continent may be as common next year at this time as the delivery of mail by aeroplane on the New York-Philadelphia-Washington route is today. The mail will be much heavier over long distances, because the aeroplane will make it possible to make deliveries a number of days sooner.

Closer Understanding Between Nations—or Another Menace to Our Generation

The fact that the radius of flight of aeroplanes is extending to 2,000 miles, and may extend to 4,000 miles within two years, brings hope for closer understanding between nations after the war, due to faster transportation and intercommunication, but also brings the menace of disaster which may befall our generation if the control of the air falls in the hands of warlike people.

Germany is planning extensive aerial mail, express and passenger transportation lines to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of large aircraft. This would give her a reserve air fleet large enough to blow England, France or Italy and the cities on the American continent off the map overnight. As was brought out in the House of Commons by Lord Montague, aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs for cargo. We all hope, of course, that some agreement will be reached between nations which will guarantee against such a horror as the bombing of a nation out of existence over night by another nation having tens of thousands of aeroplanes. But the present war has shown that hope does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids on Belgium, France and Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So while keeping our hearts in the right place, the Allies must be ready to protect the Rights of Humanity and the Cause of Civilization.

Anything that is done to bring into use thousands of aircraft for civic purposes is a contribution towards placing the United States and the Allies in the position of the porcupine which goes about its peaceful pursuits, harms no one, but is ever ready to protect itself. The Post Office can use thousands of aeroplanes for the aerial mail service—which will form a valuable reserve for national defense.

Unused Resources to be Developed by Aerial Mail Service

There are thousands of men who have volunteered for the air service, but cannot be accommodated, who can be used for the aerial mail service; and there are extensive manufacturing facilities not being used for war purposes, which can be kept busy building aerial mail planes. By using these unused resources, the Post Office can develop reserve aviators and manufacturing resources which can be used for war purposes when needed.

We have had occasion to submit these facts to leading Allied authorities and they agree with us that it is necessary to look ahead. Ambassador Jusserand in a recent communication states:

"You are quite right. Honest nations must not only be more honest, but also stronger and cleverer than the other, so that honesty and not barbarity may prevail in the world.

"France and America owe to their past to see to it that the mastery of the air, as on the earth and in the waters, be held by those who believe in justice and in the sanctity of the pledged word. The lands of the Montgolfier brothers and the Wright brothers, must and shall keep their rank and justify their fame.

"All success to aviation in the service of international honesty.

Sincerely,

(Signed) Jusserand."



THE NEWS OF THE WEEK



Signal Corps Returns on Aeronautical Property

War Department General Orders, No. 71.

III. 1. All Aviation and Aircraft property now carried on Signal Corps returns, as of June 30, 1918, will be invoiced to the proper supply officers of the Division of Military Aeronautics and the Bureau of Aircraft Production, and separate returns of Signal Corps supplies, Aviation suppies and Aircraft supplies shall henceforth be made. The property return of the Signal Corps supplies will be rendered to the Chief Signal Officer for auditing, and the property return for the Aviation suppliess will be rendered to the Director of Military Aeronautics for auditing and the property returns for Aircraft supplies will be rendered to the Director of Aircraft Production for auditing.

2. Signal Corps supplies will consist of supplies other than Oeronautical, designated as Fire Control and Signal Corps supplies in the authorized Signal Corps Manuals; and all Aeronautical supplies heretofore considered Signal Corps supplies will be construed as Aviation supplies and Aircraft supplies.

3. Aircraft supplies will consist of those supplies necessary for the production of aeroplanes, aeroplane engines, aircraft equipment, unfinished, unattached or unassembled aeroplanes, aeroplane engines or aircraft equipment. Such Aircraft supplies will automatically be transferred and become aviation supplies on delivery to the Department of Military Aeronautics by the Bureau of Aircraft Production, the transfer being effected on the bill of lading. Such supplies will be invoiced to the receiving Supply Officer of the Department of Military Aeronautics by the Supply Officer of the Bureau of Aircraft Production, who makes the shipment. These supplies when received by the Department of Military Aeronautics and all other supplies now considered as Signal Corps supplies with the exception of those described above as Aircraft supplies and Signal Corps supplies will be construed as Aviation supplies. The decision as to whether Aeronautical supplies are Aircraft or Aviation will be based on the distinction drawn in General Orders, No. 51, War Department, 1918.

4. All Signal Corps supplies as accounted for in proper returns up through the period ending June 30, 1918, will be audited by the Chief Signal Officer of Army and this order shall operate as from July 1, 1918. All returns rendered to the Chief Signal Officer, for auiiting for period ending June 30, 1918, and all previous periods, will remain the property of the Chief Signal Officer.

Americans Cited by General Pershing

Washington—Graphic stories of the individual heroism and daring of American officers and men fighting in France are told in cryptic citations by General Pershing in awarding them Distinguished Service crosses. The citations were received at the War Department on September 5.

Second Lieutenant Fred A. Tillman, A.S.H.C. —He aroused the admiration of all the French first-line infantrymen when making an infantry liaison west of Rheims, June 26. He flew over the enemy lines at an altitude of only 150 metres, in spite of violent machine-gun and anti-aircraft fire. Shot down between the lines, with his plane riddled with bullets, and his pilot severely wounded, he picked up his pilot in his arms and carried him through heavy fire more than 200 metres to the French first line, after he was himself wounded in the neck.

First Lieutenant Edgar G. Tobin, Aero Pursuit Squadron—While leading a patrol of three machines in the region of Neuville July 16 he attacked an enemy formation of six single-seaters. He destroyed two himself and forced down a third out of control.

Sergeant Frank Gardello, Jr., Infantry—When two enemy aeroplanes flew parallel to our infantry lines north of the River Ourcq, near Villers-sur-Fère, July 28, pouring machine-gun bullets into our positions and driving everyone to cover, Sergeant Gardello rushed to his machine gun and took aim at the upper of the two machines. Although he was constantly subjected to a storm of bullets from the planes and from enemy snipers on the ground, he nevertheless coolly sighted his gun and riddled the upper plane. It collapsed and fell in flames, striking the lower one as it fell and causing it to crash to earth also.

Schieffelin Commended

London.—Ensign John Jay Schieffelin of New York has been commended by the British Admiralty for his energetic attack on a German submarine in the North Sea while on patrol duty August 19. He observed a submarine on the surface and dived to attack. He succeeded in hitting the U-boat with a bomb, severely damaging the craft. At the same time he gave warning to an allied convoy of the proximity of the U-boat.

In connection with the mention of Ensign Schieffelin's feat the Admiralty announced that American aircraft have begun operations from the new base on the Irish coast.



Lieut. Edward Milton Urband, A.S.Sig., R.C. He graduated from the Aviation School at Ithaca, N. Y. He has brought down two German planes up to date

U. S. Bomb Program Gets Fritzie's Goat

Colonel C. V. Clark of the Air Service has outlined an interesting program on bombing as carried out by American aviators in France. Under present condition on the Western battle front material damage must be done by night bombers, says Col. Clark. Day bombers will be used solely for the moral effect of inflicting perpetual unrest except in a few special cases when vulnerable objectives are difficult to locate at night.

The primary military functions of the day bomber are:

(1) To bomb important points, such as small objects difficult to find by night, headquarters, small ammunition "dumps," small storehouses containing munitions or supplies, small railway junction, and small aerodromes.

(2) To bomb such communities as is considered desirable, especially factories and factory towns.

(3) To conduct long range reconnaissance, strategical reconnaissance, reconnaissance by staff officers or with camera.

(4) To do special photographic work so far beyond the lines as to necessitate great altitude, demanding a camera of great focal length and therefore great size and weight.

Leave Extended

Major Cushman A. Rice, Air Service, who returned several months ago from the fighting lines "over there" and who had been "gassed" while directing the American Aerial forces that were operating with the British army, has just been granted an extension of three months' sick leave. Major Rice is undergoing treatment at the Walter Reed Hospital, at Washington, D. C., and while improving in health slowly, is anxious to return to battle with the Hun. A bronze medal was presented to him on his recent trip to the west by the University of Minnesota in recognition of his patriotic services.

London the Rest Camp for Run-Down Airmen

London.—The American soldier on his first visit to London from some of the numerous camps around England often asks why there seem to be so many aviators strolling around the city streets, apparently without a care in the world. It is evident that many of them are veteran fliers, for they wear ribbons and decorations which could have only been won by great valor on the field.

Most of these men, the American learns, are "on leave." London is the great "rest camp" for aviators. After a long period of war flying in France they flock back to London to rest their nerves until the medical officers pass them for return to duty.

Two to four weeks is the average period they spend in this city. They naturally look forward to these periods of leave with great pleasure, but by the time their three or four weeks are up they are beginning to be anxious to get back into the atmosphere of gasoline.

U. S. Fliers in 94 Flights

Washington—American aeroplanes in France, according to official dispatches received, made 964 flights in the first two weeks of August, engaged in ninety-four combats and brought down at least twenty hostile fliers, one captive balloon and probably two other enemy aeroplanes not officially accounted for.

The American bombing planes attacked Conflans, Longuyon and Damourie in daylight, dropping 5,300 kilograms of projectiles.

The French fliers during the same time made nearly 14,000 flights, engaged in nearly 700 combats, took 10,000 photographs of enemy positions and dropped 31,000 kilograms of projectiles.

With the American Forces on the Vesle

German aviation is still desperately engaged in barring our fliers from having a look at their back areas. Despite a horde of Pfalz, Fokker and Albatross machines hovering about them, American aerial photographers have been getting quite a collection of interesting snapshots. German chasing planes are having a mighty hard time of it.

American Airmen Bomb Conflans

With the American Army in Lorraine.—American bombing machines in their attack on Conflans and Longuyon on September 4 were successful. In Longuyon the raiders dropped forty-four bombs, and seven direct hits were observed at the east end of the railroad yard, two on a roundhouse and repair shop, and two on other buildings. One American machine turned back after dropping its bomb. At Barencourt four direct hits were observed.

In the Conflans raid more than a ton of bombs were bunched on the junction of the Briey-Conflans-Metz railway. The bridge of the former road was destroyed. All of our machines returned safely.

Enemy bombers were active last night in the villages far behind our lines.

American aviators in a battle with Germans near Pont-a-Mousson routed the enemy. One enemy machine is believed to have been driven down.

With the American Army on the Lorraine Front

American bombing machines successfully attacked railway yards and buildings at Conflans, twenty-five miles east of Verdun, on August 30. Several direct bursts were observed. Enemy pursuit planes followed the invading Americans back to their lines, but did not attack them.

At noon American airmen dropped bombs on the railway yards at Longuyon (about twenty-five miles north of Conflans), scoring several direct hits.

Late in the afternoon conflans was again raided, but poor visibility made it difficult to ascertain whether the bombing was effective.

Enemy anti-aircraft guns were active against the American raiders in all three of the day's excursions. All of our machines returned.

One lone American aviator attacked a German who was driving at a French balloon. Six Germans were above him, but the American forced the German machine into a nose dive. The six other Germans then attacked the American and forced him to descend. He landed behind the American lines uninjured.

American Official Communique

Headquarters, American
Expeditionary Forces,
September 4, 1918.

Yesterday our aviators successfully bombed the railroad yards at Longuyon, Demmary, Baroncourt, and Conflans.

North of Toul one of our aviators shot down a hostile machine. On Aug. 21 and 22 our aviators successfully bombed the railroad yard at Longuyon, Audun-le-Roman and Conflans. Three and one-half tons of bombs were dropped and many direct hits were observed. All our machines returned.

With the American Army on the Vesle Front.—Lieut. Louis Verdier, formerly head of the Lafayette Flying Squadron, a brother of Paul Verdier of San Francisco, has been killed in action, according to information received.

No details are given in the report.

With the American Army on the Lorraine Front—An American air patrol of four machines on Aug. 29th met a German fokker in the region of Manonville and dived upon it. Lieut. Armstrong fired 230 shots at the enemy plane. There was a burst of flame from the fokker as it turned and made for the German side, falling as it crossed the line at Pont-a-Mousson.

A huge German triplane swooped down upon the American line near Pont-a-Mousson, showering the trenches with machine gun bullets. This craft made its escape, notwithstanding the violent anti-aircraft fire directed against it.

With the American Army in France.—Three German aeroplanes are believed to have been shot down on Sept. 10 by Lieut. Jacques Swaab of New York city.

On his return from a flight over the lines he engaged and shot down a fokker. He was attacked by a group of German planes, but shot one down in flames and forced another down out of control.

Lieut. Jacques Swaab is a graduate of the University of Pennsylvania, the son of Mayer Swaab, Jr., who is a member of Fleet & Co., with offices at 949 Broadway. His parents live in 88 Central Park West. Lieut. Swaab, who is 24 years old, had his aerial training at the ground school at Columbus, Ohio, the flying school at Dayton, Ohio, the Government school in France and six weeks' training in the aviation school in France.

Four Thousand Skilled Workers Wanted by Air Service

Major Wadsworth of the Aero Service of the United States Army is anxious to engage 4,000 skilled mechanics between eighteen and fifty-six years for work as aeroplane mechanics, carpenters, coppersmiths, instrument men, motorcyclists, vulcanizers, blacksmiths, cabinetmakers, chauffeurs, fabric workers, truckmasters, welders, propeller makers, motor mechanics and machinists.

Applications may be made any day between 8 A. M. and 5 P. M. to Lieut. Billker, room No. 902, No. 104 Broad Street.

Duesenberg Establishes Washington Office

The Duesenberg Motors Corporation has announced the establishment of a Washington office in the Munsey Building, in order to facilitate their intercourse with the various Government departments, as their entire facilities are being devoted to the execution of Government contracts. Mr. N. G. Rost, General Sales Manager, formerly located at No. 120 Broadway, New York, is making his headquarters at the Washington office for the duration of the war, and the Duesenberg Motors Corportaion will be glad to have its friends make use of this new office whenever convenient.



Lieut. Fileto Santos, one of the three young Brazilian aviators who are in this country studying the latest things in aeronautics on behalf of the Brazilian Government.

John D. Ryan Gratified

Paris.—On his return from a tour near the battle front John D. Ryan, American Assistant Secretary of War, in charge of air service, declared that he was much gratified by the work done by the aerial force of the American army.

Mr. Ryan's tour was made during the recent operation of the American army and gave him an opportunity to see the various American aviation activities in the zone of advance. He was accompanied by Gen. Patrick, chief of the air service of the American expeditionary forces.

As the American aviation centres are not yet completed Mr. Ryan said he desired to refrain from discussing that branch of the service at any length. He spoke in the highest terms of the brilliant exploits of the American troops.

Giant Plane Crosses the British Channel

London.—A big British aeroplane carrying its crew and nine passengers has made the trip from France to England, it is announced here. The whole journey from an aerodrome in the interior of France to one in the interior of England occupied little more than half an hour.

The test was made under routine conditions, with an ordinary service aeroplane of the largest type. The passengers carried the normal amount of baggage of travellers by train and boat.

Great French Ace Sends Down His 44th Foe.

Paris.—The newspapers announce that Lieut. Nungesser, the French aviator, has scored his forty-fourth official aerial victory.

That Strange Uniform

Have you noticed it? Do you know whether you are to salute him or not? Well, you are for he has the status of an officer and is an envoy of the Brazilian government. He is Alfredo C. Daudt of Porto Alegre, Brazil, and he came to this country to learn flying and then return to teach his countrymen how it is done. He came to this country about nine months ago and has just finished a course at the Massachusetts Institute of Technology. Other representatives of the Brazilian government are in France and England taking lessons in modern aero work. Daudt states that flying is in its infancy in Brazil and that their army has only a few planes and these are of the old types. The navy is better equipped in this respect than the army, but neither is up to date so far as flying apparatus goes. —Chanute Field Propeller.

Plan Action to Have Highway Taken Over

Arrangements for conferences with the military affairs committee of the House and Senate for hearings, about December 10, for the purpose of showing that the War Department should take over the Bankhead national highway running from Washington to Little Rock, Ark., are being made.

J. A. Roundtree of Birmingham, Ala., secretary of the United States Good Roads Association, and Col. Benneham Cameron of Stageville, N. C., chairman of the state highway commission and a member of the board of directors of the Bankhead highway, are arranging for the hearing.

The highway passes through Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Tennessee and Arkansas. There are twenty-one cantonments and aviation schools on the highway.

Light and Dark Work Done by Night Bombers

Behind the British Lines in France.—The working month of a night bombing squadron in France is divided into two periods, which are known as the light and dark.

The light period covers the moonlit half of the month. Should it be attended by fine weather great aerial activity prevails. Practically any raid that is possible by day can be carried out equally well at night during this period. Although certain details are not clearly visible, the essential features of the ground stand out clearly and can be followed easily.

The ease with which targets can be found depend largely on their geographical position. Water is the great guide for night flying, and on a clear, moonlight night it can be seen from a great distance. Hence targets situated near a river, canal or lake present no difficulty whatever as regards their being found.

Railways, too, if they are in use, prove excellent guides, for the rails shine clearly in the moonlight and can be followed easily. Woods, especially, if they are of peculiar shape, make good landmarks. The black mass, which shows up well in the moonlight, can be quickly identified on the map.

During the light period most of the long raids of the squadron are carried out. The dark period, the moonless nights, is a much less active time.

New Aviation Camp in Michigan

Acquisition of 1,800 acres of land between Selfridge field and Lake St. Clair, near Mount Clemens, Mich., for instruction of aviators was announced recently by the War Department. The rental for the first year will amount to $52,000 and after that $40,000.

Frenchman, Inventor of Zeppelin, Dies at Paris

Paris.—Maurice Chevreaux, part inventor of the famous Zeppelin airship, is dead, and with his passing emphasis is given the fact that Count Zeppelin was not altogether the originator of the great airship that bears his name.

Chevreux, who was a French naval engineer, resided for some years in Germany and was employed in the Zeppelin workshops, and while so engaged he designed the six-cylinder motor by which Count Zeppelin was able to triumph over the difficulty of making a dirigible that would stay for hours in the air.

Balloon Observers Needed

Balloon observers are being sought by the Division of Military Aeronautics. This branch of the United States Army needs several hundred men between the ages of 25 and 35.

The qualifications necessary for this work is any technical training which will help him to read maps and photographs of the terrain and to calculate distances and angles. The Division of Aeronautics sends the successful applicants to one of its training schools, of which it has five—at Arcadia, Cal.; Fort Omaha, Nebr.; John A. Wise, San Antonio; Lee Hall, Va., and Fort Sill, Okla., the last two being the schools where the candidates get practice in connection with the artillery camps in those places. The candidates, upon the completion of their course, receive commissions as second lieutenants, and are sent abroad for further education.

Lieutenant J. C. Edgerton Weds

Washington, D. C.—The school-day romance of Lieut. James C. Edgerton, 1646 Park Road, reached a climax on Aug. 16 with his marriage to Miss Mary Olive Robinette, 15 3d St., Northeast. The ceremony was performed by Rev. Howard F. Downs.

Lieut. Edgerton first came into public notice when he successfully inaugurated the postal aerial mail service in a record flight from Philadelphia to Washington May 15. He piloted the plane which brought hundreds of historic letters from New York and Philadelphia to President Wilson and other high government officials.

Since the aerial mail service was put into operation, Lieut. Edgerton has made daily trips between Washington and New York, and is one of the few aeroplane mail pilots who has made the flights without an accident.

He is a lieutenant in the Air Service.

(*Continued on page 87*)

The AIRCRAFT TRADE REVIEW

Aircraft Motor Lubrication

John H. Torrey, Interior Combustion Engineer

As our up-to-date writings so generally center about the aircraft situation, it would seem permissible to add a few lines, keeping aloof from too technical outlining regarding the aviation motors which are specifically to be considered on phase of the very highest effort of mechanics to attain adjustments which will permit of the nearest approach to the objective goal—100% efficiency.

Allowing then that mechanics are true and so attested to; then it becomes the responsibility of those who are to account for the operation of the motors. The GAS or carburetting mixture must be correct, calling for the best of fuel product to admix under pressure and heat with the air, and right here it can be said that poor performances are more often due to poor carburetting than any other one feature. Now, with the mixture right, the last and not least important matter is to eliminate the fricion from the moving parts by introducing a lubricating product that will permit of the least quantity fed to film the metal surfaces and yet at the same time not carry into the chambers of explosion any suspensions that could possibly foul or leave a contamination or taint in such a degree as to diminish the efforts to eliminate said friction; as the presence of such bad segregation could only produce prematures and in short order bring about a stalling of the motor or such an erratic performance of the interior as to be sufficient warning to shut off the power.

Experience goes to show that *petroleum* furnishes us the best agency for the frictional elimination of interior combustion chambers, because a better film can be effected on the metal surfaces, the beats can be more successfully coped with and the fluidity and limpidity of such lubricant is not equalled by any other agency and as a necessity the rarity rather than density of the lubricant permits of the catering to the finest clearances of opposing metal surfaces. Phasings of necessity to get the correct lubricant must positively call for *baume* gravity, viscosity and flashing points. All these carrying high rather than low figures.

As the matter stands, both from laboratory and practical deduction, the correct lubricant for interior combustion chambers must come from, and it is proven that petroleum is the only sure agency and it is permissible to state as a final clause that the up-to-date product is at hand based on many years of practical caterings to interior combustion chambers.

Kettering to Address Detroit Section

Detroit.—C. F. Kettering, president of the Dayton Engineering Laboratories Co. and president of the Society of Automotive Engineers, will address the Detroit Section on the subject of the future of the aeroplane industry after the war. The meeting will be held on Sept. 20 at the Hotel Pontchartrain, Detroit, at 8 p. m. It is expected that a number of out-of-town people from the aeroplane industry will be present to hear Mr. Kettering's address.

Standardize Oil Specifications

Washington, D. C.—The Specifications Commission of the Allies has arrived in Washington to discuss the standardization of specifications for petroleum products for use by the American Government and the Allies. President Wilson recently announced in a proclamation that standard specifications would be drawn up and appointed an American committee.

The Specifications Commission from London comprises: W. Fraser, chairman; H. R. J. Conacher, secretary; Engineer Commander A. E. Hyne, Royal Navy; Captain W. E. Guttentag, British Air Ministry; Captain E. C. Paix, French Army; Captain L. Noyer, French Army; Major Galileo, Italian Navy.

The commission met in conference with the American Committee on Standardization of Petroleum Products, composed of the following members: M. L. Requa, general director oil division, U. S. Fuel Administration, chairman; J. W. Williams, secretary; Col. George E. Warren, appointed by Secretary of War; Admiral R. S. Griffin, appointed by Secretary of the Navy; H. L. Doherty, appointed by chairman of Shipping Board; C. B. Young, appointed by Director General of Railroads; C. H. Beal, appointed by Director of Bureau of Mines; Dr. C. W. Waidner, appointed by Director of Bureau of Standards. Further conferences will be held from day to day.

Personal Pars

V. Hughes has resigned from the Overland Motor Co. to enter Government service as aeronautical engineer, Aviation Section, Signal Corps, and is assigned to McCook Field, Dayton, Ohio.

Lots of Balloons

"We see so many 'sausage' balloons every day, that I am constantly reminded of Goodyear," writes J. A. Blatherwick, a former Goodyear Tire & Rubber Company workman, now stationed at a supply depot near the battle front in France. Ever since the breaking out of the war this company has been making observation balloons—known familiarly on the battle fronts as "sausages"—to furnish "eyes" for the Allied Forces. These balloons can be held at any desired height, while the observer gathers military information concerning the enemy and communicates it by telephone to those below. They are used extensively by the artillery for directing artillery fire.

Interned in Holland

Aviator Lieut. Don Harris, formerly of the Goodyear Tire & Rubber Company, Akron, Ohio, has been interned in Holland for the duration of the war. The report of his internment states his aeroplane was fired upon by anti-aircraft guns and struck in several places. He was forced to descend for repairs, but unfortunately was unable to get back to the American lines, and was interned before he could complete his repairs and get under way again. He reports the best of treatment by the Holland authorities.

The following is a list of purchases contracted for by the Bureau of Aircraft Production:

[NOTE.—The first number at the beginning of each paragraph is the Order Number, the second the Contract Number.]

August 6, 1918

20906-1. 3429. Standard Aircraft Corporation, Elizabeth, N. J., for services in the erection of 1 British Handley Page aeroplane.

30442-14. 2250-2. Wright-Martin Aircraft Corporation, New Brunswick, N. J., services and material in repairing motors returned from United States aerial mail station, Bustleton, Pa.

720151. 4038. Curtiss Aeroplane & Motor Corp., Buffalo, N. Y., 436 JN6H advance training planes with dual control and fixed gun only; 90 JN4H advance training planes with dual control and fixed gun only; 34 JN4H advance training planes with dual control and fixed gun only for the Navy.

730164. 4437. Splitdorf Electrical Co., Newark, N. J., 40 sets Dixie D800 magnetos and spare parts to be used in connection with all Hispano-Suiza engines, using 1 right-hand and 1 left-hand magneto.

820013. 4438. D. Nussbaum & Co., Union Course, Long Island, N. Y., 7,500 sweaters.

August 7, 1918

30442-15. 2250-2. Wright Martin Aircraft Corporation, New Brnuswick, N. J., repairs for Hispano-Suiza type A engines—crankshaft and hub assembly, crankcase assembly complete, water pump assembly, Dixie D800 magneto assembly, right-hand cylinder cover, tachometer drive assembly.

710114. 4436. Long-Knight Lumber Co., Indianapolis, Ind., 100,000 feet walnut lumber.

760090. 4430. British Munition Board, London, England, 125 lenses for airplane cameras.

August 8, 1918

30442-19. 2250-2. Wright-Martin Aircraft Corporation, New brunswick, N. J., spare parts for Hispano-Suiza engines—cylinder casting left-hand and right-hand aluminum assemblies, cylinder casting steel sleeve assembly.

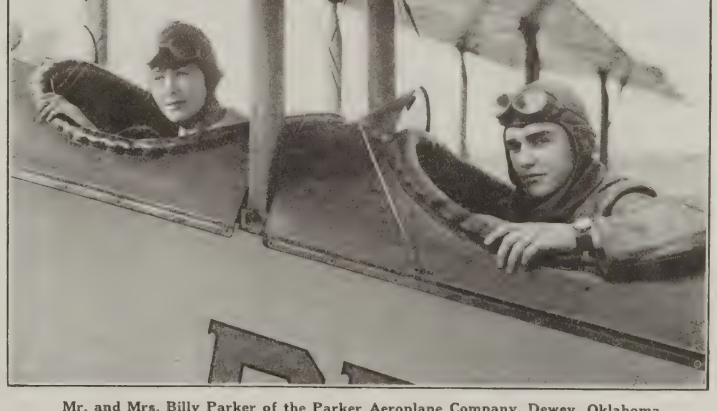
720235. 4443. Firestone Tire & Rubber Co., Akron, Ohio, 436 outer casings (latest type now in production for Curtiss JN6H advanced training planes).

720237. 4442. Unit Construction Co., Philadelphia, Pa., material for 50 sets of laminations for Handley Page propellers.

720242. 4445. Hardman, Peck & Co., New York, N. Y., 1,000 sets of laminations for Handley Page propellers.

760104. 4444. C. F. Pease Co., Chicago, Ill., 1,125 100-yard rolls X-electric blue print paper.

780024. 4435. Lycoming Foundry & Machine Co., Williamsport, Pa., 15 sets tools, complete, for maintenance of Gnome aeroplane engines, type B2.



Mr. and Mrs. Billy Parker of the Parker Aeroplane Company, Dewey, Oklahoma

SOME METEOROLOGICAL CONDITIONS WHICH INCREASE THE DANGER OF FLYING

By Captain C. J. P. CAVE, R.E.

(*Concluded from page* 1323)

Rain, Hail, and Snow

The danger arising from these is obvious, and it varies, of course, from nothing in the case of very light falls to a real danger in the case of very heavy falls. Danger from very heavy rain or from hail can often be avoided by keeping away from cumulo nimbus clouds. Such clouds are often seen in isolated masses, some miles in circumference, perhaps, but still they can on such occasions be avoided. In the case of a line squall it is, however, not possible to fly round the cloud, for this often extends in a long line for several hundred miles. It might be possible to fly over a line squall and so avoid the rain, hail, and turbulent motion of the air associated with the disturbance; but I do not know that there is any evidence as to the heights to which the line squall disturbance extends; it probably varies on different occasions.

Hailstones in summer thunderstorms constitute a real danger to an aeroplane that might be involved in the storm, for they sometimes attain an enormous size. In the British Rainfall Organization's Volume for 1913 is a photograph of hailstones that fell in Essex on May 27 of that year. Although they had partially melted before they were photographed, they are still shown as nearly as large as a hen's egg that was photographed with them for comparison. They fell at Wickham St. Paul's, near Halstead, in Essex. At Great Yeldham there was a fall of similar hailstones. At the latter place the fall lasted only eight minutes, but "the devastation was great," an observer says. "Crops were smitten to the ground, glasshouses all smashed, tarred roof felting cut to ribbons, corrugated iron riddled, tiles and windows smashed in thousands. . . . Man and beast were bruised, and among other animals killed on my own farm I saw rooks, wood pigeons, full-grown hares, partridges, pheasants, rabbits, and various small birds, wild ducks, farmyard fowls, and three cygnets." At Haverhill the stones varied from the size of nutmegs to that of walnuts. At Harston the stones were 1¼ inches in diameter, and at Sheerness ⅝ inch to ⅞ inch. Damage from hail was reported from a wide region in the eastern counties on this day.

Doubtless, it will be said that this was an exceptional occasion, and no doubt it was, but a glance through one of the Rainfall Volumes shows that very heavy falls of hail occur in the summer months in all parts of England. For instance, besides the 24th of the month, heavy falls occurred in May, 1913, on several occasions; on the 10th very heavy hail fell at Bolerno, in Midlothian; on the 26th hailstones over 1 inch in diameter fell at Bulvan, and at Bishops Castle scores of windows were shattered; on the 31st, at Waltham-on-the-Wolds, there was an exceptionally heavy fall of hail.

A glance through the records for any summer month shows that so-called exceptional falls of hail are fairly common, and it scarcely needs pointing out that hailstones far smaller than hens' eggs would have fatal effects on an aeroplane that met them.

Fog

Perhaps fog is one of the worst of the dangers that beset flying, and I should like especially to call attention to fog to those who maintain that at the present time aviators can afford to disregard the weather. The subject of fog, however, has lately been dealt with before this Society by Major Taylor. I may, however, give an example of how a fog may be formed by the mixing of air at different temperatures. On April 3 of this year there was a shower of snow at Farnborough which was followed immediately by bright sunshine; after a few minutes a mist began to form over the aerodrome, and for a short time wreaths of fog covered the Common. No doubt the sun heated the ground and warmed the air in contact with it; the relatively warm air, which would have been fully saturated, was mixed with the cold layer just above—air that had been cooled by the melting snow before the sun came out. The saturated warm air was chilled and its moisture was condensed into fog.

Lightning

It is difficult to say what is the danger to be apprehended from lightning as such. The dangers to flying from thunderstorms are due to the squalls and to the heavy rain and hail that accompany them. It is possible that the actual danger from lightning to an aeroplane flying through a thunderstorm may be no more than that incurred by a pedestrian walking across an open common during a storm. A pilot who was flying above a thundercloud last summer reported that long sparks were given off by his machine at intervals. It is very likely that this happened every time there was a flash of lightning from the cloud below him. But no inconvenience was caused by the sparks. In the case of an airship, however, it would be far otherwise, for quite small sparks might ignite the hydrogen. Lightning is also a danger to kite balloons, owing to the conducting wire. There are several cases on record in which meteorological kites have been struck by lightning, and, as some of these occurred when there was no thunderstorm in progress, it must be remembered that clouds may be highly charged with electricity at times when no actual storm is going on.

There is a particular type of violent thunderstorm in which most of the lightning takes place from cloud to cloud, and when it is almost incessant. It would probably be dangerous for an aeroplane to enter such a cloud, but the appearance of the danger is so obvious that it scarcely needs pointing out.

I hope that what I have said will make it clear that the airman is not entirely immune from the disturbances in the medium in which he flies. If I could persuade aviators in general to take meteorology rather more seriously I should feel that I had not read this paper in vain, but I am afraid that weather maps and forecasts are looked on by many, though not by all, I am glad to think, as mere matters of guesswork, and not worthy of serious consideration. The public in general exhibit a lamentable ignorance of the very elements of meteorology, which is largely due to our educational methods. I do not wish everyone to become a meteorologist, but there is no reason why everyone should not take an intelligent interest in the movements of depressions and anticyclones, and have some faint knowledge of what these terms mean. The English are supposed to talk so much about the weather that it is a pity they should not know what they are talking about, and those who are responsible for the safety of aeroplanes and airships ought to know as much about the weather as, say, a master mariner in the mercantile marine. There are cases where ignorance may be criminal.

Discussion

The Chairman said he thought it was very important that some organization should be set up for transmitting information as to weather conditions from one aerodrome to another. He also expressed the opinion that it was very desirable that there should be further research into the reasons for certain phenomena.

Sir Napier Shaw said that people who fly have much better opportunities to observe the weather conditions than ground observers; and it was to him astonishing that no information had been afforded to the meteorologist from this source, as the airman could find out what is going on in the actual place where the weather is being made and changes are taking place.

The present difficulty was really one of scale; anything that meteorologists could study must be of such a size that it could go on a map covering the whole distance from Asia Minor to Iceland, whereas the dimensions of the phenomena affecting airmen were very small. For these reasons phenomena which chiefly affect the airman are not to be found on meteorologists' maps. An incident of this is afforded by the almost total absence of reports of line squalls from observers, and these were usually located from studying the records of temperature, barometer, etc., afterwards. The scale of even the line squall was not large enough to impress itself upon the observer.

Mr. B. G. Cooper thought that the reason for the lack of assistance afforded to meteorologists by pilots was that a pilot flying on war service was too occupied with his work to pay much attention to meteorological dangers. As line squalls could not be flown round, if there was not an easy height at which they could be surmounted it would seem that they might prove a very serious obstacle, particularly to commercial aviation.

Lecturer's reply—Captain Cave regretted that he was unable to say at what height it would be possible to get above line squalls. A gale frequently extended to a height of five or six miles, and thunderstorms up to the top of the cumulus cloud, which occasionally was at about 24,000 ft. He thought that if gun firing were the cause of up-currents such as had been mentioned, heavy rain would inevitably result, and that the forces causing weather conditions were too gigantic to be affected by such small causes.



Fig. 5. Fully developed cumulo nimbus: the whole top of the main cloud is a mass of false cirrus



Fig. 6. Fog forming on the aerodrome at Farnborough when a snow shower was followed by bright sunshine



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R.F.C., C.F.A.

BALLOON WINCHES

THE subject of balloon winches is, to a great extent, a highly technical one, and approximates in a good many respects the subject of motor transport in general. It has this difference, however. While the modern winch is gasoline driven and operates through a system of gears, which are selective by the way, the same as an automobile, it must not only haul the balloon down by the cable but it must also store that cable without straining it in any way. Everyone is familiar with the way a spool of thread is wound. The cable must be wound the same way, except that it must be under no pressure as it winds on the storage drum. It must be tight, yes, but it must not be under any pressure except the natural weight of one layer lying upon the one underneath. To explain further, if a toy balloon was fastened to a spool of cotton and let up and hauled down by turning the spool, the strain, what there was of it, would come directly on the spool. To obviate this happening with the cable and the winch, a means had to be devised whereby the strain of the balloon being hauled down would be taken by something between the cable drum and the balloon. Comparatively recently it was found that by carrying the cable round and between two grooved steel drums, the strain would be taken off the storage drum.

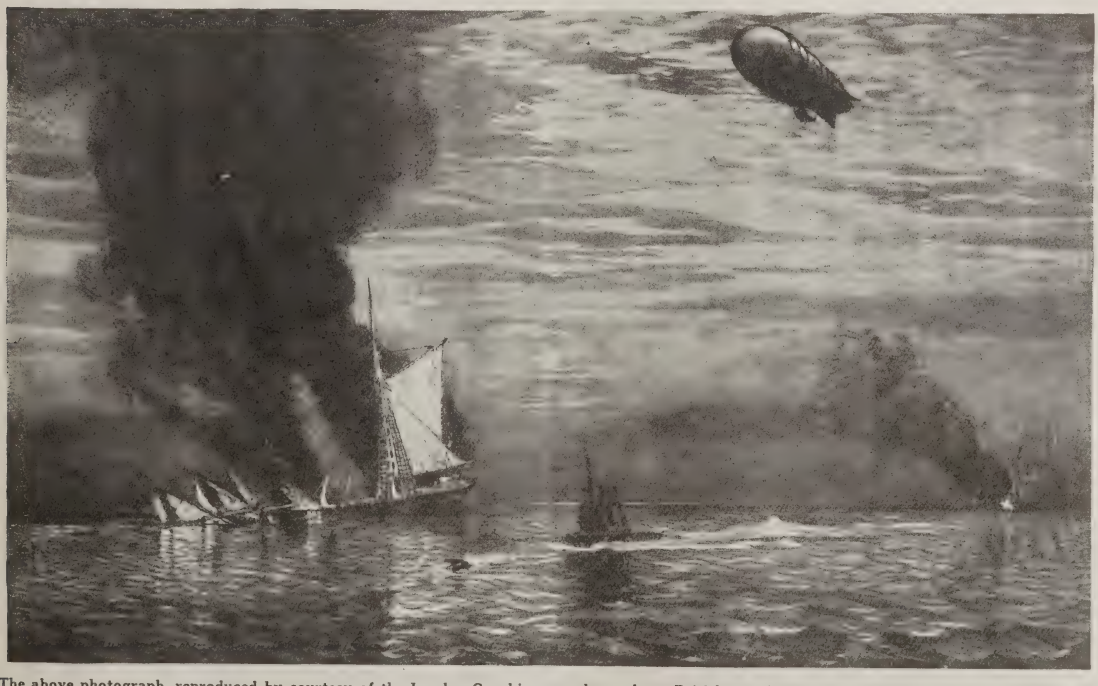
As the storage drum would have to revolve faster to take in the same amount of cable when there was little on it than when it was nearly full, an ingenious contrivance was arranged which caused the storage drum to revolve in direct ratio to the amount of cable there was on it.

There are two brakes to control the outgo of the cable, one of the internal expanding type, which also acts as a lock brake, and the other a band type, which acts directly on the gear drum.

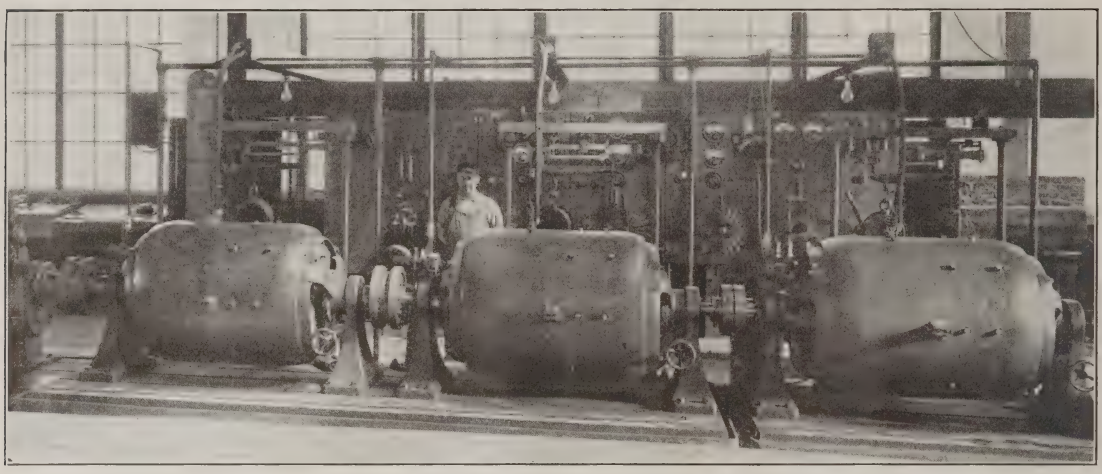
A wheeled piston acting on a compressible spring, to which is attached an indicator, registers the strain on the cable caused by the lift of the gas or the wind pressure on the envelope.

A dial operated by gears gives at all times the amount of cable released. This is adjustable and requires changing as often as the size of the cable is changed. American ingenuity has improved on this idea, and now the modern winch has nothing more or less than a speedometer arrangement, which registers the height of the balloon at any given time, the wind pressure, the strain on the cable, and the total amount of flying that winch has done. The strain is indicated by a hand similar to the speed indicator on a speedometer, the height is registered where the trip mileage would be shown, and the total amount of work done is shown as the season mileage. The trip mileage automatically reduces as the balloon is hauled down. In fact, the whole thing is so complete that one almost expects to find the pilots name and address and what he had for breakfast recorded on the face of this very comprehensive instrument.

As regards the latter, when there is a high wind it might not be impossible—but why go on. You know what Sherman said.



The above photograph, reproduced by courtesy of the London Graphic, was drawn by a British naval officer from his experience, and material supplied by an eye-witness. It depicts a scene which has often happened in the North Sea near the English coast. The German submarine has just managed to reduce the two sailing vessels to burning wrecks when a British Naval dirigible, or Blimp, as it is called, puts in an appearance. From the height a Blimp flies it is very easy to spot a submarine under the surface. A Blimp or, in fact, any lighter than air aerostat, is not admirably designed to do any bomb dropping, as when a bomb is released it acts the same as the release of that much ballast. Though it does not actually destroy many submarines, a Blimp is probably one of the best means for discovering these menaces under the water. Because it has a hydrogen field to sustain it in the air, it can hover over anything that looks suspicious and study it carefully. This is not possible with an aeroplane which relies, for its ability to stay in the air, on its speed. By calling up a destroyer, and then hovering directly over a submarine, conforming to its course, the Blimp can give the destroyer a chance to drop its depth bombs very accurately



THE NEW DUESENBERG AERO ENGINE TEST HOUSE

THE new test house of the Duesenberg Motors Corporation at Elizabeth, N. J., has just been completed. As can be seen in the illustrations, it is a permanent institution designed with a view to affording facilities for the accurate and expeditious testing of a production run of motors. The building, 240 feet x 67 feet, is of substantial steel, faced brick and concrete construction, with monitor roof, and is well lighted and ventilated.

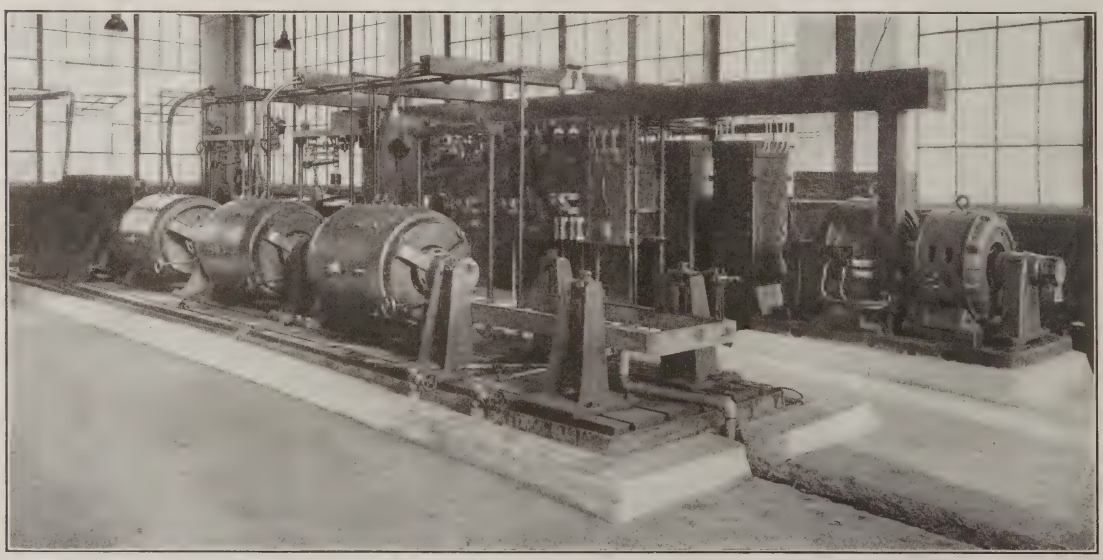
The office and the oil filter room are at the right hand of the broad entrance, and the chemical and physical testing laboratories at the left. These laboratories are equipped with the most modern scientific instruments necessary to analyze and prove material entering into the construction of the motors and are conducted by a specialist in modern analysis methods.

The main test room occupies the center of the building and is 176 feet long and the entire width. There are facilities for testing twenty-two airplane motors at one time. For testing the production run of motors, torque stands are used, each stand being arranged with its own gasoline, oil, and supply and are filled at will by electric driven pumps. The tanks themselves are set up on scales in order that exact fuel consumption by weight may be readily obtained. The feed to the engine is by gravity. The oil tanks are equipped with calibrated sight gauges. While each test stand has its own water tank, the series of tanks for all the stands are connected up in a circulating system operated by an electric driven water pump which drives the excessively hot overflow water from each motor through a gigantic concrete cooling fountain having a diameter of fifty feet and a cooling capacity of 75,000 gallons.

Motors, when completed in the factory, are loaded onto auto trucks and carried to the test house. The truck is backed up to a vacant stand and the motor lifted into place by means of a chain hoist.

An interesting feature is the method of disposing of the exhaust gases from the running motors. The exhaust from each motor is directed into main ducts beneath the floor which lead into one or the other of the two eighty-five-foot stacks shown in the pictures and the gases are carried out by the water tanks. The gasoline tanks are connected up to the main natural draft of these chimneys, which also serve to muffle the noise.

It is apparent that in order to be of value, the test of each motor must be accurately recorded. For this purpose the most



The three 300-400 horsepower Sprague dynamometers used in the Duesenberg aero-engine test house



The gigantic cooling fountain of the Duesenberg aero engine test house. Its diameter is fifty feet, and it has a cooling capacity of 75,000 gallons

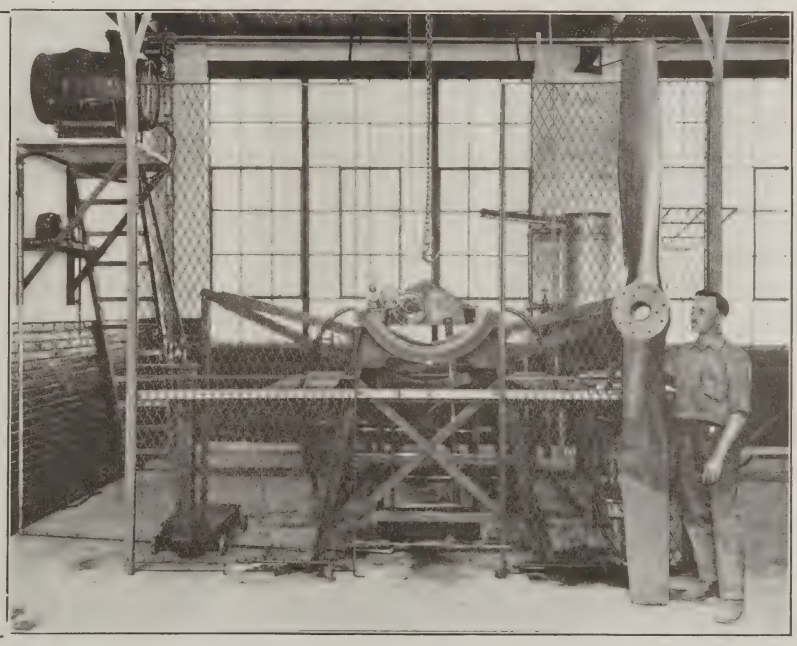
accurate equipment obtainable has been installed. Water and oil temperatures are automatically recorded on entering and leaving the motors by delicate recording thermometers. Electric tachometers of the most improved type are installed at each test stand and corrected and calibrated in their permanent locations. Vacuum meters, registering gasoline pumps, oil filters, and many other special devices form the testing equipment.

Beyond the main test room is the dynamometer testing room where the actual horsepower tests are run. Clubs for use on the production run of motors are calibrated on a sample motor hooked up to the dynamometer brakes and, of course, all experimental power tests are run on the dynamometers.

The equipment of the dynamometer room consists of three 300-400 horsepower Sprague machines with maximum speed of 3,500 r.p.m. These machines are set up in concrete in a tandem arrangement and for motors requiring the maximum dynamometer brake are all coupled together, otherwise two or a single machine being used according to the size of the engine to be tested. The switchboard for this outfit is conveniently installed and as these dynamometers are not running continuously enough to make practical use of the current they generate, which is more than enough to operate and light the whole factory, resistance grids have been installed behind the switchboard which are capable of absorbing up to 1,200 horsepower. The engine test stands are set up at either end of the row of dynamometers and the motors are started by the dynamometers acting as motors, the power being commercial A. C. current transformed to D. C. by means of an independent converter outfit.

This outfit is remarkable on account of the great range of power it is capable of handling.

One of the test stands in the Duesenberg aero engine test house



THE LONDON ENEMY AIRCRAFT EXHIBIT

The Fokker Biplane

BY G. DOUGLAS WARDROP

ONE of the most recent acquisitions of the Enemy Aircraft Exhibit in London, is the Fokker biplane of the D VII type, which recording data on one of the wing spars was constructed some time in April, 1918.

The machine is thus one of the most recent to be exhibited, and is of interest on that account, as well as because of the originality of its design. Except for the fact that it is a biplane, the new Fokker product is very similar to the triplane described in our columns recently. The body construction is the same, and the "wireless" wing design is very similar to that of the Fokker triplane. There is one notable departure, however; the engine fitted has evidently been a stationary water-cooled one, probably a 180 Mercedes.

The body of the Fokker biplane is built throughout of steel tubing, the method of joining the struts and cross members to the corner rails being the same as in the Fokker triplane, and the tubular quadrants serving as an anchorage for the cross-bracing wires being also exactly of the same type as in the previous machine. The wire bracing, as before, is simply doubled over the terminals, and only a single strainer being employed in each double wire. The tail plane and elevator are similar in shape and construction to those of the triplane. The rudder is balanced, as in the triplane, but is preceded by a triangular vertical fin, which has probably been necessitated by the larger water-cooled engine, which gives a deeper body in front. The vertical fin is chiefly remarkable on account of the fact that it has its front attachment slightly off-set to he left, probably to counteract the tendency, caused by the torque, to turn to the left.

The pilot's seat is similar to that of the triplane and is provided with the same wing nuts for quickly adjusting its height to suit individual pilots. In the machine exhibited, the control lever is missing, but from the parts remaining in place it would appear that there has been a forked lever pivoted on a longitudinal rocking shaft, which in turn carried the cranks for the *aileron* control cables, which pass over pulleys in the top plane in the manner illustrated in our description of the triplane.

The engine is mounted on a structure built entirely of steel tubes. The two engine bearers are large diameter tubes, supported from the corner rails by small diameter tubes apparently of very light gauge. The tanks are placed immediately behind the engine, the right-hand compartment of the large main tank carrying the oil, and the left-hand compartment the gasoline. A Vee-type radiator of honeycomb formation is built into the nose of the body, and is provided on the inside with a shutter for adjusting the cooling.

The under carriage is of very similar design to that of the triplane, the axle being enclosed in a wing section of three-ply wood. The shock absorbers are of the spiral spring type, and are covered in by a woven casing. A feature of the Fokker construction, both as exemplified in the triplane and in the present machine, is the large amount of welding employed, and the manner of employing it. After an examination of the biplane, one is apt to come to the conclusion that the designer of the Fokker biplane places implicit faith in his welders, and, we are bound to admit, with very good cause.

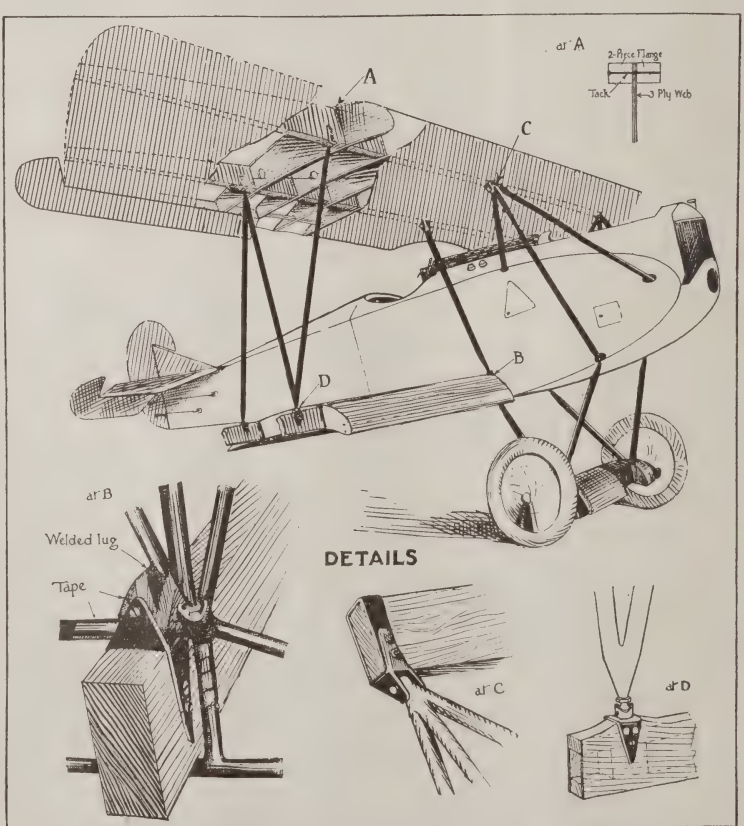
With regard to the wings of the Fokker biplane, these have been designed on the "wireless" principle, as in the case of the triplane. There is this difference, however, that whereas in the triplane the two spars were placed so close together as to form a single box, they are quite seperate in the biplane, owing, no doubt, to the great chord, which with its consequent greater travel of the center of pressure, made it necessary to place the spars farther apart than could conveniently be done with the single-box arrangement. Each of the spars is built up of spruce flanges, connected on front and rear faces by three-ply webs, the whole forming a box. Both spars taper in a vertical as well as in a horizontal plane. The spars of upper wing are of uniform width and depth over the portion between the body struts, and taper, from the point of attachment of these struts, to the wing tip, both in front elevation and in plan. The lower wing spars are of uniform section for the width of the body, and hence taper with a straight taper to the tips.. The wing section appears to be similar to, but an enlarged edition of, that employed in the triplane. It is extremely deep compared with any modern standard, about 9½ ins. being the maximum thickness of the top plane. The bottom plane, which is of smaller chord, appears to be a geometrical reduction of the top one, and is of considerably smaller chord. The actual dimensions have not yet been ascertained, as the machine in question is very considerably damaged, but we hope to refer to it in more detail at a later date. As far as can be ascertained at present, the chord of both wings was uniform from root to tip, which fact would appear to indicate that the section from point to point varies from one of very great depth and thickness in the center to one of more orthodox section near the tips.

The wing ribs of the Fokker biplane are somewhat similar to those of the triplane, but a difference was noticed in the construction of the flanges. In the triplane the thin three-ply web was accommodated in a narrow groove in the top and bottom flanges, but so narrow was the web that quite 50 per cent of the tacks missed the web altogether and simply served to weaken the flanges. In the biplane it is not, therefore, surprising to find that an attempt has been made to eliminate this defect. This attempt has taken the form of the employment of a two-piece flange instead of the old grooved one-piece flange. Instead of vertical tacks the two halves of the two-piece flanges are held together and to the thin web by transverse tacks driven through alternately from right and left, and riveted over.

The manner of supporting the top plane is somewhat different from the method employed in the triplane. No wire bracing whatever is used, the necessary transverse rigidity being provided by the arrangement of the body struts. Sloping outward from the body is a system of struts, all stream line steel tubes. One strut runs from the lower corner rail of the body to the rear spar. A set of three struts unite in a welded joint secured to the top spar by a single bolt. Each of these three struts is welded to a portion of the body, so that when the top plane is removed, a pyramid of steel tubes remain in place on the body, sloping upwards and outwards from the sides. The front one of these struts is welded to the tubular engine bearer, projecting through an opening in the metal body covering. The middle strut is welded to the bottom corner rail at the point where is attached the front strut of the undercarriage, and the third strut is also welded to the bottom corner rail, or, more correctly speaking, to a rail running above the spars of the lower wing, at the point where it is crossed by the front spar. The upper front spar is thus rigidly secured, whereas provision has been made for an adjustment of the angle of incidence by fitting into the end of the strut running from the rear spar to the lower body rail a threaded eye bolt fitting into a socket on the lower rail. Incidentally it might be mentioned in this connection that the upper plane is marked "Anstellwinkel 0°" (angle of incidence 0°.) Whether or not the bottom plane is also set at no angle of incidence we have not yet been able to ascertain. The mounting of the bottom plane is slightly different to that of the bottom plane of the triplane. In the latter provision was made for a slight adjustment of the angle of incidence, but in the biplane no such arrangement is to be found, the spars being rigidly attached to the body corner rails.

Only one pair of inter-plane struts connect the upper and lower wings on each side. These are in the form of an N, the joints between the members being welded. The joints between the legs of the N and the wing spars are in the form of ball and socket joints, those for the front top spar and rear bottom spar being fixed, while threaded bolts screwed into the end of the struts meeting the upper rear and lower front spars provide means for adjusting the incidence. No lift or landing wires are fitted, the deep spars being relied upon to resist the bend-

(*Continued on page 87*)



In the Fokker captured the wings have been somewhat badly damaged, and it has not, therefore, been possible to represent exactly the shape of the wing tips. The upper plane has probably been approximately as shown in the drawing, but of the lower wing sufficient did not remain intact from which to reconstruct the shape of the tip. The unusual strutting of the top plane should be noticed. Inset are some constructional details

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart

George L. Conner, Chief Clerk to Second Assistant Postmaster Praeger
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
Frank Praeger, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
A. C. Danielle

Aero Mail Service in August Without Mishap of Any Kind

The Post Office Department issues the following:

During the month of August the Aero Mail Service between Washington, Philadelphia, and New York was conducted without a miss, hitch, or serious delay of any character.

The operations for the month were perhaps the most remarkable in the history of aviation. There were 27 flying days, of which 108 legs of the journey had to be performed, and in that month there were but two forced landings, one with a delay of 7 minutes and the other with a delay of less than 10 minutes. One forced landing was made within 4 miles of Belmont Park at the end of a journey. It was caused by the break of a magneto shaft. The other forced landing was made on a flight where fog and haze obscured the ground, and for the purpose of picking up the course, because the compass failed to work.

The total possible miles of flight was 11,961, of which 11,957 miles were completed.

During the first 10 days of the month the routes were flown by Lieuts. Edgerton, Kilgore, Bonsal, Webb, Culver, and Miller without a miss, hitch, or forced landing. During the last 20 days of the month the civilian aviators of the Post Office Department operated the routes. The perfect scores were made by Aviators Max Miller and E. V. Gardner. Aviators Maurice Newton and Robert Shank, on the Philadelphia end of the route, each had one forced landing, giving them a score of 99 per cent.

A total of 5,679 pounds of mail was carried on the trips.

A most rigid mechanical maintenance system on all fields was maintained, with the result that the month closed without a single plane of the 15 being laid up in the shop for repairs.

Aero Mail Carrier Sets New Records

D. C. De Hart, a California aviator who recently joined the staff of the aerial mail service, made two records in his flight from Washington to Belmont Park on September 16.

He left the capital at 11:40 A.M. with 210 pounds of mail and arrived at Bustleton Station, Philadelphia, at 1:03 P.M., or 1 hour and 23 minutes for this leg of the route.

Leaving Philadelphia at 1:11 P.M., he landed in Belmont Park field at precisely 2 o'clock, 49 minutes for the ninety miles of this part of the trip and 2 hours and 12 minutes flying time for the through trip from Washington.

This is the best through time yet made by any flier, civilian or army, and the time between Washington and Philadelphia, 1 hour and 23 minutes, was also the fastest yet, making two records to De Hart's credit.

His time of 49 minutes from the Quaker City has been beaten in a Liberty motor, 42 minutes being the record. De Hart flew with one of the smaller Curtiss planes.

Fast Flight with Aero Mail

One of the best flights made since civilian aviators took over the carrying of the mail was made Sept. 13th by Maurice Newton, who came through from Washington with 135 pounds of mail, arriving at Belmont Park at 2:05 P. M. The mail reached many New York business houses soon afterward.

Newton left Washington at 11:42 A. M. and arrived in Philadelphia at 1:10 P. M., stopping there only five minutes. His elapsed time for the through trip was two hours and 18 minutes.

Robert Shank took the mail south. It is expected that the next flight to Chicago will not take place for two weeks, but preparations are being made for extension of the facilities of the terminal at Belmont Park, with complete equipment to insure the success of the new aero line when a regular schedule is undertaken.

Want Aero Mail Station in Newark

Frederick W. Egner, as chairman of the Board of Trade Committee which will endeavor to induce the postal authorities to accept a Newark site as an aerial mail delivery landing station and distributing point, has called a meeting of the committee for September 18th at 12:15 o'clock at the Downtown Club. Postmaster John F. Sinnott has received an invitation to attend the luncheon and meeting to present his views anent Newark as an aerial mail center.

As has been announced in the Sunday Call, the site which is being considered favorably by the postal authorities in Washington is the Heller tract of fifty acres in the northernmost part of the Forest Hill section of this city.

It is possible that as a result of the meeting a committee will be appointed to visit the postal authorities in Washington and present Newark's qualifications as an ideal location for an aerial mail station. Paul E. Heller, one of the members of the committee and an owner of the land, stated that inasmuch as the postal authorities say they have no funds to purchase land for this purpose has offered the department the use of the land for the duration of the war.

Monthly Report of Operation and Maintenance

UNITED STATES POST OFFICE AERO MAIL SERVICE

JUNE 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	PILOTS		HANGAR MEN		MECHANICS		Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST					
							Actual time	Dead time	On plane	Miscellaneous	On plane	Shop time					Gallons of Gasoline	Total time run	Total miles run	Miles run per gal. gas.	Cost per hour	Cost per mile
																		hr. mi.				
38275	$93.57	$24.60	$26.55	$79.79	$16.85	$2.27	$49.22	$42.94	$97.51	$17.95	$71.27	$15.52	$137.13	$64.94	$31.81	$771.92	307	25 33	1617½	5.26	$30.21	$ .4772
39362	27.70	5.03	15.84	79.79	16.85	2.27	15.40	42.94	53.76	17.95	97.04	15.52	1312.40	64.94	31.81	1799.24	94	3 11	300	3.19	565.20	5.9974
39363	6.00	.75	9.09	79.79	16.85	2.27	.....	42.95	8.75	17.96	26.87	15.52	25.23	64.93	31.82	348.78	20	— 45	74	3.70	465.04	4.7132
39364	1.95	.....	9.09	79.79	16.85	2.27	.....	42.95	8.75	17.96	30.29	15.52	1.43	64.93	31.82	323.60	6¾	— 24	16	2.46	808.99	20.2250
39365	85.20	12.70	15.84	79.79	16.86	2.27	64.40	42.95	53.76	17.96	114.24	15.52	12.70	64.93	31.82	630.94	284	16 07	1540	5.42	39.14	.4097
39366	271.15	45.36	15.84	79.79	16.86	2.28	193.32	42.95	53.76	17.96	214.42	15.52	351.25	64.93	31.82	1417.21	914½	49 57	4724	5.16	28.37	.3000
39367	20.10	1.08	15.84	79.79	16.86	2.28	7.00	42.95	53.76	17.96	90.47	15.52	644.38	64.93	31.82	1104.74	67	1 08	87	1.29	974.77	12.6981
38262	16.50	5.40	6.75	79.78	16.86	2.28	.....	42.95	45.01	17.96	61.30	15.52	667.08	64.93	31.82	1074.14	55	.. ..	.....	.....	.....	.....
38274	132.93	37.19	17.49	79.78	16.86	2.28	91.55	42.95	88.76	17.96	33.84	15.52	95.83	64.93	31.82	769.69	435	33 58	2295	5.27	22.66	.3353
38276	90.36	33.99	17.46	79.78	16.86	2.28	113.15	42.95	88.76	17.96	91.64	15.52	224.15	64.93	31.82	931.61	296	26 49	1747	5.90	34.73	.5332
38278	93.99	32.01	17.46	79.78	16.86	2.28	69.39	42.95	88.76	17.96	79.20	15.53	97.92	64.93	31.82	750.84	308	25 59	1755	5.69	28.90	.4278
Total	$839.45	$198.11	$167.25	$877.65	$185.42	$25.03	$603.43	$472.43	$641.34	$197.54	$910.58	$170.73	$3569.50	$714.25	$350.00	$9922.71	2787	183 51	14155½	5.07	53.97	.7009

Note.—Depreciation is not estimated in this report, for lack of convincing data, but is reflected in the items under repairs, parts and labor. Items for rent, light, power, etc.; misc.; dead time of pilots; time of hangar men, misc.; shop time of mechanics; interest on investment; and departmental overhead charges; all of which are not directly apportionable to individual ships, are pro-rated equally between all of the ships.

THE DE HAVILAND V. SINGLE SEATER

THIS modern British aircraft has now to be dealt with in the standard German description, the following being a description from the technical German aero paper, *Zeitschrift für Flugtechnich und Motorluftschiffhart* (*Journal of Aviation and Aerodynamics*), reading to the following effect:

The aeroplane in question was manufactured by the Darracq Motor Engineering Company, Ltd., in London, and carries the recognition mark: A9435.

It is a single-pair-strutted biplane, the upper planes of which are staggered 0.695 metre backwards.

Both planes have a span of 7.84 by a chord of 1.375 m. The upper planes are mounted to a canopy (center-section), the lower ones to rudimentary pieces at the height of the bottom body longtitudinals.

The V-position (dihedral) of the planes amounts to 172 deg.; there is no arrow shape.

The angle of incidence of the upper plane is 2 deg. by the centre section, 2½ deg. at the end, that of the lower plane 2½ deg. over all.

The spruce spars have I-shaped section.

The distance between the ribs amounts to 280-350 millimetres. Between each two ribs on the suction side, two further auxiliary ribs are arranged from the leading edge rib to the main spar. The struts are made solid of spruce.

Load sustaining and opposed cables re made of profile wire in single arrangement.

Ailerons are attached to all four planes at the back spar. Their governing wires run outside the planes, below in front of the leading edge rib, above over the front spar. The corresponding ailerons are connected by profile wires.

The normal wire cum wood body fuselage, with four longtitudinals, is strengthened in front till behind the pilot's seat, and behind below the fixed tail-plane by the planking of plywood of 3 mm. thickness.

By the mounting of fairings the body attains in front almost circular shape from the pilot's seat.

The fuselage is covered with canvas.

The solid wooden non-covered landing gear struts are of streamline section. The through running axle rests between two auxiliary streamlined covered ones. There is no limit of the spring effect range.

The through-running tail plane rests fixed on the body-end with an angle of incidence of 1 deg. without the hitherto usual angle of incidence change arrngement.

Each part of the divided elevator is provided with levers with single governing cables.

The engine is a 110 Le Rhône rotary, which has given 130 h.p. by earlier tests.

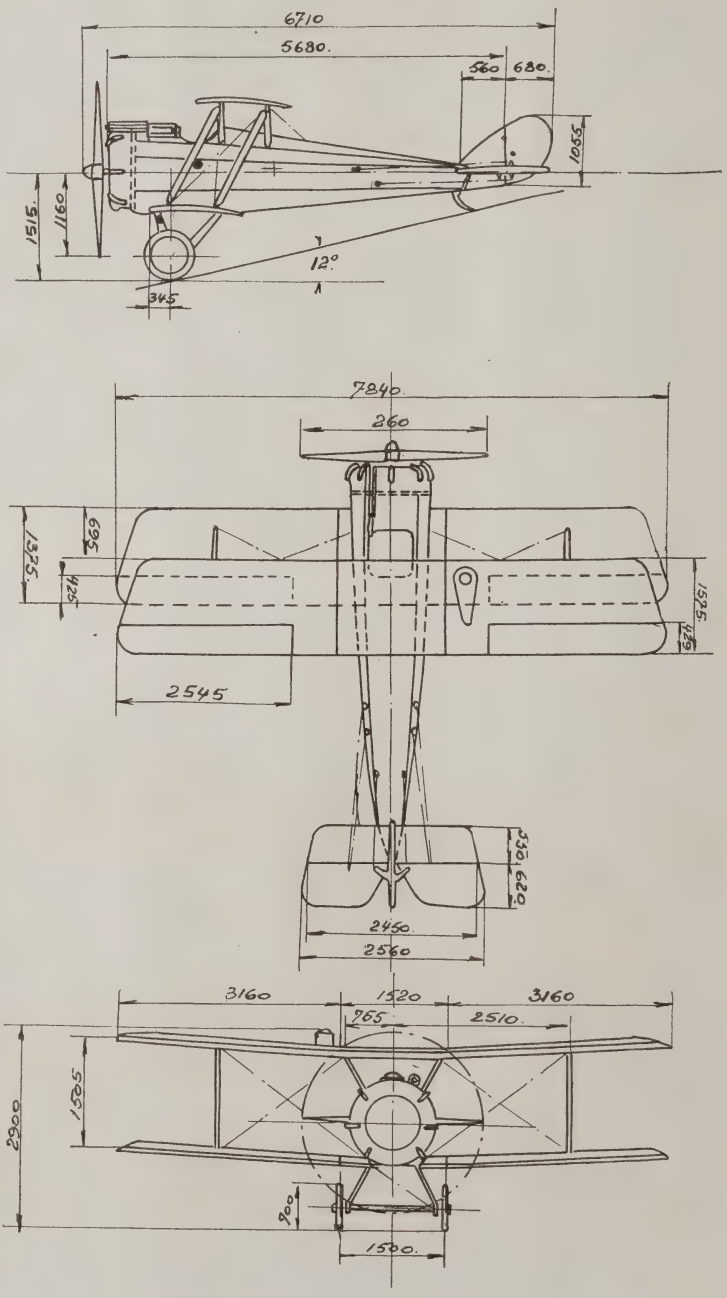
The main petrol tank of a capacity of 100 litres and the oil tank of a capacity of 21 litres are mounted behind the pilot. Further, a gravity tank of 26 litres' capacity is placed on the right upper plane.

The petrol supply from the main tank takes place by means of compressed air, produced by a small propeller air-pump, fixed on the left landing gear strut. The petrol store suffices for a flight of about 2 hours' duration.

In the pilot's seat are arranged the instruments. To the right of the pilot: The two petrol-supplying tubes with stop cocks; the change arrangement for a spring relief of the elevator management. In the middle: Tachometer, speedometer, altimeter, contact-breaker, watch and compass. To left: Gas and petrol regulation hand air-pump.

Two further aeroplanes of the same type, which were manufactured by the Aircraft Manufacturing Co., Ltd., in London, show a considerably more convenient arrangement of the instruments, and are further provided with electric light for night flying.

The aeroplane is armed with a fixed machine-gun of the Maxim type (usual army model with the up-placketed jacket)



mounted on the top of the cockpit to the left side of the pilot's seat. There is hydraulic control and release by means of Bowden wire. From remains found in the fuselage it could be ascertained that the cartridge belt is a metal one. The belt-box lies below the machine-gun direct behind the motor.

The empty weight of the aeroplane worked out at 461 kilos.

The weight of the fuel, with fully loaded tanks, amounts to 108 kg.

Setting 125 kg. aside for pilot and armament, the useful load amounts to 233 kg., and the total weight works out at 694 kg.

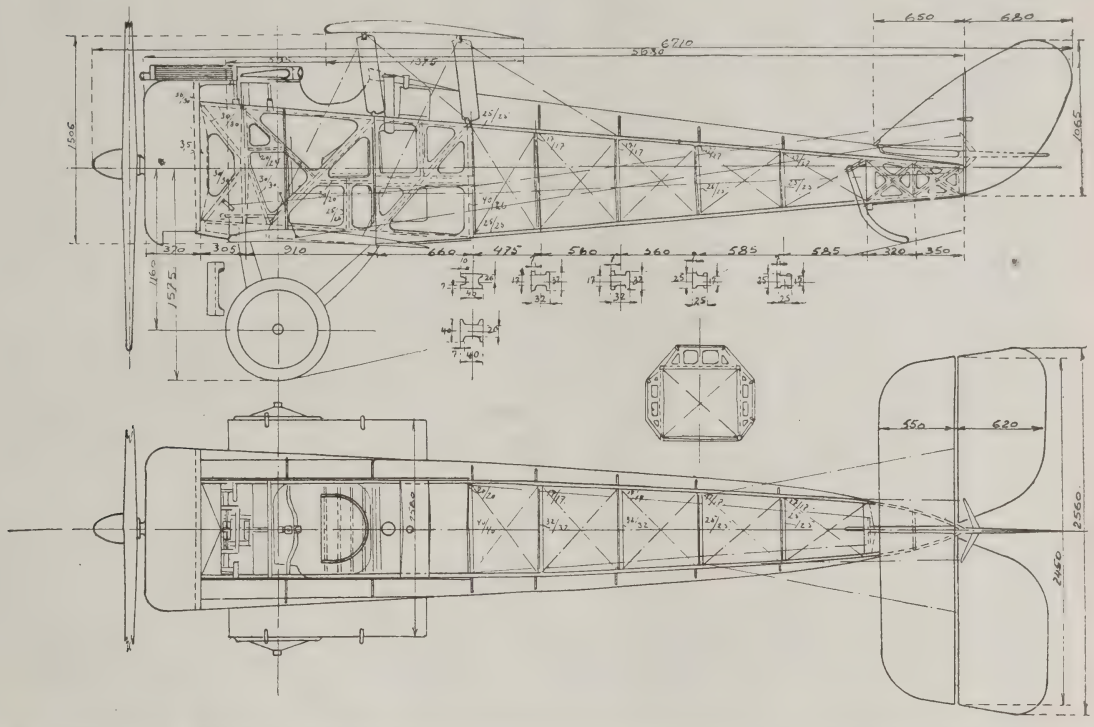
With a surface area of 20.14 square metres the load is thus 34.4 kg. per sq. m.

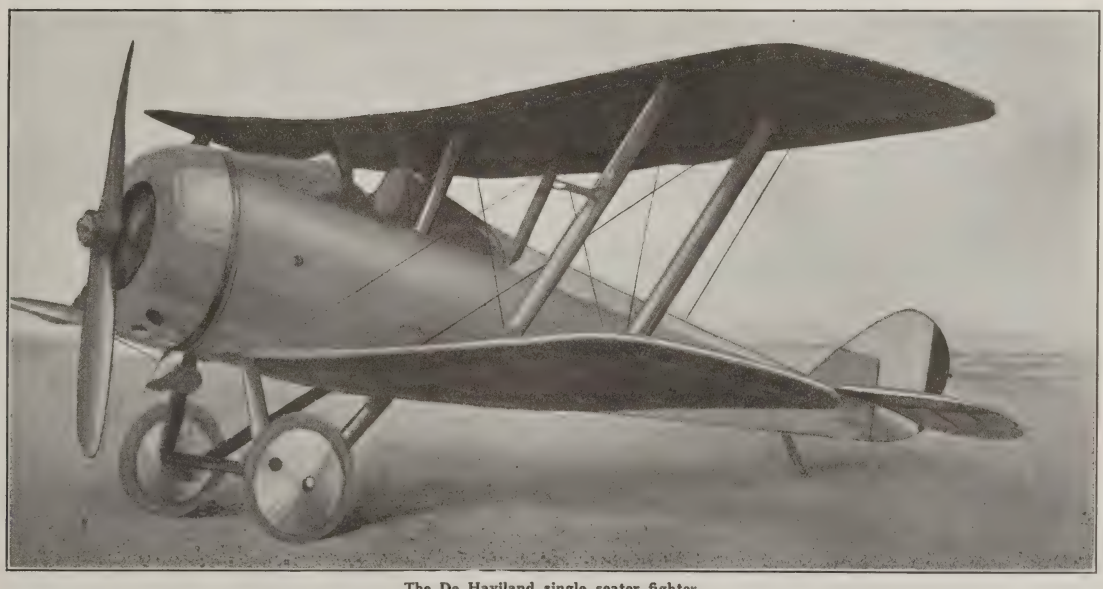
The performance load amounts to

$$\frac{964}{130} = 5.33 \text{ kg. h.p.}$$

Owing to the staggered position of the planes and the moving of the tanks behind the pilot, his seat has advanced much forward, there being thus a good sight forwards and upwards.

From this arrangement there arise aerodynamically no drawbacks for the longtitudinal stability. Yet the enlargement of the angle of incidence of the upper planes towards the ends should have a bad influence on the lateral stability.—*The London Aeroplane.*





The De Haviland single seater fighter



The New York-Cleveland-Chicago Aerial Mail. From left to right, Mr. J. S. Stevens, Maj.-Gen. W. L. Kenly, Director of Military Aeronautics; Lt.-Col. Rhinehardt, Commanding the First Provisional Wing and in charge of the Flying Circus; Col. F. R. Kenny, Executive Officer, Department of Military Aeronautics



Arrival of the Aerial Mail at Chicago. Captain Benjamin B. Lipsner, Superintendent of Aerial Mail, receiving from Pilot Max Miller a bag of mail with which he has just landed

Bon Voyage! T
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mont Park to C
left to right, M
Hawley, preside
of America; the
ex-Governor Bro
land; Mr. Henry
Lieutenant Eytin
Air Service; an
Pennypacker, U
vice

Capt
pilot

THE NEW YORK — CLEVELAND — CHICAGO AERIAL MAIL



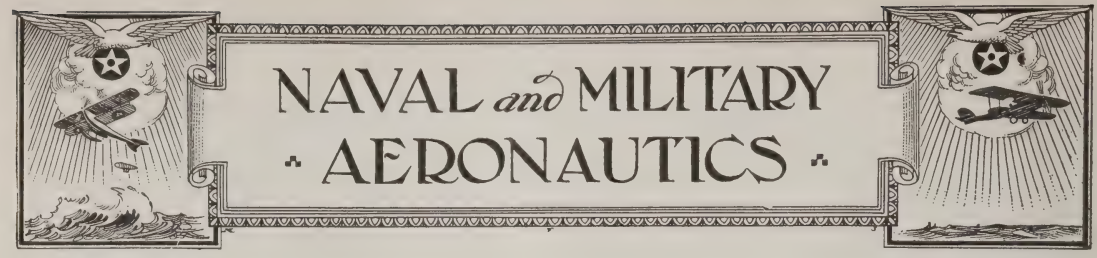
enjamin B. Lipsner, seated. The two aerial mail
ix Miller and Edw. V. Gardner, with Augustus
Post, standing



The arrival of the first aerial mail at Belmont Park from Chicago. Harry S. Hartung getting the mail from Miller's plane

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Air Ser-





Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report in order named to places mentioned for temporary duty.
Note 2—Report of Aviation Gen., Supply Depot, Los Angeles, Cal.
Note 3—Report to Standard Aircraft Corp., Elizabeth, N. J.
Note 4—Report to Fisher Body Corp., 870 Woodward Ave., Detroit, Mich.
Note 5—Report to Aero Production Depot, Detroit, Mich.
No. 6—Report to Aviation Gen. Supply Depot, Middletown, Pa.
No. 7—Report to Park Place, Houston, Texas.
Note 8—Report to American Exp. Depot, Baltimore, Md.
Note 9—Report to Aviation Gen. Supply Depot, San Antonio, Texas.
No. 10—Report to Dis. Office of Inspection, San Francisco, Cal.
Note 11—Report to Central Dept., Consumers Bldg., Chicago, Ill.
Note 12—Report to Dis. Mgr. Production, Mutual Bldg., Dayton, O.
Note 13—Report to Det. 14, Aircraft Prod. Depot, Moraine Field, Dayton, O.
Note 14—Report to Chief, Technical Section, Dayton, O.

Special Orders Nos. 198-203, Inclusive

A

Alexander, George L.....BFT
Alcox, Purl Ervin.....SLA; FOB
Akin, Thomas Bancroft.....SLA; CAF
Adams, Josiah Knowles.....SLA; RSD
Arneson, Sorren Richard.....SLA; CAF
Allen, Carl Beaty.....SL
Albright, Oliver.....SLA; RSD
Austin, Charles A.....PFO
Avery, Robert P.....WFO
Ahl, Parker V.....UTA
Andrews, Frank M.....CAF
Allen, Roy Hutchins.....CPA; DAP
Atwater, Donald V.....CWT
Abel, Allison A.....EOT
Anthony, Charles A.....EOT
Amiot, Arthur Louis.....SLA; KST
Albert, Paul.....SLA; ELA
Amos, Frank Huntington.....SLA; DAP
Albi, Joseph Aloysius.....SLA; KST

B

Bailey, Henry Fleming.....SLA; KST
Brinkerhoff, Verne William.....SLA; DAP
Bishop, Lionel Moise.....SLA; BFT
Brown, William Thomas, Jr.....SLA; CFT
Bagby, Howard.....SLA; MAC
Blair, James.....SLA; KST
Bates, Lew Ancell.....SLA; KST
Burt, John Ivey.....SLA; RSD
Blake, William McKay.....SLA; KST
Belser, King.....SLA; CWT
Bird, James Norman.....SLA; FOB
Bertschi, Phil Albert.....SLA; KST
Brenner, Frederick Charles.....SLA; LDT
Baxter, Walter Taylor.....SLA; CRI
Botts, Robert Thomas.....SLA; KST
Boyd, William Lewis.....SLA; LDT
Bradford, John R.....LHV
Belsky, Charles J.....LHV
Burger, Fairfax C.....WFO
Brown, Henry J.....PMT
Billiter, Earl Dominick.....SLA; AAD
Benson, Matthew M.....CWT
Benham, Reid F.....CAF
Brewer, Kenneth E.....CAF
Bach, Albert.....DMA
Beara, Ralph Berheisel.....SLA; DAF
Butler, William O.....MJA; DMA
Barber, Clifford L.....CAF
Bergan, Knute W.....CAF
Bobzein, Edwin B.....CAF
Boswell, Haden E.....CAF
Block, Dave.....CPA
Bowser, Robert.....CPA
Burgess, Walter Kellsy.....SLA; RSD
Bagnall, Howard E.....SMM
Bidwell, Ira M.....CWT
Bernard, Clifford S.....TFT
Binion, Clay.....SLA; TMA
Brown, John E.....LHV
Blitman, Charles H.....CWT
Briggs, Garland Baird.....SLA; AAD
Breathitt, John William.....SLA; BST
Bostrom, Hjalmer Oliver.....SLA; KST
Buckley, Cecil William.....SLA; TMA
Blanchard, Francis E.....EOT

Brown, Raymond F.....EOT
Blackerby, George N.....SMM
Boyette, Larry Giles.....SMM
Bonsal, Stephen, Jr.....FLA
Buster, Melvin W.....CWT
Blair, Edward .....CPA
Berry, Thornton A.....PFO
Boyd, James F.....BST
Benjamin, Walter Ernest.....SLA; BST
Bryant, Russell W.....MJA
Bunce, Ralph L.....CWT
Bullis, Leland S.....WFO
Burns, Edward .....MJA
Beekley, Archie G.....WFO
Busch, Carl C.....BST
Bartlett, Lowell W.....WFO
Burns, John V.....WFO
Bonney, George L.....CWT
Brown, Charles M.....CWT
Brown, Ray W.....CWT
Byrne, Melvin G.....CWT
Burr, Hudson .....OBS
Bremer, Carl A.....GLC
Breathitt, John W.....GLC
Banigan, John J.....EOT
Bradley, Ralph S.....EOT
Bowles, Walter S.....FLA

C

Cobb, James Forrest, Jr.....SLA; DAF
Colton, Ralph M.....FRF
Clarke, Jeremiah Edward.....SLA; CWT
Chandler, George David.....SLA; DAF
Corning, Daune D.....FRF
Crabtree, Lloyd Wayne.....SLA; MAC
Campbell, Lloyd Kenneth.....SLA; CAF
Clopeck, Frank .....SLA; CAF
Clark, Alfred .....FRF
Cox, Henry Ray.....SLA; SBI
Conner, Henry Waddell.....SLA; DAF
Cagney, John Albert.....SLA; KST
Cook, Harold Lockwood.....SLA; PMT
Cole, Bert L.....LDT
Clancy, John Francis.....SLA; GLC
Chamberlin, Steven Bolton.....SLA; BFT
Cain, George Wendell.....SLA; DAF
Corrigan, Ray Edison.....SLA; RSD
Coray, Francis Moray.....SLA; RSD
Cornog, Clyde L.....CUI
Carter, Frank Lorne.....SLA; KST
Chase, Lee .....TMA
Crowley, Jeremiah Anthony.....SLA; PFO
Chalk, Albert Herndon.....KST
Cook, Ralph Clayton.....SLA; DMA
Clark, Samuel G.....CAF
Campbell, John R.....CAF
Cleary, Ansel R.....CAF
Crumrine, Clarence E.....CAF
Cushman, Robert Greene.....SLA; KST
Cannon, Robert Hamilton.....SLA; CWT
Conklin, Roscoe G.....FOB
Chapman, Lester M.....SMM
Cox, Hines B.....SMM
Currier, Donald E.....SMM
Cluley, John B.....TMA

Cook, Philip P.....CPA
Crawford, Daniel .....ASM
Curtis, Allen .....CPA; DAP
Clark, Jeremiah E.....PFO
Crowe, Dorsey R.....WFO
Crocker, Robert Graeme.....SLA; PFO
Clark, Hollis C.....DAP
Clapp, Charles Edwin, Jr.....SLA; RSD
Collins, Thomas L.....LHV
Curits, Dwight W.....LHV
Cargo, William F., Jr.....TFT
Coulter, Joseph R.....TFT
Calvin, Patrick J.....SLA; BST
Cooper, Forrest G.....ELA
Christensen, Ezra A.....WFO
Carroll, Phillip A.....MJA
Coates, Aaron Thompson.....SLA; PMT
Codner, Ray K.....EOT
Carter, Samuel O.....BST
Cundiff, Lawrence B.....CUI
Carpenter, Charles Howard.....SLA; CAF
Cox, Henry R.....CWT
Canny, Ralph Gessler.....SLA; CAF
Campbell, Ralph Cornelius.....SLA; LDT
Carney, Herbert S.....CWT
Caskey, Jack P.....CWT
Coble, Paul L.....Note 13
Clement, Stephen M.....CPA
Chadwell, Earl .....FLA
Conway, Theobald E.....SMM
Clark, Elmer C.....WFO
Carroll, Alfred B.....Note 7
Calkins, Richard W.....WFO
Conway, Joseph C.....WFO
Calef, Robert C.....Note 7
Case, Leland I.....Note 7

D

Dowd, Thomas John.....SLA; VBW
Donaldson, Lindsay Montgomery.....SLA; CGC
Drexel, William R.....RSD
Dunford, Samuel William.....SLA; MAC
Dunston, Fred Lloyd.....SLA; MAC
Dudley, Frank B.....DMA; DAF; Note 1
Davis, Fred John.....CPA; DAP
Decker, John Harold.....SLA; CAF
Dietrich, Richard H.....FRF
Deab, Orman Lamont.....SLA; LDT
Demarest, William Cornell.....SLA; CAF
Dension, George Kendrick.....DAF
Dillon, Edward B.....SMM
Dryer, Olin G.....SMM
Dawson, Charles S.....SLA
Denton, George R. S.....UIU
Dickinson, Roy Willis.....SLA; CRI
Dujardin, Harold E.....WFO
Davis, Paul Judson.....SLA; SBI
Davis, Nathaniel P.....DMA
Davidson, Harry T.....BST
DeLacour, Harold F.....FLA
Delaplane, Edwin S., Jr.....WFO
Drummey, John F.....UTA
Durston, Harry C.....DMA
Divine, Howard Eber.....SLA; CAF
Dowling, Glena A.....WFO
Downs, Wilbur H.....DMA

Davis, George E.....CWT
Dudley, William A.....BFT
DeCoster, Harry Perry.....SLA; LDT
Day, Curtiss L.....WFO
Dugas, Graham C.....Note 4

E

Ebi, Kenneth A.....FRF
Elliott, Clifford Withrow.....SLA; GLC
Ellsworth, Frank Van Patten.....CPA
Eldridge, Earle Whitney.....SLA; BFT
Eager, Alfred G.....LHV
Ely, William N., Jr.....SMM
Ewell, Thomas Jefferson.....SLA; DAF
Emmens, George R. Jr.,
APR; CUI; LHV; Note 1
Ebaugh, John Williams.....EOT
Evans, Jesse Melvin.....SLA; CAF
Elsasser, Hugh H.....BST

F

Flack, Augustus Sloan.....SLA; DMA
Foster, Raymond W.....SLA; MAC
Farmer, LeRoy, Jr.....SLA; KST
Farwell, Ivy Irving.....SLA; RSD
Foertch, Clarence Joseph.....SLA; CRI
Fischer, Conrad J.....FRF
Farquhar, Guy Lewis.....SLA; CRI
Flint, William Spencer.....SLA; LDT
Fladeland, John Earl.....SLA; RSD
Fraser, Frank W.....FRF
Foley, William Robert.....SLA; RSD
Fetterhoff, Roy R.....DIK
Foss, Alden S.....DIK
Fawcett, Henry Francis.....SLA; LDT
Foster, Angier Hobbs.....SLA; FOB
Ferrell, Raymond Wesley.....SMM
Foote, Charles L.....CUI
Flanagan, Charles Vincent.....SLA; ELA
Franseen, Leonard Edward.....SLA; LDT
Fair, John A.....TMA
Feick, William .....SLA; ELA
Fox, Edwin H.....Note 12

G

Galman, Floyd .....SLA; KST
Gill, Robert Sutherland.....FLA; VBW
Gates, Byron Elihu.....SLA; LDT
Grimmer, William E., Jr.....FRF
George, Abram N.....FRF
Graham, Earle Harlow.....SLA; LDT
Gaston, Alexander N.....WFO
Gifford, John .....WFO
Gilchrist, Claude F.....FLA
Grantz, Raymond L.....FLA
Gaylord, Henry F.....FLA
Gompf, August Peter.....SLA; PFO
Gibson, George W.....UIU
George, Edwin S.....DAP
Gillett, John Sidney.....SLA; KST
Goodrich, Charles Lyman.....SLA; TMA
Griffith, Clyde L.....EOT
Gullett, Fay Sherman.....SLA; BST
Gillett, Frank E.....FLA
Garrett, Robert H.....SAG
Greene, Warwick .....LTA
Gladish, David Francis.....SLA; KST
Greene, Arthur D.....PFO
Gardner, J. Francis.....WFO
Griffith, John, Jr.....WFO
Gustin, Plomer Julius.....SLA; PMT
Guinther, Lawrence O.....SMM
Gage, George Raymond.....SLA; PMT
Gildersleeve, C. Russell.....Note 14
Graham, Joseph A.....Note 7
Gray, Charles A.....Note 8

H

Harris, John West, Jr.....SLA; RSD
Harwood, Herbert Edward.....FLA
Halle, Stanley Jacque.....CPA
Hesser, John Westly.....SLA; KST
Hebbert, Clarence Mark.....SLA; UIU
Huston, Sylvester .....SLA; BFT
Hamill, Howard Edison.....SLA; RSD
Hayhurst, Alfred H.....CPA
Hoisington, Earl M.....FLA
Hampton, John Clay.....SLA; MAC
Hampton, Robert, Jr.....FLA; PUP
Hewitt, Clarence Leslie, Jr.....SLA; CRI
Horton, Elwood .....DIK
Hyman, Kenneth Rayner.....CPA
Hoagland, George B.....CPA
Harvey, Earl M.....CPA
Hinkle, Stacy C.....SLA; EOT
Hurt, Samuel Fuqua.....SLA; PFO
Hewins, John Herschel.....SLA; KST
Harvey, William, Jr.....FLA; DAP
Hardy, Clinton Pennock.....SLA; KST
Harthorn, Lawrence D.....BST; RSD; Note 1
Heller, William B.....DAP
Heath, Fred T.....SMM
Hopkins, Frederick M.....SMM
Hopkins, Frederick M.....SMM
Hesser, John W.....TMA
Hefron, Bernard Murice.....SLA; LDT
Hochreiter, Charles J.....ASM
Hussell, Leroy E.....GLC
Higginbotham, William H.....DIK
Haynes, Winthrop P.....APR
Haslam, Reed H.....WFO
Hanisch, Arthur O.....CWT
Haddix, Clifford Francis.....SLA; AAD
Humphreys, Robert Hatch.....SLA; KST
Hunter, Leon Woods.....SLA; BFT
Harrison, George Blair.....FLA



Japanese seaplanes flying round a battle cruiser at manoeuvres

(*Continued on page* 83)

FOREIGN NEWS

GREAT BRITAIN

"On the morning of September 2 our squadrons attacked the hostile aerodrome at Buehl with very good results. Excellent shooting was obtained. Many direct hits were observed on the hangars, and a hostile machine on the ground was destroyed. All four machines returned safely."

The British independent air force within twenty-four hours has dropped fifteen tons of bombs on German military works in the Rhine provinces.

Three raids were made on the German aerodrome at Buehl. Three hangars were demolished and direct hits were obtained on many others.

The railways at Ehrang, four miles northeast of Treves, were attacked from a height of 900 feet and every bomb scored a direct hit.

At Saarbrucken, forty miles southeast of Treves, the Burbach works and railways were bombed.

In addition to the attacks already reported on the hostile aerodrome at Buehl on the morning of September 2, our squadrons on the afternoon of that day again attacked the same objective. Very good results were obtained. More hangars were hit and a fire was started. All our machines returned safely.

On the night of September 2-3 our squadrons dropped a total of seventeen tons of bombs. The Buehl aerodrome was again heavily attacked and the following targets bombed: The Burbach works and the railways at Saarbrucken and Ehrang and the Boulay aerodrome. Several fires were started. At Buehl three hangars were demolished and direct hits were obtained on many others. The attack was carried out at an altitude from 300 to 900 feet. More than fifteen tons of bombs were dropped on this aerodrome in twenty-four hours.

The railways at Ehrang were attacked from a height of 900 feet and every bomb obtained a direct hit. A fire was started in the Burbach works (Saarbrucken) and very good bursts were observed. All our machines returned safely.

American and British airmen in a raid on the German aerodrome at Vassenaere, Belgium, have caused great damage. A gasoline and oil dump was set on fire, and this in turn ignited an ammunition dump and also six Fokker biplanes. Two other machines were destroyed by direct hits by bombs, and a large Gotha hangar was completely burned.

The pilot of a British two-seater was attacked by seven hostile machines. The enemy fired explosive bullets and the pilot was hit five times in the left leg. Although his leg was almost severed, he succeeded in landing his machine behind the British lines.

Of the work of the airmen in the battle zone an official communication says:

"On September 2 our aeroplanes worked all day in front of the advancing battle line, behind which our observation balloons followed closely. Our airmen were frequently attacked by large formations of hostile machines, but persisted in their various tasks.

"The targets offered by the retiring Germans were reported to our artillery and contact with our infantry and tanks was maintained. Concentration of hostile troops and transport along the road were engaged with bombs and machine guns, hostile anti-tank guns were silenced, and supplies of small arms ammunition were dropped to our infantry in the forward zone.

"Many aerial encounters took place. We destroyed ten German machines and drove two down out of control. Our missing machines amounted to twenty.

"Twenty-four tons of bombs were dropped during the day and the night following."

An official communication issued by the Air Ministry on September 4 says:

"On the afternoon of the 3d inst. our squadrons carried out a most successful attack on the hostile aerodrome at Morhange. Several hangars received direct hits and two hostile machines on the ground were blown up. The extent of the damage is confirmed by photographs. All our machines returned safely.

"On the night of the 3d-4th inst. our squadrons again heavily bombed the aerodrome at Morhange. Several more hangars were hit, and some fires were started. The hostile aerodrome at Boulay and the blast furnaces at Esch, southwest of Luxemburg, were also attacked. Direct hits were obtained on the blast furnaces and fires were started at Boulay. All our machines returned safely.

"On the morning of the 4th inst. our squadrons attacked the aero drome at Morhange, this being the third attack within twenty-four hours. Excellent shooting was again made, and seven hangars received direct hits. All the bombs were seen to burst well.

"One squadron attacked the Buehl aerodrome with very good results. All our machines returned safely."

The aerial operations referred to by the Air Ministry were carried out by the British Independent Air Force.

Constantinople was bombarded twice, the latter part of August, the Admiralty announced. The arsenal, the dockyard, the Turkish War Office, the aerodrome at Galata, the seaplane base at Gallipoli, and Chanak were attacked.

The raids, which were carried out by the Royal Air Force, occurred on the nights of August 25-26 and 27-28.

On August 26 and September 1 the Royal Air Force, co-operating with the navy, carried out successful bombing raids on Ostend and Zeebrugge, on the Belgian coast. Thirteen tons of bombs were dropped and large fires were started, the statement announces.

A total of 465 enemy aeroplanes has been destroyed and 200 disabled since the commencement of the offensive on August 8, according to an official statement on aerial operations issued September 5. Sixty-one hostile balloons were destroyed and 911 tons of bombs were dropped on targets.

One hundred and sixteen British machines are missing.

British air supremacy on the western front during the last month was emphasized in a statement made by the British Bureau of Information.

Two features of the recent fighting, it was pointed out, were "the remarkably high number of enemy machines destroyed week by week and the singularly spasmodic and nervous way in which Germany seeks to counteract the threefold aerial offensive against her."

The "bags" by the British on the western front alone for the week ending August 27, it was said, were 70 enemy machines destroyed and 11 driven down to earth, as compared with 27 British machines reported missing during the same period—a ratio of more than two to one.

Successful results by the British airmen were reported also on the Italian, Balkan and Palestine fronts, where 18 enemy machines were smashed during the week ended August 27, while only 12 British aviators were reported missing. On all of the European Mediterranean battlefields in the month in question the British, it was stated, accounted for approximately 120 enemy aircraft, against a net loss of 29 of their own machines.

The disparity on the western front is all the more noticeable, the report continues, because it is there that Germany is concentrating her strength. British airmen, during the week referred to, made thirty-six raids into Germany, in addition to innumerable bombing incursions on vital enemy positions behind the German lines and intense local engagements.

The dogged persistency of British and other allied airmen is said to bewilder the Germans. This week at Mannheim, where, owing to numerical superiority, and after "bitter fighting," an early morning raid resulted in the loss of seven British machines, the Britons on the evening of the same day renewed the attack and, in spite of even greater resistance, dropped double the number of bombs, all the machines returning safely.

Five important cities in Germany and five hostile airdromes were heavily bombarded by British aerial squadrons on the night of Aug. 21-22, according to an official statement issued Sept. 5 by the British Air Ministry.

The text of the statement reads:

In spite of the enemy's most determined efforts for protection, consisting of a large number of anti-aircraft guns, between the hours of 8 P. M. on the 21st, and 10 A. M. on the 22d inst., five important towns in Germany were heavily attacked as well as five hostile aerodromes.

FRANCE

The official statement of September 2 on aviation reads:

"Bad weather interfered with the aerial operations on September 1. Nevertheless, four enemy aeroplanes were brought down and one captive balloon was set afire.

"Our patrol machines carried out bombardments in the region of La Fere, convoys on the roads radiating around St. Quentin and La Fere were subjected to machine gun fire. During the night nearly eleven tons of bombs were dropped on the railway stations at Marle, Laon and Ham, causing fires. Eight tons of projectiles were dropped on bivouacs in the neighborhood of Villers-Franqueux, and on stations at Maison Bleue and Guignicourt. Four and a half tons of projectiles were dropped on the latter place, causing heavy damage."

On September 2 our aviators were particularly active along the whole front. They did important work. Our observers increased their reconnoissances over the enemy lines. They took about one hundred photographs of the battle zone. Our infantry airmen chronicled the advance of our troops, reported on the enemy batteries in action, and in liaison with the artillery co-operated in the destruction of enemy centres of resistance.

"Numerous engagements were fought, in the course of which nineteen enemy planes were brought down or put out of action, and nine captive balloons were burned.

"Our bombing planes dropped more than thirteen tons of bombs in the region of Chavignon, Ainzy and Brancourt. During the night our bombing machines continued their work. Sixteen tons of projectiles were dropped on stations, bivouacs and railways behind the enemy front. The station at Flavy-le-Martel received six tons, and two violent fires broke out. Three tons were dropped on cantonments in the region of Jussy, and four tons on the stations at Guignicourt and Maison Bleue, giving excellent results. Our bombing machines also used several thousand cartridges against enemy bivouacs."

"On September 4 our aerial squadrons took an important part in the battle. Our planes, flying at a low altitude, used their machine guns on convoys and troops withdrawing each of the Canal du Nord, especially in the region of Flavy-le-Martel, Jussy, Bois l'Abbé, Cailloulet and Mennessis. Thousands of cartridges also were fired at the enemy retreating north of the Vesle and on bivouacs and cantonments on the north bank of the Aisne.

"Our squadrons fought numerous engagements over the German lines. Fifteen enemy machines were brought down or put out of action, and four captive balloons were burned."

Nearly forty tons of explosives were dropped by 148 Entente Allied aeroplanes on the towns of Brancourt and Anizy-le-Chateau, south of Coucy Forest, August 29, in connection with the advance of General Mangin's army, says the *Matin*. Important material damage was done.

In the course of the aerial operations fifteen fights took place. Six enemy aeroplanes were shot down. Only one Allied machine was lost.

During the month of August French bombardment aeroplanes dropped more than 629 tons of projectiles, according to a statement issued Sept. 11 by the war office. The statement says:

"In the course of August our bombardment aeroplanes in day flights dropped more than 269 tons of projectiles on objectives on the battlefield between the Somme and the Aisne. In night attacks our bombing aeroplanes dropped 360 tons of projectiles on railway stations and enemy roads of communication.

"In the same month 280 enemy machines were downed or seen falling out of control, and sixty-six enemy balloons were set on fire."

GERMANY

The report for Sept. 6th follows: Our battle airmen succesfully attacked enemy columns during their crossing of the Somme, near Brie and St. Christ.

Five aeroplanes were brought down out of a British squadron which advanced to the attack.

During August 565 enemy aeroplanes were brought down on the German fronts, 62 of them by our anti-aircraft guns. Captive balloons to the number of 52 also were brought down. Of the total number, 251 airplanes are in our possession. The remainder were observed to fall on the other side of the enemy lines. We lost in battle 153 aeroplanes and 86 captive balloons.



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

Steam Engine Construction

THE steam engine and the compressed air motor are alike in principle, the only difference is the compressed air motor is acted on by the air forced into the tank and compressed to a certain pressure, while the steam engine is worked by the steam pressure from the boiler. This steam pressure is generated from water heated to a high degree. You have perhaps noticed a kettle boiling on the stove, and the cover jumping up and down from the pressure generated inside. If you were to seal up the spout so that no steam could escape in that direction, the cover would be forced off by the pressure.

The boiler of the motor about to be described is known as the flash type, and is made of a coil of tubing through which a jet of flame from a sort of Bunsen burner is projected.

Upon referring to the accompanying drawing it will be noticed that the engine is of the same form and shape as the compressed air motor described previously. The cylinders, valves, and crankshaft are of the same construction, but the piston is minus the leather cup washer for the simple reason that the heat of the steam would burn it up. If possible it would be a good idea to have two pistons turned out of aluminum by some machinist. The pistons would then be of correct size and therefore no loss of pressure would result. The lubricant should be of the heavy steam engine cylinder oil used in large engines.

The soldering of this engine will be harder than the compressed air motor because of the use of silver strip solder such as jewelers use, instead of soft lead solder, we used in the other engine.

The reason for this, is, the intense heat, which would tend to melt the lead. The model builder must remember that it requires a great deal of heat to melt the silver solder and it is possible that the parts to be joined might melt also, so I would advise the builder to be careful. Again care must be taken, not to let the solder run into the pipes or valve openings.

The flash boiler is made of a twelve-foot piece 3/16″ outside diameter steel or seamless copper tubing, preferably the steel on account of its higher tensile strength. This tubing is then bent on a wooden former 1-1/2″ diameter, taking care not to get any kinks in the coil or the boiler will not work well. One end of the coil is soldered to the engine, the other being fastened to the water pump. The water tank is made of thin sheet metal, the two ends are made from small curtain rod balls 1-1/4″ diameter. The tank should be made large enough to hold three ounces of water. The pump is made from a piece of 1/4″ inside diameter tubing, with a piece of drill rod as the piston. This drill rod must be just tight enough to allow for a working fit. When constructing the pump make sure that the piston is above the pipe leading from the tank when it is at its highest point or top center. The stroke of the piston is 1/2″. When the steam is "up" in the boiler it will have a tendency to force the water back into the tank. In order to overcome this tendency, we must put a check between the boiler and the pump. By glancing at the sketch of the pump arrangement you will see how the check valve is constructed. A ball bearing held in place by a spring. This check is pushed back when the pump forces the water through the valve but it jumps back immediately when the pumping action stops on account of the joint action of the spring and the pressure of the steam.

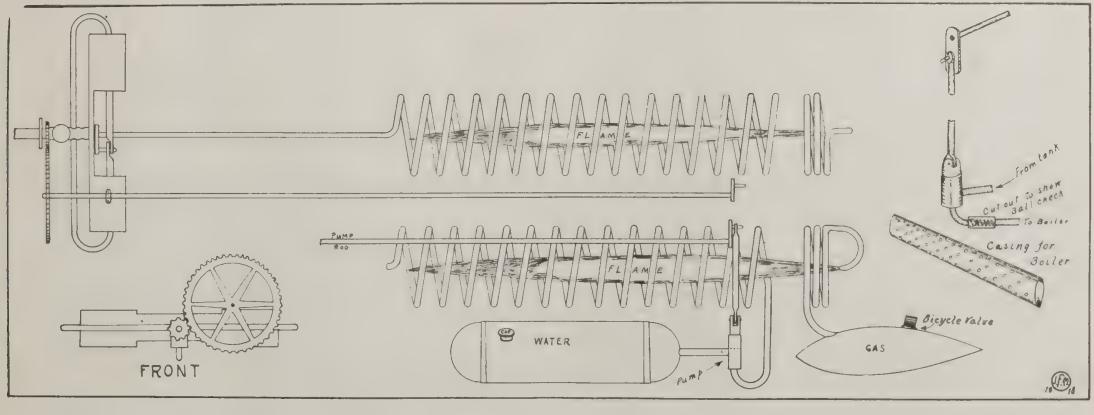
The pump is operated by a crankshaft running from the large gear at the front of the engine and connected to a crank throw at the rear. This crank throw is constructed so as to allow for a half-inch stroke. The large gear is driven by a smaller gear one-fifth the size, fastened to the crankshaft. This arrangement allows the engine to make five revolutions to each stroke of the pump.

The Bunsen burner is made of tubing the same as the boiler. The ounce of gas is held in a receptacle made to a convenient steamline shape with a bicycle valve soldered in it to allow pressure by means of a foot pump and also for filling with gas. To fill up the tank unscrew the inside of the valve. The tubing is then soldered to the tank, making two or three circles, and then shoots down so as to bring the nozzle in the centre. This arrangement allows the flame to pass between the coils of gas tubing, thereby vaporizing the gas quickly.

The gas tank should have a pressure of five pounds in order to keep the gas blowing with enough pressure to allow the flame to shoot to the ends of the coils. The tubing that forms the nozzle of the Bunsen burner should be hammered to a point and a small hole drilled in same. This hole can be enlarged often experimenting to find out the proper size hole.

A steam plant is a very tricky combination to handle and is very powerful, so I would advise testing the engine fully before putting in a model.

To keep the heat in the boiler it is advisable to put a casing around it of thin sheet metal, having ventilator holes drilled or punched in it. If procurable I would advise inserting a sheet of very thin asbestos paper between the coils of the boiler and the casing. This will assist in holding the heat inside.





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

His Northern Brother

Just make it two, old fellow;
I want to stand once more
Beneath the old flag with you,
As in the days of yore;
Our fathers stood together
And fought on land and sea,
The battles fierce that made us
A nation of the free.

I whipped you down at Vicksburg,
You licked me at Bull Run,
On many a field we struggled
When neither victory won,
You wore the gray of Southland,
I wore the Northern blue;
Like men we did our duty,
When screaming bullets flew.

Four years we fought like heroes
But when the war was done
Our hands met in friendly clasp.
Our two hearts beat as one,
And now, when danger threatens
No North, no South, we know,
Once more we stand together
To fight the common foe.

My head, like yours, is frosty—
Old age is creeping on;
Life's sun is lower sinking,
My day will soon be gone.
But if our country's honor
Needs once again her son,
I'm ready, too, old fellow—
So get another gun.—*Minneapolis Journal.*



STICK CONTROL

The Fable of the Funny Wop

By Lynn

Once upon a time there was an Italian with an East Side accent that joined the army. He was a chauffeur. In the army he was a cook in the Air Service. Failing in a last futile attempt to create a spagetti dish out of camouflaged corn-willie, he was given a job as orderly. It was his nature to ask questions. This was irksome to the various non-coms that wield the destiny of thousands of memorandums. It became necessary that action be taken. The Wop, which wasn't his name at all, was given instructions to find anti-slip grips, climb the 100-foot tower, and rescue the barometer for the records of the delinquency clerk.

After forty-four bucks were passed as to the whereabouts of the anti-slip grips, the Wop gave it up and climbed the tower without them. His trip was one of hazards, but that was a matter of small importance.

The Wop was obeying the orders of silly non-com petents.

From the tower he brought back to his non-coms two sledge hammers, one bird nest and four vin rouge bottles. The barometer was not there.

Moral: The Wop was a soldier, a gentleman and perhaps a good judge of—Soda Pop, and he obeyed orders whether they came from a brain of emptiness or a regular guy. And the point is this: Don't kid a bird with a foreign accent—he may be a better soldier than you. Remember the old proverb about junking rocks at the lady of easy virtue. You don't remember seeing any boulders floating around permiscously, do you.

Fire, Fire, Fire

(With apologies to Tennyson)

Fire, Fire, Fire,
At the cold grey stars, Oh Guns
And I'm glad that my tongue can utter
The thoughts that I think of the Huns.

'Tis well for the shining moon
That she sits in the heavens at rest;
'Tis well for the cold, bright stars
That are watching the guns do their best.

But the buzzing Zepp goes on
To its cultured German lair;
And Oh, the comfort of being in bed,
For I'm tired of the cellar stair.

Fire, Fire, Fire,
At the cold grey stars, Oh Guns.
For the tender thought of a sleep that is lost
I will *never* forgive the Huns.

Of Different Degrees

There are four kinds of lies. There is the ordinary plain, every-day lie. There is what may be called, and frequently is called, the d—d lie. There are statistics, AND the German Wireless.

I Should Say Not

The cadet was filling out an application for a furlough.

He was mildly surprised when he read the question:

"Is there not someone at or near your place of residence who can act as substitute for you?"

The cadet approached the busy clerk and asked: "How must I answer this question?"

The clerk was used to that. "Simply make a correct statement," he said without looking at the paper.

"Well, believe me, it's going to be "N" "O" in LARGE CAPITAL letters," said the cadet. "I'm going home to get married."



(Continued from page 75)

Horning, DeForrest A.....FLA
Hunter, Archie D.....TFT
Hyde, Gordon E.....TFT
Henmon, Vivian A. C.....DMA
Hood, Randolph M.....SMM
Harvey, George R.....SMM
Hunter, Lowell W.....SMM
Harrison, George R.....CUI
Hewitt, Clarence Garrald.....SLA; TMA
Hazeltine, Matthew Emery.....SLA; LDT
Helstrom, Roy Luther.....SLA
Harvey, George W.....AMV
Hubbard, George Graham.....SLA; GLC
Howell, Gorman Bigelow.....SLA; FOB
Hardy, Clinton P.....CWT
Hirsh, Charles L.....CWT
Haslam, Reed Hamilton.....SLA; CAF
Hannon, Francis M.....DMA; CGC; Note 1
Hitt, Joe Langston.....SLA; SAG
Higgins, Robert F.....Note 2
Helstrom, Roy Luther.....SLA; Note 6
Harmed, Doyce H.....PFO
Hodgkin, George Barclay.....SLA; LDT
Haddon, Julian B.....Note 7

I

Imes, Hollis L.....SMM
Israel, Gerald H.....DIK
Immel, Paul P.....ELA
Irwin, Seaton Grantland.....SLA; TMA

J

Jones, Paul Vincent.....SLA; VBW
Johnson, Charles Fabian H.....MJA; DAP
Jacobi, Herbert J.....CUI; LHV; Note 1
Jenson, Leslie Leroy.....SLA; GLC
Jones, Elliott Willis, Jr.....SLA; BFT
Judge, Joseph B.....FRF
Jennings, William P.....FRF
Johnson, Lowell.....SLA; GLC
Johnston, Lloyd Edward.....SLA; GLC
Johnson, Frederick C.....ASM
Johnson, Herbert C.....CWT

K

King, Jefferson Johnson.....SLA; BFT
Kramer, Emanuel Davis.....SLA; CRI
Knickerbocker, Harry Clayton.....SLA; CWT
Kunzelman, Charles.....SLA; EOT
Kiggins, John Philip.....SLA; VBW
Kerr, Harry Hampton, Jr.....SLA; KST
Kearney, John Mark.....SLA; VBW
KEIG, Alfred J.....TFT
Kamm, Philip Schuyler.....SLA; LDT
Kennedy, Harry J.....FLA
Kirby, Marquis L.....WFO
Knox, James E.....Note 14

L

Langman, Victor James.....SLA; CWT
Lawson, William E.....GLC
Lee, Theophilus, Jr.....FLA
Lewis, Robert.....SLA; TMA
Lloyde, Robert K.....DMA; FOB; Note 1
Lindstrom, Algot John.....SLA; PMT
Lindsay, Charles E.....WFO
Likins, Charles Cecil.....SLA; SBI
Lawson, Harry E.....TFT
Lenoir, Whitman H.....TFT
Lester, Hodge.....SLA; SBI
Lowe, Wayne Marsh.....SLA; BST
Lovett, Craig.....SLA; RSD
Lewis, Elmer Reed.....SLA; BFT
Lewis, Robert.....CWT
Levensberger, Edgar B.....TFT
Largent, Ralph Newton.....SLA; CFT
Low, James Byron.....SLA; DAF
Langdon, Cecil Leland.....SLA; DAF
Lea, Curry.....SLA; RSD
Lunger, Clarence William.....SLA; KST
Lyon, McDowell.....SLA; TFT
LeHardy, Frank Miller.....SLA; CAF

M

Maloney, Arthur M.....FRF
Morrison, Raymond.....SLA; RSD
Middleton, Ellis Spear.....SLA; CAF
Macks, Robert G.....ASM
Myrick, Leroy Henry.....SLA; TFT
Mills, Henry Hill.....CPA; VBW
Mahoney, Justin Thomas.....SLA; KST
Marrs, Aubrey R.....DIK
Means, Gardiner C.....DIK
Mackey, George Best.....SLA; DAF
Macomber, Bart.....SLA; VBW
Meng, Paul H.....BST
Mabry, Palmer V.....PFO
Miller, Ernest L.....CWT
Miller, Eralbert T.....ASM
Matthews, Stanley Grant.....SLA; BST
Murray, John Leonard.....SLA; KST
Meng, Walter J.....WFO
Munford, Edward S.....HHN
Mulholland, Emmett P.....SLA
Miller, Carl A.....CFA
Miller, Marion L.....ELA
Major, Schwab Samuel.....SLA; AAD
Manning, John Philip.....SLA; CAF
Meek, Frederick J.....CAF
Moffett, George G.....CAF
Monett, Howard Bennett.....SLA; KST
Murray, Francis B.....FLA
Myers, Verne Martin.....SLA; LDT
Mitchell, Henry G., Jr.....RSD
Mauch, Eugene Anthony.....SLA; SBI
Miller, Frank R.....DAF
Hayfield, Hollace E.....EOT
Markley, John Benjamin.....FLA
Meyers, Herman C.....FLA
Miller, Boynton K.....Note 9
Matthiesson, Frederick W.....CWT
Moll, Norman L.....PMT

Mc

McKinley, Howard Waldo.....SLA; BFT
McDevitt, Lester M.....FRF
McMillin, Frank Emerson, Jr.....SLA; RSD
McClain, Robert Waite.....SLA; SBI
McNally, Sellers M.....LHV
McElhinny, William Dunbar.....SLA; BFT
MacKenzie, Roy J.....MJA
McConnell, George Benjamin.....SLA; PMT
MacKay, George B.....BST
MacEwen, Herbert M.....BST
McIlhiney, Donald W.....WFO
McArn, Theodore A.....PFO
McCully, Coleman Clyde.....SLA; PFO
MacKay, Charles Howard.....SLA; DAF
McDuffee, Herbert Spencer.....SLA; CJW
McLean, James H.....CPA
McCoy, Dell H.....OBS
McCormack, Robert D.....WFO
McKay, Leo H.....WFO
McHenry, Harold.....I; Note 3

N

Neet, Lewis Edward.....SLA; MAC
Neber, Lawrence Washington.....SLA; KST
Newman, Oliver.....SLA; CRI
Nichols, Elmer E.....FRF
Neilson, George F.....SMM
Norton, John D.....SMM
Neal, Howard Kent.....SLA; CAF
Newnam, Samuel Harrison.....SLA; KST
Norris, Fred P.....GLC

O

O'Sullivan, William Joseph Gregory.SLA; TMA
Obenauer, Victor J.....BST

P

Peterson, Joseph Harold.....FLA; DAP
Poe, Tom.....DMA
Pye, Walter David.....SLA; ADT
Pettengill, Raymond Robinson.....SLA; EOT
Pyle, Glenn L.....SLA; KST
Potter, Charles M.....FRF
Pengilly, Henry Eugene.....SLA; UIU
Porter, Mark L.....ASM
Peterson, Charles Peter Adolph.....SLA; HHN
Prall, Bryan William.....SLA; PMT
Powell, Roger S.....DMA



Q

Quirk, Joseph Charles....SLA; KST

R

Rudy, Dudley Given....SLA; KST
Rosson, Prentiss....SLA; CWT
Royal, James M....ASM
Reynolds, Charles Archibald....SLA; VBW
Ross, Norman de Mille....SLA; RSD
Russell, Oscar V....FRF
Rahsman, Arthur Herman....SLA; TFT
Richards, Homer Maro....SLA; PFO
Roberts, Hamilton Harvey....SLA; AAD
Royer, Carl E....DIK
Ray, Chester Paul, Jr....SLA; LHV
Rogers, Donald Spencer....SLA; GLC
Reilly, James A....MJA
Rothfeld, Tracy Lesman....SLA; KST
Riebe, Herbert F....WFO
Ryon, Robert E....WFO
Rayzor, Sam Boyd....LDT
Riddle, Harry Earl....SLA; AAD
Ryan, John H....FLA
Rowland, Dudley E....FLA

S

Seavey, Charles C....WFO
Stuart, Geary John....CPA; VBW
Smith, William Calvin....SLA; CWT
Singleton, John Davis....SLA; CAF
Sparling, Edward James, Jr....SLA; CFT
Sturtevant, Harold Vaughan....SLA; GLC
Sowdon, Arthur Whitlock....SLA; CWT
Sattler, Augustus Edmund....SLA; SBI
Schwarz, Harry Heyman....SLA; LDT
Shrake, Byrl H....SLA; PMT
Smith, William Henry....SLA; CAF
Staerker, Otto....SLA; CAF
Steen, Edwin French....SLA; UCB
Sales, Carter....SMM
Schock, William Oren....SLA; MAC
Stevenet, J. E. H....MAT
Snyder, William Jennings....SLA; CAF
Schoeppe, Edward....FLA
Saucier, Loren Randolph....SLA; PFO
Stolze, Charles W....CPA
Sholts, Forest H....Note 11
Stephens, Orville L....WFO
Schick, Herbert Mervin....SLA; TMA
Scarboro, William E....CPA
Smith, Presley L....Note 5
Smith, Vernon V....CWT
Stafford, William Spencer....FLA; DAP
Schriver, Herschel L....BST
Simpson, Samuel Marion....SLA; KST
Scott, Allison E. H....DAP
South, Charles Millard....SLA; MAC
Sherwood, Samuel C....CWT
Stebbins, Willis Irl....SLA; SBI
Sheridan, Harry W., Jr....CAF
Shively, James Cole....SLA; PFO
Sweeley, William R....MAT
Scofield, Edward Ellis....SLA; KST
Snyder, Ralph M....FLA
Sego, Arthur Anthony....SLA; DAF
Stelle, Harry W....CWT
Sherman, Edward Hemingway....SLA; TMA
Smith, Harry L....PFO
Stone, William Craig....SLA; DAF
Short, Sidney E....ASM
Stevens, Edgar Locker....SLA; KST
Silbert, Samuel B....SMM
Speck, Harry L....SLA; SMM
Stagg, Thomas E., Jr....FLA
Scharfschwerdt, Otto....SLA; CWT
Selts, William A....TFT
Setzler, Harry G....TFT
Stinson, David R....TFT
Stone, Percy N....TFT
Stutzman, Theodore B....TFT
Stone, Ephraim S....GLC
Shroyer, David M....CAF
Steinkamp, Christopher....CAF
Shewmon, Dan D....DMA
Stephenson, George E
DMA; Note 15; WDM; Note 1
Smith, Rollin C....IMA; Note 1; MAT
Shepherd, Herbert R....TFT
Snyder, Gerald S....TFT
Stanley, Robert H....TFT
Senseney, Charles G....CWT
Strauss, Sidney H....CWT
Scott, George....CPA
Schlemmer, Harold P....CWT
Sanborn, Joseph W....SMM
Spalding, Russell A....SMM
Swaney, Oscar H....SMM
Stevens, Thaddeus Jesse....SLA; PFO

T

Thornton, Dudley Chipley....SLA; DAP
Thrane, Frederic William....SLA; VBW
Towne, Josian Mitchell....SLA; MAC
Twachtman, Quentin....CPA
Tracy, Stanley Bannon....SLA; CRI
Thomas, Millard Price....SLA; MAC
Tilson, Howard F....DMA
Tatnall, Emmett R....DMA
Tyler, William B....FLA
Thompson, Neal....FLA
Thigpen, Roy M....LHV
Talbot, Elmer R....TMA
Thornton, Arthur L....PFO
Thweatt, William K....PFO
Tenhope, Jerry T....TFT
Teutz, Otoo Herbert....SLA; CRI
Thomas, Don W....ARV
Todd, Clarance W....WFO
Coonrod, Victor Tucker....SLA; PFO
Toole, Charles Edward....SLA; DAF
Thompson, George Russell....SLA; CRI
Turpin, Paul R....PUP
Tefft, Lionel V....CAF
Thomas, Alfred H....SMM

U

Upton, Thomas Dinsmore....CPA; VBW
Underhill, Herman L....DMA

V

Vaughn, Grady Miller....SLA; EOT
Vipond, Benjamin Leslie....CPA; DAP
Van Vater, Claude Oscar....CPA; DMA
Vories, Randolph Peyton....SLA; TFT
Vanderwerker, Francis Harold....SLA; DAP
Valentine, Allen W....Note 7
Velte, Charles H....SAG
Volintine, Daniel....CWT

W

Whitney, Howell Eugene....SLA; CJW
Watson, James Bennett....SLA; CRI
Wiegand, Vernon Ivan Ellsworth....SLA; GLC
Welch, Leslie Andrew....SLA; FOB
Willson, Hubert Elmore....SLA; LDT
Winters, Lovelle Dudley....SLA; VBW
Wright, Earl Leon....SLA; PFO
Walter, William Sherlock....SLA; MAC
Weissenborn, Stanton Martin....SLA; TMA
Woods, James Arvine, Jr....SLA; CAF
Williams, William P....FRF
Willis, Henry Percy....FLA
Wilson, Francis Burrell....SLA; CRI
Wilson, Vincent Lambert....SLA; CRI
Wilson, David E. Johnston....SLA; VBW
Woolf, Julian Stuart....SLA; EOT
Weed, Frank J....WFO
Wohler, Chester R....ASM
Ward, John Alling....SLA; CWT
Wooley, Frederick P., Jr....DIK
Weathers, Paul D....FLA
Waters, Philip L....CWT
Webber, Stanley Haskell....SLA; ELA
White, William Joseph....SLA; BST

(Continued on page 87)

Thomas

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Whitney, Rollin Gregg.....SLA; Note 10
Waite, Raymond Alonzo.....FLA; UCB
Wilcox, Ralph W.....WFO
Wainwright, Louden S.....SLA; AAD
Watson, Hugh.....TMA
Walker, Ralph G.....TMA
Wilford, Robert N.....TMA
Winters, Victor D.....EOT
Wood, Landon C.....EOT
Waddell, Chauncey L.....BST
Williams, John Maxwell, Jr.....SLA; LDT
Warde, Wilfrid B.....SAG
Williams, Robert Newton.....SLA; BST
Waddell, Chauncey Lockhart.....SLA; PMT
Ware, James Gwyn.....SLA; CWT
Williamson, Lamar.....SLA; TMA
Wells, Frederick L.....DMA
Wilkins, Charles L.....CAF
West, Caleb.....MJA
Wehrle, Howard Franklin.....MJA
Wetherbee, Alex P.....LDT
Wakeley, Morton.....SMM
Weightman, Harry E.....ELA
Wood, Norman H.....TFT
Whitely, Felix E.....PFO
Wall, William P.....EOT
Watson, Minor S.....CWT

Y

Young, Donald Arthur.....SLA; VBW
Yeager, Wilbur A.....CWT

Z

Zipf, Oscar H.....LHV

(*Continued from page 62*)

Rich Field Notes

Commissions granted:

2nd. Lt., L. G. Russell, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., L. F. Muter, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., W. D. Perry, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., D. W. Salter, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., E. R.Bahl, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., R. W. Barnes, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., C. C. Kittenger, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., E. A. Leman, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., H. C. Schmitt, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., E. C. Austin, R. M. A., A. S. A., Flying Instructor.
2nd. Lt., W. N. Amis, R. M. A., A. S. A., Flying Instructor.

The first cross-country formation flight was recently made from Rich Field to Everman Field, a distance of about 210 miles. The flight was made with 15 planes, all of which held their positions throughout. None were forced to land. The success of the trip was largely due to the efficiency of the departments in charge of training the cadets for that work. The formation was lead by Lieut. David C. Faulkner, who is in charge of the formation stage. The ships took off in formation and landed in formation at Everman Field, where they were gassed up for the return trip. The flight was made in two hours and twenty-eight minutes.

Major C. W. Russell, J. M. A., S. C., Commanding Officer of Rich Field, has been ordered to Washington and has released command of this post. Major J. G. Whiteside, S. C. A. S., is in temporary command.

Enemy Fears Acute Airplane Shortage

London.—There are indications that the aerial reserves of the enemy are seriously depleted. A captured document lays stress on the necessity of salvaging to the uttermost all bits of aeroplanes which have crashed behind the German lines. The document says:

"In view of the situation as regards raw material, our aeroplane industry is more and more reduced to relying on the working up of instruments and motors saved from destroyed aeroplanes. The supply of material for the front has become essentially dependent upon the return of waste material from the front."

New Altitude Record Set by Lieut. Kelleher

Chicago.—A height of 23,500 feet, claimed to be a world's record for altitude by a two-seater aeroplane, was reached by Lieut. M. B. Kelleher, who flew from the United States War Exposition grounds with a passenger on Sept. 9th. They used a new oxygen apparatus. Attempting to land, the aviator crashed into a fence, but was not seriously injured. It is said the highest previous record for a plane with a passenger is 21,000 feet.

Aviators Kill a General

London.—British aviators attacking the headquarters of a German unit in the neighborhood of St. Quentin killed Gen. Hugo Hahn and the majority of the members of his staff, according to a despatch from Geneva to the London Daily Express.

According to a despatch from Basle a number of other German Generals had narrow escapes from death in aerial attacks in the same sector, where the British airmen continually are bombing the centres of concentration and the division headquarters.

(*Continued from page 68*)

ing moments without external aid. Internally the wings are drift-wired with solid circular section steel wire, of heavy gauge, but not in duplicate. It was noticed that one of the lugs to which a drift wire was attached had sheared through, but we should hesitate to say that this necessarily indicates that here was a weak point regarded from the point of view of flying stresses, as the wing had evidently been badly damaged by the machine turning over on landing.

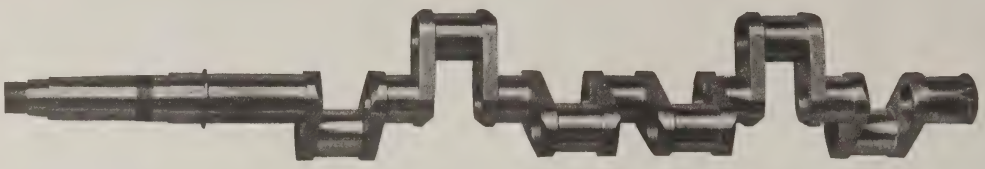
The armament of the Fokker biplane consists of two Spandau guns mounted on top of the body and synchronized in the usual manner to fire "through" the propeller.

As regards the covering of the Fokker biplane this is chiefly remarkable, in the specimen under review, on account of the colors in which it is painted. The front portion of the body and the top surface of the top plane are painted a deep vermilion, while the rear portion of the body is painted white. The lower surfaces of the top plane and the bottom plane are camouflaged in the usual German manner by a printing in different colors of lozenge-shaped figures.

The tail plane and elevator are painted black, with the exception of a parallel portion of the top surface, which is painted white like the body.

Payne Field News

Major Jack W. Heard, Commanding Officer of Payne Aviation Field, situated at West Point, Miss., has been promoted to Lieutenant Colonel. Colonel Heard has been in command of the Payne Field since early in April, when Payne Field was converted from a construction camp to one of the most modern aviation fields in America. Ninety cadets were recently commissioned after having been trained at Payne Field without a major accident. Payne Field is situated at West Point, Miss., in the heart of an egg-shaped prairie section of Mississippi, 130 miles long by 30 miles wide, which territory is all ideal for aviation purposes, thus giving Payne Field a decided natural advantage over most fields in America. Air conditions are ideal, as well as health and sanitary conditions. Payne Field has recently been made a "Combat Field."



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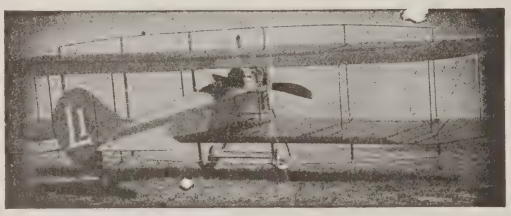
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AERIAL AGE WEEKLY

Vol. 8, No. 3 SEPTEMBER 30, 1918 10 CENTS A COPY



Dispatch Fleets of Liberty Planes

Allied Air Control Plainly Shown

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.
Subscription: Domestic, $4; Foreign, $6.
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879.

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1918



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AERIAL AGE WEEKLY

VOL. VIII SEPTEMBER 30, 1918 No. 3

TABLE OF CONTENTS

PAGE

To Dispatch Fleets of Liberty Planes 113
Allied Air Control Plainly Seen... 114
Air-bombing Chief Praises Americans ... 114
How the Aerial Mail Took a Report to General Pershing a Week Sooner ... 114
News of the Week ... 115
U. S. Aerial Mail ... 117
Air Service Open for Enlistments.. 118
Aerial Mail Service in Canada..... 118
Military Aerostatics ... 119
American Caproni Meets Tests in Air ... 120
The Aircraft Trade Review..... 121
The Future of the Aircraft Industy. 122
The New Zeppelin Bombing Biplane ... 122
Thermodynamic Cycles in Internal Combustion Engines ... 126
Third Annual Report of the National Advisory Committee on Aeronautics ... 128
The London Enemy Aircraft Exhibit ... 130
Naval and Military Aeronautics... 131
Foreign News ... 134
Model News ... 135
Aeronitis ... 136

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Sept. 30, 1918
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, SEPTEMBER 30, 1918 NO. 3

DISPATCH FLEETS OF LIBERTY PLANES

ROMERANTIN, Central France (Correspondence of The Associated Press).—Liberty aeroplanes were darting across the sky, other Liberties were drawn up in battalions across the big plain, and still other Liberties were puffing and struggling at their anchor tests, as The Associated Press correspondent arrived at this great centre of aeroplane production for the American fighting army. The nearby town of Issodoun is the great centre for American aviators.

Crowds of soldiers and workmen had gathered to see one of the fighting Liberties completely equipped with bombing machines, wireless outfit, all its guns, and every last device for going into combat. There had been other Liberties turned out, scores and hundreds of them now moving in a steady stream. In this and others which had preceded, the last step had been taken to give them their final equipment for actual fighting.

The big machine had a spread of forty-three feet across, and like all the others was of gray cloud-color seen from below, though above the color changed to green and merged into the green fields. Ahead pointed the machine-gun operated by the pilot, with synchronizing device by which some hundred shots a minute flew between the blades of the spinning propeller. Further back, in the observers' nests, two more machine-guns had a sweep of both broadsides and upward and rearward. There was no angle they could not reach, and even the Gotha trick of shooting straight down through a floor tunnel was more than matched, though details of how this is done cannot, of course, be given. It is sufficient to say that this new type, long and anxiously awaited and now a reality, armed for combat, was as formidable as any car ever produced, and in the judgment of these experts was far more formidable than any of them.

Recording Power and Speed

Climbing into the pilot's seat there was an opportunity to see the workings of this big car—the pioneer of the fighting squadrons soon to come. The powerful motor, with all its pistons jumping, was just ahead, with two long exhausts sweeping back toward the tail. Within the seat were straps to hold the pilot in a headlong flight, and all the delicacy of mechanism one sees in an automobile—speed indicator, gas meter, oil pressure, throttles, switches—and much more besides; lights for signalling, height meter and compass, and fire extinguishers to fight a blaze.

"This is the joystick," said Captain X., as he swung the lever controlling the tail and ailerons. And he pointed out that the foot rudder, which controls the horizontal movement, worked on the same principle as the bob-sled.

"Truly it is a wonder," he said, fondling the mechanism. "I know them all—English, French, Italian—and there is nothing like this for power and speed. Why?"

And then he gave an instance of what had been accomplished in a straight rise from the ground, which constitutes a record far exceeding anything before. This was made in one of the Liberties recently turned out here. It was not regarded as one of the best of the machines, and the workmen even dubbed it "False Alarm!" But it soon proved its rights. It was sent to one of the training fields, and on one of its first ascents it shot up straight from the ground to the height of 20,400 feet in 35¾ minutes.

"It is the fastest time a human being has ever gone up," said the Captain, "and it gives an idea of what is ahead when these squadrons are in line."

If details could be given of the number of these planes and the squadrons equipping for the battle line, it would cheer those who have grown heartsick with waiting and charges and investigations, and would let them know the day of real accomplishment was at hand in the thick of the fighting. Without giving numbers, it can be said that we saw these machines crowding a vast workshop in such arrays that their wings touched and covering much more than the area of a city block. They were not piecemeal cars, but all ready to go forward. They have been passing by the score daily into the hands of the aviators, and squadron after squadron was being made ready for the front.

We saw them in combat formation over the flying field of Issoudoun. This was no longer a vague promise of the remote future, it was at hand, and we saw these machines in vast number arming and starting for the battlefront.

The testing of the engines gave an idea of the tremendous power of the new cars. The cars were anchored by heavy chains, and workmen gripped the long body to keep it from plunging as the propeller started and the engines gave out a long wail. The men, gripping the chains and rigging, were swept as though in a tornado, the grass was flattened and great clouds of dust rose like the smoke of batteries. There is an awe in the power of this engine and its whirling propeller, and a danger, too, which the men have learned.

The suction of the propeller while the car is on the ground is far greater than has ever been known with other cars. A workman was drawn in, and killed the other day, and the great maelstrom of rushing air sucks in everything coming within ten feet of its mouth. But this is merely a detail of testing and has no bearing on the capacity of the car for flight. Like the power of the engine, the propeller is much larger and heavier than in other cars.

This turning out of the new type of American Liberties is only one of the activities of this mammoth air service production centre located here, with huge shops and warehouses, 2,700 men, 200 officers, and 1,200 Chinese laborers. All the planes made in America come here in parts, to be assembled, tested, armed, and all the other makes of planes are mobilized here preparatory to going into use on the flying fields and the front. There is, besides, the huge work of receiving the wrecked planes as they come here riddled with bullets, their wings torn off, which tell of a fierce contest. Such as can be made serviceable again are sent back to the field, while the wreckage of those beyond repair strew an immense field and is a ghastly reminder of the heroic sacrifice their pilots have made.

The process of assembling the machines as they come from America was followed through its various stages in the six huge "bays" of the workshop, each bay having a capacity of eighteen machines, or over 100 machines going forward at the same time. Nine huge boxes bring the different parts. First, the fusilage or body is set up, the motors installed, the landing wheels attached, the wings and tail adjusted, the gun racks and armament prepared, and soon a complete car ready for flights grows out of the scattered parts.

How many are turned out daily cannot be stated, but it can be said that the capacity of this big aeroplane centre working in eight-hour shifts is fifty complete aeroplanes a day. And in these days, when the mobilizing of machines follows close on the mobilizing of men, the actual production is not far from the full capacity.

ALLIED AIR CONTROL PLAINLY SHOWN

In the Week's Fighting the British Alone Destroyed 101 Enemy Planes

SO far as air fighting is concerned, the past week has been one of the most remarkable of the war. At least three aspects of the week's work will take a good deal of explaining by the Germans.

First, the British independent air force dropped more bombs on German towns in five days than had been dropped at any previous time in a fortnight.

Second, in twelve hours British airmen took more aerial photographs of German positions behind the Hindenburg line than any previously recorded day's total.

Thirdly, in a single air fight over the German coast defenses in Belgium, British airmen destroyed or drove down out of control eighteen enemy machines, or nine for each of the two British machines reported missing.

These facts show that the initiative in the air, as on land, has passed definitely into the hands of the Allies.

Foremost among the achievements of the week must be placed the remarkable effort of the independent air force against the enemy railways near Metz and in the St. Mihiel salient. It easily broke all records both as regards the number of objectives attacked and the weight of bombs dropped. Acting in conjunction with the Franco-American offensive it made thirty-five separate raids between Friday morning, September 13th, and Monday night, the 16th. Of these thirteen were directed against the vital railway junction and triangle at Metz-Sablon, four against the junction at Courcelles, eight against Saarbrücken, Kaiserlautern, and Mainz, while heavy attacks were also made upon important enemy airdromes at Buhl, Boulay, Frescati, and Hagenau.

Air attacks upon such important railway centres have a direct and powerful effect upon the military operations of the enemy, delaying much-needed supplies of arms and ammunition, disorganizing and preventing the rapid transport of troops and withdrawing large numbers of enemy aircraft from the zone of battle.

In addition there were remarkable simultaneous long-distance raids into Germany. These were directed against chemical and aeroplane factories.

In all over sixty tons of bombs were dropped in five days, or more than half the total weight of bombs discharged by the Independent Force in the preceding month, which in itself constituted a record.

On the northern battlefront in France in the course of two days' fighting, seventy-two German machines were destroyed, twenty-seven sent down out of control, and one hostile kite balloon shot down in flames, making a total of 100 enemy aircraft accounted for in forty-eight hours. In the same period thirty-two machines were reported missing.

Simultaneously with this heavy fighting in the air, British bombing squadrons were very active, dropping over seventy tons of bombs upon military objectives behind the battle line.

In all, British airmen on the western battlefront in the past week have dropped upwards of 120 tons of bombs, exclusive of those dropped in Germany, have destroyed 101 enemy machines and driven down thirty-seven more out of control. Fifty British machines were reported missing.

AIR-BOMBING CHIEF PRAISES AMERICANS

Tells of Splendid Work of Escorting Squadron Co-operating with British

THE commander of the American aero squadron on the American front has received the following letter from the chief of the British squadron, with which the American forces have been co-operating:

"I would like very much to express in writing the gratitude felt both by myself and the personnel under my command for the exceptionally fine escort work done by your squadron when escorting in bombing raids.

"We all have agreed that when the squadron is escorting in our raid we have nothing to fear from the enemy aircraft. Although it often is imperative to fly low, thus making a very long trip over the lines, nevertheless your squadron always has stuck to us.

"On one or two occasions one of our machines would straggle owing to engine trouble, but these machiness had no need to fear the attacking enemy aircraft as one of the escorting machines would always look after the straggler.

"On many occasions enemy aircraft have attempted to attack our bombing machines over the target, but they never have been successful owing to the excellence of the escort.

"Finally, I can only say that I do not consider any squadron in France is supplied with a better escort than is my squadron."

HOW THE AERIAL MAIL TOOK A REPORT TO GENERAL PERSHING A WEEK SOONER

HOW the aerial mail took a report to General Pershing a week sooner is told by the publication *Personnel*, published by the Adjutant General of the United States Army. The article is entitled "It Couldn't Be Done, But——," and read as follows:

General Pershing had cabled an urgent request that all officers be re-rated before being sent to France. A Western division was on its way and had stopped at a pre-embarkation point. It was essential that the officers make new ratings at once, particularly in view of the fact that the old ones had been inaccurate because of lack of instruction.

A representative of the Personnel organization was therefore sent from Washington to address the twelve hundred officers of the Division and instruct them in proper methods of rating. He left on the 9 o'clock train, the last one that would get him to his destination before 4 o'clock, the time appointed for the meeting.

About 9:30 it was discovered by two other members of the organization that important papers he would need were in the office—among them a complete analysis of the previous ratings of the Division that indicated clearly the improvement necessary. They knew, without being told, that lack of these papers would handicap the effectiveness of his instruction; hence some way had to be found for getting them to him.

As usual, everybody said it couldn't be done. There was no train and no other means of communication fast enough. *Yes, the aeroplane mail service operated between Washington and Philadelphia, but the mail was closed.* Besides, the mail bags were locked and could not be opened except at the Philadelphia post office. This would not allow time for the swiftest courier to reach the camp before the meeting. As a final barrier, there was no courier available.

It couldn't be done. Yet it *had* to be done. And the arrangements had to be made by telephone in less than twenty minutes, for the aeroplane was to leave at 11 o'clock.

It *was* done. The Second Assistant Postmaster General authorized the necessary steps. The papers were received and carrid by *the aeroplane* as an outside package. At the aviation field the package was dropped into the hands of a motorcycle courier sent from the camp. He sped off and arrived just in time for the meeting. As a result the new ratings of the Division from the West are accurate ratings—ratings that can be depended upon by the command overseas.

The United States Army today is an efficient army. It is demanding results and getting them. The reason is that throughout the organization is growing constantly a spirit of co-operation and singleness of purpose—a spirit which enables it to do what *has* to be done—even when told that it *can't* be done.



THE NEWS OF THE WEEK



Allied Air Services to Pool Resources

A dispatch from Paris by Charles H. Grasty, special correspondent of the New York *Times*, says:

After spending several days at aviation headquarters on the American front John D. Ryan is back in Paris working with the British and French on aviation plans. He and Winston Churchill spent yesterday together and there is close co-ordination between them and the French.

Mr. Ryan's effort is in the direction of pooling resources and getting the greatest possible force to the front in the shortest possible time. Allied representatives are meeting him in the same spirit and they are getting results.

Mr. Ryan was much pleased with the showing made by our air service in the recent offensive, which he had an opportunity of observing.

Long Island Flyers Made One Brigade

All the flying fields at Long Island will hereafter be known as the 1st Reserve Brigade of Long Island, with the main headquarters at the Hazlehurst Field, Mineola.

Lieutenant Colonel Claude K. Rhinehart will command the brigade, which includes Hazlehurst Plateau, the H. J. Damm Field at Babylon, the Brindley Field at Comac, the Major Lufbery Field at Wantagh and the Mitchel Field at Hempstead.

Major Robert D. Wrenn commands the Mitchel Field; Lieutenant Colonel Archie Miller, the concentration field; Major Whitten J. Fast, Brindley Field, and Captain H. B. Peters, Hazlehurst Plateau. Major Thomas Hitchcock commands all flying and his assistant is Captain F. H. Harvey.

Major John S. Phipps, formerly a crack polo player of Meadow Brook, is the executive officer of the brigade. The brigade adjutant is Lieutenant James J. Gambs, and Lieutenant J. R. Homer Akers is his assistant. Lieutenant John R. McKee of California and Lieutenant James D. Cassel, who is a son-in-law of Inspector General A. W. Brewster, are adjutants for the Hazlehurst Field.

Athletic Equipment for Army Aviators

An appeal for athletic equipment, and also musical instruments, for the enlisted men of our aviation forces has been issued by the National Aeronautic Committee, 289 Madison avenue, New York, of which Mrs. Newton D. Baker is honorary chairman, and Mrs. Charles A. Van Rensselaer, chairman. The committee, which is under the direction of the War Department Commission on Training Camp Activities, has received requests from officers in command of Army air squadrons going overseas and also from all air training stations in this country, to supply equipment for baseball, football, soccer, basketball, track athletics, volley ball, indoor baseball, medicine balls, punching bags, boxing gloves, etc. Major General Kenly endorses this work, it is stated.

75 Planes to His Credit

Toronto.—Capt. McCaul of the Royal Air Force, who is said to have brought down seventy-five German aeroplanes, or three more than the number credited to Lieut.-Col. Bishop, Canada's crack aviator, arrived here on Sept. 17 en route to spend a six months' furlough at his home in western Canada. He was aboard the steamship shelled by a German submarine a few miles off an Atlantic port.

Capt. McCaul, who wears the D. S. C., Military Cross, and the Distinguished Flying Cross, is said to have been recommended for the Victoria Cross.

5 Yankee Flyers Win Decorations on British Front

With the American Armies in France.—The brilliant work of the American airmen on this front, particularly during the great August battle, has been quickly recognized by the British, who have just conferred the coveted Distinguished Flying Cross on five American airmen. This is the first time such a decoration has been awarded to airmen not of British nationality.

In August occurred the first battle where all the American units pacticipated under American leadership, and of seventy-five machines downed during the month by the Americans most of them were brought down by these units, and this does not include unofficial victories or indecisive combats. One unit had twenty indecisive combats, and one pilot who is credited officially with six destroyed enemy planes has seven unofficial victories which he has not claimed.

Among those decorated are Lieuts. G. M. Vaughn of Washington Avenue, Brooklyn; Merton L. Campbell of Wakeman, O.; L. A. Hamilton of Burlington, Vt.; Thomas J. Herbert and James A. Keating.



Ensign Arthur Childs Burns, Senior Flight Officer, United States Air Station, Rockaway Beach, L. I.

New Aviation Base

The Government is planning to establish an aviation base in San Pedro in connection with the submarine base in the outer harbor.

Camp Greene to Be Enlarged

The biggest aviation training and concentration camp in the world is to be established at Camp Greene, N. C. Announcement to this effect has been made by Secretary of War Baker. As rapidly as possible arrangements will be made to provide accommodations at the camp for at least 15,000 aviators, and after the camp gets in full swing it is expected that as many as 25,000 fliers will be in training there at one time.

Camp Greene has been abandoned as a divisional training camp. More recently it has been used as a remount station, but this also will be discontinued, the remount service being removed elsewhere. The camp is located near Charlotte, N. C.



AT AN AMERICAN REST CAMP IN SOUTH OF ENGLAND CENTRE
Major Mackenzie Rogan, M.V.O., Bandmaster of the Coldstream Guards and part of the American Air Service Band

Putnam, American Ace, Killed Near St. Mihiel

First Lieutenant David E. Putnam of Newton, Mass., American ace of aces, was killed on Thursday, Sept. 12, while on patrol along the American lines north of St. Mihiel.

Lieutenant Putnam was flying with Lieutenant Wendella Robertson, when they were attacked by seven German machines. Four of these made for Putnam's aeroplane, and three attacked Robertson's. The attack was sudden and unexpected, and the enemy was able to fire from above.

Lieutenant Putnam was shot twice through the heart. His machine glided to the earth at Limey, within the American lines, where he was found by his comrades.

Lieutenant Putnam, who was 19 years old and a descendant of General Israel Putnam, had twelve aerial victories to his credit. He enlisted as an aviator with the Lafayette Flying Squadron, and made his debut Dec. 20, 1917. After seven months' training and one month's service at the front he fought his first battle and won it on Jan. 19, 1918.

One of his longest and hardest fights was on April 11, when he engaged four two-seaters for thirty-five minutes, and brought down one of them. The next day he got two out of a German "circus" of six machines. On May 15 he was engaged at close quarters with a two-seater, who fell forward, pierced by a bullet from Putnam's gun.

The young American aviator was made famous by his work in a fight on June 5, when he brought down five of an enemy squadron of ten Albatrosses. The fight took place over the battlefield of Rheims.

Speaking editorially of Lieut. Putnam the New York *Sun* says:

No American aviator had a finer single exploit to his credit than Lieutenant David E. Putnam, who has gone the way of Lufbery, Thaw, Roosevelt and many others of our young heroes of the air.

His performance above Rheims last June, when he engaged ten enemy Albatrosses and brought down half of them, has not been surpassed in the war unless perhaps by Fonck, the greatest of the French fliers since Guynemer.

Putnam was not only a great aviator, but an aggressive fighter, who went into the clouds for his foe as his ancestor, Israel, went into the cave for the wolf.

150 Yankee Air Raiders Bomb Retreating Troops

With the American Army in Lorraine.—The Germans in their retreat from St. Mihiel used two main roads. The Americans closed one of them and the sole avenue of escape left to the enemy was the St. Benoit-Woel road. Congested transports of troops and guns were struggling along the road when there suddenly appeared 150 American airmen carrying small bombs and 500 rounds of ammunition each.

Swooping down the road they pelted the bombs and bullets. Horses fell and men ran and wagons disappeared. All that was left was a jumbled mass, which enabled the American troops to make a large haul.

The War Department Authorizes the Following

Cadets and student officers at Kelly Field, Texas, are beginning a new system of instruction which will eventually require them to actually construct the ships in which they fly. This course is a departure from the regular curriculum. It is not yet general and had yet to be approved by the Training Section. At present the work amounts to twelve days in putting together wings and fuselage only. The other parts of the shop will come in little by little as the course advances, until the practical assembling of a complete aeroplane is a part of the instruction of every flyer. Instructors believe that if American fivers are required to put together the ships that they will later control, there will be less carelessness, less tendency to hurry work being done, or to overlook anything that might endanger life later on.

The new course of instruction at Kelly Field will take the prospective flyer completely through all the shops. The aeroplanes put together will be inspected by experts before they are flown and whenever an error is found in assembly the cadets or student officers who put this particular machine together will be shown what might have happened to the flyer had not the error been detected in time.

It is further believed that the new course will acquaint flyers with the functioning of all parts of their machines so that in case of forced landings they will be able to make repairs sufficient to take them home.

La Guardia is Made Major of Aviators

Congressman Fiorella H. La Guardia of New York City, who as a captain in the United States Aviation Service in Italy has been mentioned many times in dispatches for bravery, has been promoted to be a major. The promotion appeared in the army orders. Mr. La Guardia was one of the first legislators to obtain a leave of absence to serve his country on the firing line.

Embryo U. S. Aviators Fight Imitation Hun

In their eagerness to win top score over their competitors the instructors of the Gunnery School at Rockwell Field, Cal., Division of Military Aeronautics, have devised a floating sleeve target which resembles a small cylindrical shaped balloon, and when released in the air is used as the floating target at which the air gunners shoot.

At an elevation of 5,000 feet the target is released. Then the shooting begins, the aeroplanes diving at the target or running from it and using in the game every stunt known to fliers. At the mercy of air currents and being light in weight, the sleeve target twists and turns in every conceivable manner and direction, all of which tends to make it as tricky as a Boche opponent. Service ammunition is used by the gunner and this target practice takes place over areas on which there is no habitation.

The Egyptian Flying Forces

The efficiency of the British air service has been strikingly illustrated by the list of honors bestowed on officers and other ranks of the Royal Flying Corps serving with the Egyptian Expeditionary Force in 1917. The list follows:

Victoria Cross	1
D. S. O.	4
Military Cross	34
Croix de Guerre	2
Military Medal	1
Meritorious Service Medal	14
Order of the Nile	2

The airmen's work was of incalculable value during the march of the expeditionary forces northwards from the crushed Gaza-Beersheba line. The patrol work was so effective that only one enemy machine penetrated the area from which its occupants could see the movement of troops about to attack Beersheba. This was brought down by the British aviators.

Perilous long-distance flights were made by the Englishmen in Palestine, three of whom bombed Maan after a trip of 150 miles from an aerodrome in a straight course over desert land so rough that it would have been impossible to come down without seriously damaging a plane.

Aerial Gunnery and Trick Flying School

The largest aerial gunnery and trick flying base in America will be established by the War Department at Rockwell field, on North Island at the entrance of San Diego Harbor. The schools there for training army airmen will be patterned, largely, after those at Cazeau and Avord, France. The students will receive advanced training at Rockwell according to the schedule of the great French schools.

Don't Kill Carrier Pigeons

Legislation is urged in several states to make it a federal offense to kill the carrier pigeon. This action results from the slaughter of these birds near training camps, particularly in Kentucky. Carrier pigeons are of vital importance in modern warfare, carrying messages when all other means fail.



Ensign Harold A. Pulliam, holder of Hydro-aeroplane Certificate No. 237, of the U. S. Navy. His brother, K. G. Pulliam, is Captain in the Army Air Service

American Aviation Camps in France

America has an aviation camp in France, with barracks for 6,000 men, space for many hangars, rest rooms, Y. M. C. A. huts, warehouses, spare-part stock rooms and a machine shop. This mushroom city rose over night on the spot where three months before General Pershing splashed through on one of his inspection tours.

One West Point officer runs the entire camp. No pilot goes there who has not had some training elsewhere and the school is meant especially for the combat and bombing pilots.

Arizona Flyer Downs Three Foe Observation Balloons

With the American Army on the Lorraine Front.—Three enemy balloons were destroyed on Sept. 17 by Lieut. F. Luke, Jr., of Phoenix, Ariz., on a flight into the German lines. This makes his total nine balloons in three days.

With Lieut. J. F. Whener of Everett, Mass., Luke left his aerodrome at dusk and crossed the line. Within thirty-five minutes the American aviators had completed their work of destruction and the flames could be seen from the American aerodrome.

One other balloon was destroyed and three more are believed to have been shot down, but the reports have not been confirmed. Bad weather prevented bombing, however, and the only observation possible was the adjustment of artillery fire.

German aviation machine gunners and bombers attacked what they supposed to be the American positions in the region to the west of Vandieres on Sept. 17. The mist and low clouds, however, prevented the Germans from finding their targets. The Germans themselves were located and driven back by anti-aircraft fire.

The flying machine gunners dropped near the ground at several places in their determination to find the American troops, but the weather conditions were too much for them. The bombers flew at higher altitudes, but they, too, were hampered by the weather and possibly by misinformation as to the American positions, and wasted numbers of bombs.

Owing to the effectiveness of the American and French anti-aircraft fire, a number of the German machines were hit, the observers reported. When last seen the crippled planes were returning hastily to their own lines.

American aviators have performed many feats of daring and endurance the last few days.

One of the most trying experiences was that of Lieut. Snyder of a reconnoissance group, who flew with another officer over the enemy lines at a height of less than 1,000 metres in a rainstorm. They remained in enemy territory more than two hours, always flying at a low altitude.

They penetrated a distance of thirty-three miles and brought back much valuable information. Although they were repeatedly fired at by anti-aircraft guns and passed through several rainstorms, they returned safely.

The large part which aviation has played in the offensive operations is indicated by the summary of the first four days of the battle. According to this, despite the heavy rains which transformed the airdromes into seas of mud and seriously handicapped them for at least two days, the aviators were not only able to make more than 3,300 sorties, covering a period of 4,000 hours, but so thoroughly bombed the enemy aerodromes that the enemy was unable to accomplish much.

Five U. S. Planes Missing

Gen. Pershing reported in the communique of Sept. 18 as follows:

In the course of a bombing operation in Lorraine our aviators were attacked by superior forces. Five of our machines are missing.

Lieut. Ray Brooks an "Ace"

A press dispatch says Lieut. Ray Brooks of Boston qualified on Sept. 16 as an American ace by shooting down his fifth enemy plane. Lieut. Horace Lake, formerly an architect in Washington, D. C., and Lieut. Bertram Neideneker of New York City, in a French machine, are credited with being the first Americans to go over and shoot up the new German positions. Flying less than fifty yards from the ground they sprayed the roads and shell holes filled with enemy troops and returned safely.

Specialists May Choose Branch of Service

Washington, D. C.—After October 1, registrants of September 12 may be inducted into special branches of the army, which are in need of men, and for which the registrants are specially qualified. The wide-open volunteer system will not be accepted again.

Persons inducted into the army under this system must enter as privates and may be sent to officer training camps, whence they may be commissioned, but if they fail of commission they remain in the army as privates. The War Department has also let it be known that the day of civilians stepping into the army with commissions is practically at an end.

If a man goes to an officers' training camp he comes out a second lieutenant or a private. When the department needs a first lieutenant he will be promoted and so on to the captaincies and higher officers. Only a highly trained expert very necessary to the military is likely to receive a commission higher than that of second lieutenant; and practically all successful applicants for even second lieutenancies must come from the ranks.

War and Navy Department officials are now struggling with the regulations governing assignment of draftee men to army, navy and marines. It is possible registrants who are drafted may be allowed to indicate any special qualifications for these services, which the local boards may take these services local boards may take into consideration in certifying them in response to calls.

However, the tendency in the Provost Marshal General's office just now is to take from the local board the authority of decisions of this kind and the Navy Department seeks some more definite means of fixing the qualifications for men certified to it for service.

Balloon Cable as Aerial

Reports received at the Division of Military Aeronautics from Balloon Training Fields in various parts of the country, show several unusual messages received by the wireless crews, indicating increasing efficiency both in the work of the students and the equipment. The wireless station at Arcadia, California, by using for an aerial the cable of a balloon put aloft from the training field, has intercepted messages sent by the Brooklyn (N. Y.) Navy Yard. This balloon cable probably makes the highest aerial in the world.

This particular school has 106 miles of wire in use for teaching military communication. For the purpose of demonstration it has a complete system of wiring strung as it would be in the front line trenches. Communication posts and stations for all kinds of messages are used by the students the same as soldiers use them at the front.

A good part of the country southeast and southwest of Arcadia is laid out with lines of communication to this balloon school, similar to part of a sector at the front. All of the balloons, when aloft, are so wired that they can be linked together with any trench, doubled up for any work together, or they can be cut off from the trenches and talk only with their own chart room and winch or operating crew on the ground below.

(*Continued on page* 141)



One of the New York Air Raid Sirens which opened the Fourth Liberty Loan Campaign by sounding at 7.55 P. M. on Friday, September 27th. The Sirens all over Greater New York sounded for five minutes and at 8.15 P. M. they sounded the "all clear" signal. The use of the Sirens not only reminded people of the Fourth Liberty Loan, but they gave people an idea of the alarm which would be sounded in case of an actual air raid

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville



PARIS AEROPLANE MAIL SERVICE INAUGURATED

The first trial of the aeroplane post from Paris to St. Nazaire recently. Two planes made the trip, leaving from Le Bourget and making one stop at Le Mans. The first plane carried over a thousand letters; the second followed in case of accident to the first. The Minister of Posts and Telegraphs, the President of the Aeronautic Commission, and many other officials witnessed the start of the initial flight. The photo shows the pilots who made the trip

Aero Mail Defies Storm

The storm at Belmont Park on September 18 was the worst of the month, but it did not stop the aero mail service. Pilot De Hart waited an hour and then flew south at the height of the storm, while Pilot Robert Shank came through in about the usual time from Washington and reported that he had flown from cloud to cloud, encountering the worst storm since he had been flying on the aero mail route. He kept as near the earth as possible. He left Washington at 11:45 A. M. and landed in Belmont Park Field at 2:50 P. M.

New Mail Flight Record Washington to New York

All records of mail flights from Washington to New York were broken Sept. 17 by Aviator Miller, accompanied by Aviator Newton as a passenger and the mail. The same aeroplane was used for the entire trip—a standard plane with a 150-h.p. engine. The plane left Washington at 11:36 a. m. and arrived at Philadelphia at 1 p. m.—1 hour and 24 minutes, or a speed of 91½ miles per hour. It left Philadelphia at 1:07 p. m. and arrived at New York at 1:50 p. m.—43 minutes, or a speed of 125½ miles per hour.

Time, Washington to New York, including Philadelphia stop—2 hours and 14 minutes, or a speed of 102 miles per hour. Time, Washington to New York, actual flying time, 2 hours and 7 minutes, or a speed of 108 miles per hour.

Monthly Report of Operation and Maintenance

UNITED STATES POST OFFICE AERO MAIL SERVICE
FOR JULY 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	PILOTS		HANGAR MEN		MECHANICS		Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST					
							Actual time	Dead time	On plane	Miscellaneous	On plane	Shop time					Gallons of Gasoline	Total time run	Total miles run	Miles run per gal. gas.	Cost per hour	Cost per mile
																		hr. mi.				
38262	$77 34	$27 95	$16 94	$98 51	$15 73	$57 44	$61 90	$43 73	$84 32	$22 00	$45 12	$20 35	$66 77	$71 42	$55 30	$764 82	254	21 18	1460	5 74	$35 90	$ .5238
38274	143 72	47 04	16 95	98 51	15 73	57 44	98 06	43 74	84 32	22 00	136 00	20 35	695 58	71 42	55 30	1696 16	471	35 44	2450	5 20	44 95	.6555
38275	49 20	14 29	16 94	98 51	15 73	57 44	39 34	43 74	84 33	22 00	29 53	20 35	757 83	71 42	55 30	1375 95	162	13 07	710	4 38	104 90	1.9379
38276	46 08	16 49	16 94	98 51	15 74	57 44	33 70	43 74	84 33	22 00	73 39	20 35	18 40	71 43	55 30	673 84	151	9 05	630	4 17	74 18	1.0695
38278	124 76	41 69	16 94	98 51	15 74	57 44	116 62	43 74	84 33	22 00	108 55	20 35	67 27	71 43	55 30	944 42	409	27 18	2063	5 04	34 59	.4577
39362	57 60	4.60	17 67	98 51	15 74	57 44	11 08	43 74	63 46	22 00	60 20	20 35	263 55	71 43	55 30	862 67	192	5 13	450	2 34	165 36	1.9170
39363	150 30	9 46	17 66	98 51	15 74	57 45	83 32	43 74	63 10	22 01	117 08	20 35	2 89	71 42	55 30	829 33	501	19 11	1710	3 41	43 22	.4849
39365	130 30	18 79	17 66	98 51	15 74	57 45	94 20	43 74	63 10	22 01	117 26	20 35	202 34	71 42	55 30	1028 17	441	20 21	1820	4 12	50 52	.5649
39366	113 70	10 39	17 66	98 51	15 74	57 45	94 36	43 74	63 09	22 01	106 56	20 35	262 23	71 43	55 30	1052 52	379	23 11	2093	5 52	45 39	.5028
39367	75 80	7.99	17 66	98 51	15.74	57.45	58 16	43 74	63 09	22 01	88.54	20 35	167 81	71.43	55 30	863 58	251	14 25	1215	4 84	59.90	.7107
Total	$968 80	$198 69	$173 02	$985 10	$157 37	$574 44	$691 74	$437 39	$737 47	$220 04	$882 03	$203 50	$2504 62	$714 25	$553 00	$10001 46	3211	188 53	14601	4 54	$52 95	$ .6849

Note.—Depreciation is not estimated in this report, for lack of convincing data, but is reflected in the items under repairs, parts and labor.
Items for rent, light, power, etc.; misc.; dead time of pilots; time of hangar men, misc.; shop time of mechanics; interest on investment; and departmental overhead charges; all of which are not directly apportionable to individual ships, are pro-rated equally between all of the ships.

Aerial Mail Service in Canada

AERIAL mail service is being extended throughout the world. During the last month cables have brought reports of flights for the delivery mail and important government communications in Sweden, Norway, France, Italy, Great Britain, India and Japan. Except for the postplane deliveries in France and Italy, these flights abroad have been practically all experiments. The success of the daily uninterrupted postplane service between New York, Washington, Philadelphia and Boston has brought insistently to the attention of all other governments the necessity for this rapid and certain means of communication.

Uncle Sam's neighbor to the north is the latest to try the aerial mail service. Canada has been so busy training youths for aerial combat service abroad that it has had little time to give to the development of commercial aeronautics. But the Canadians have been alive to the possibilities of commercial aviation. Lieutenant Georges Flachaire of France recently gave a remarkable flight demonstration from Montreal to Toronto and thence on to Cleveland. A Canadian flight officer, Captain Bayne, flew in June with pouches of mail from Montreal to Toronto. He made the trip in seven hours, landing on the way at Ottawa. The flight took seven hours and was notable as being the first trip made in Canada for the delivery of government mail.

Miss Stinson's Flight

Shortly after the full success of the United States aerial service was realized, the control of the service passed into civilian hands under the control of the postmaster-general. Canada is not far behind, as may be judged from the first civilian flight with government mail made by Miss Katherine Stinson, a Curtiss flyer, on July 9, 1918. Miss Stinson flew from Calgary to Edmonton, Alberta. Hers was the first flight of the kind ever made in Western Canada.

Miss Stinson, a few years ago, was similarly honored by the United States Government.. She adds to her aerial honors the privilege of having been the first civilian to fly with mail in Canada. The editors of the leading Canadian papers speak of the flight as the actual inauguration of aerial mail service in the Dominion.

The Canadian Government has a monopoly on the handling of all mails in the Dominion. Miss Stinson was enabled, however, to make the flight through the special dispensation granted by the postmaster-general at Ottawa.

Making Canadian Record

Late in June, Miss Stinson winged into western Canada with her Curtiss aeroplane and she circled over the wide prairie stretches of the wonderful country, visiting the ranching communities. On July 9th, she was in Calgary with her Curtiss plane. Calgary is one of the wonder cities of Canada. It sprang up over night on the western frontier of Alberta. To the north is Edmonton, which until recent years was an outpost of civilization in Western Canada. But they are cities of enterprise and spirit. They are the marketing centers of the great grain basket of the Dominion. The Calgary Exhibition was in full swing at the time. Miss Stinson's flight became the climax of the successful showing of the products of the limitless prairie, draped negligently over the horizon.

Night Trip in Daylight

Promptly at 6 P. M., July 9, 1918, Miss Stinson opened the throttle and bumped over the gopher holes of a field north of the city. She was in the aid in a second and sought an altitude of 3,400 feet. Two hours and five minutes later, she swooped as gracefully as an eagle over the landing field at Edmonton and made a perfect landing. Miss Stinson, America's greatest woman flyer, had flown the 196 miles in exactly 125 minutes.

In the cockpit of the machine, Miss Stinson carried a pouch containing 259 letters. One was addressed to the Honorable Mr. Brett, premier of the Province of Alberta. Others were addressed to the mayors of the cities of the plains, to the police chiefs, to army officers, to postmasters, to women's clubs and to newspapers. Postmaster King of Calgary had personally cancelled each of the letters. The postmaster of Edmonton officially received the mail pouch when Miss Stinlanded at the capital city.

In the enthusiastic crowd which gathered about Miss Stinson's Curtiss plane when she landed at Edmonton were two Royal Flying Corps officers. One of them had but recently returned from overseas service and the other had finished his course of training and was ready to join the British flyers abroad. They knew the worth of the Curtiss machine; they had completed their training in the cockpit of these reliable machines. But they were surprised that a woman, frail and girlish as Miss Stinson, had been able to complete the flight in an elapsed time they would have been proud to have made.

Guided by School Map

The flight was made in broad daylight. It is quite possible during this season of the year to read a newspaper in the open as late as 10.30 o'clock at night. Daylight continues long after the sun has sunk below the wheatfields. In the flight, Miss Stinson guided herself with the aid of a schoolbook map she had torn from a book. The splendid little flyer has a habit of using any sort of a map which is readiest to hand when she is about to cloud-trek across country. She had no difficulty in directing her course with this small map. On the back of it ,she wrote an account of her trip and sent it to the welfare division of the Curtiss Aeroplane and Motor Corporation.

AIR SERVICE OPEN FOR ENLISTMENTS

IRRESPECTIVE of status in the draft, the Air Service has been reopened for induction of mechanics and of candidates for commission as pilots, bombers, observers and balloonists, after having been closed, except for a few isolated classes, for the past six months.

The fast moving overseas of air squadrons, planes, motors and material for American airdromes, fields, and assembly plants in France and England, together with the completion here of 29 flying fields, 1,200 de Haviland planes, 6,000 Liberty motors, the parts for the first heavy night bombers, 6,600 training planes and 12,500 training engines, has led to the necessity of increasing both the commisioned and the enlisted personnel in order to maintain full strength in this country and continue the necessary flow overseas. As a result the Air Service, alone, is now half as large again as the whole American Army at the outbreak of war.

Civilians have not been given an opportunity to qualify as pilots since last March. During last fall and early winter, a reservoir of over 6,000 prospective flyers, accepted by the Examining Boards, had been built up, and has since been gradually drawn off as room has been made for them in the aviation ground schools through graduation. Moreover, a large number of men already serving in the ranks of the Air Service have been permitted to train for commissions, in line with the policy of promoting men from the ranks whenever possible.

The available number of men possessing the necessarily very high qualifications is insufficient for the needs and as a result it is now possible to examine and accept men from civilian life, in addition to those in the enlisted personnel. The number of men who must be examined is great indeed compared to the number of men who become finished pilots. Practically one applicant out of every two is found unfit for flying at the first examination, while, even of those accepted, a large number prove wholly unable to do the mental work necessary in learning the theories of flight, radio, photography, bombing, machine gunnery, and artillery observation, so that fully 15 per cent are disqualified in the first step at the ground schools and still more in the actual flying courses later.

While this present call for flying candidates is being made generally, it is hoped that in order to avoid unnecessary pressure on the Examining Boards, possible candidates will consider whether they have both the physical and the mental qualifications necessary. The age limits for flyers are from 18 to 30 inclusive, with preference to those under 25, and for balloonists from 18 to 45. Applicants may apply at the Aviation Examining Boards located at:

Atlanta, Ga., Georgia School of Technology.
Boston, Mass., 739 Boylston Street.
Chicago, Ill., 230 East Ohio Street.
Dallas, Texas, Camp Dick.
Fort Sill, Okla., Post Field.
Los Angeles, Calif., Marsh-Strong Building.
Mineapolis, Minn., University of Minnesota.
New York City, 104 Broad Street.
San Antonio, Texas, Fort Sam Houston.
San Francisco, Calif., 55 New Montgomery Street.
St. Louis, Mo., 525 South Euclid Avenue.
Washington, D. C., Building "D," Floor 1, Wing 2.
Canal Zone, Camp Sherman.
Or to the Personnel Section, Division of Military Aeronautics, Washington, D. C.

The call for mechanics opens the Service to a large number of skilled men anxious not only for active field service, but also for service for which their training best fits them. Skilled men only are wanted. Others would have no value in the highly delicate and technical work required. Those accepted will be sent to a Concentration Depot, trade tested, given a special intensive training in the new science of airplane mechanics, and then organized into aeroplane crews and squadrons, some for duty here, others for duty overseas, with especially good opportunity for advancement, since over four-fifths of the men are promoted above the grade of private. The classes especially desired as shown by the last year's experience are:

Airplane mechanicians, cabinet makers, chauffeurs, electricians, auto mechanics, radio operators, motorcyclists, tailors, instrument repairmen, armorers, carpenters, clerks, motor mechanics, riggers, engine repairmen, propeller makers, stenographers, machinists.

The Air Service today is over 160 times what it was on the outbreak of war.

Applicants, as mechanics, who will be accepted between the ages of 18 and 55 inclusive, may receive further details from the Department Air Service officers in the six departmental headquarters located at Boston, New York, Chicago, San Francisco, San Antonio, and Charleston, S. C.; the Air Service Trade Test Boards located at:

Army Recruiting Office, Atlanta, Ga.
739 Boylston Street, Boston, Mass.
230 East Ohio Street, Chicago, Ill.
Tramway Building, 14th and Arapahoe Streets, Denver, Colo.
Third Floor Municipal Courts Building, Detroit, Mich.
104 Broad Street, New York City.
Care of Department Air Service Officer, Western Department, San Francisco, Calif.
Third and Olive Streets, St. Louis, Mo.
Madison, Wisconsin.
Fifth and Dodge Streets, Omaha, Neb. (Army Building).
Care of Air Service Mechanics Training School, Overland Building, St. Paul, Minn.
Kelly Field, San Antonio, Texas, Air Service Mechanical Training School.
Or by writing direct to the Personnel Section, Division of Military Aeronautics, Washington, D. C.—Committee on Public Information.



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R.F.C., C.F.A.

THE life of a balloon at the front is variously estimated at from one hour to several months, depending entirely on weather conditions and the accuracy and persistency of the enemy aeroplanes and anti-balloon gunners. In camps in the United States the average effective life of a balloon may be said to be four or five months, barring accidents.

Handling a balloon in the field has a great deal to do with its life. In camps in the United States the average effective life of a balloon company depends a good deal on balloon construction.

In the case of a balloon with the observer in the basket and the artillery officers still farther away, the problem is to transmit the orders and information accurately and quickly. These communications are maintained by means of the telephone. The telephone wire is sometimes a separate cable, but in some cases the telephone wire is in the center of the main cable. This is a specially stranded ¼-inch steel cable.

The windlass by which the cable and the balloon are controlled is mounted on a truck which can travel while the balloon is in the air. Also originally of French invention, the construction of this apparatus has been undertaken by American companies.

Many other accessories had to be specially developed for the balloon service. The production of hydrogen and the necessary equipment was a big problem involving work along many angles. First, the gas itself, including field generators and main supply stations; secondly, containers for shipping and storage purposes; third, methods of transferring the gas from the containers for shipping and storage purposes, and, fourth, methods of transferring the gas from the containers to the balloon.

Along with the production of balloons, the necessary inspection was a factor not overlooked. In this connection the best balloon talent known to the Allies has come forward, stepped into the harness, and built up the present organization which passes on all the army balloons manufactured in the United States.

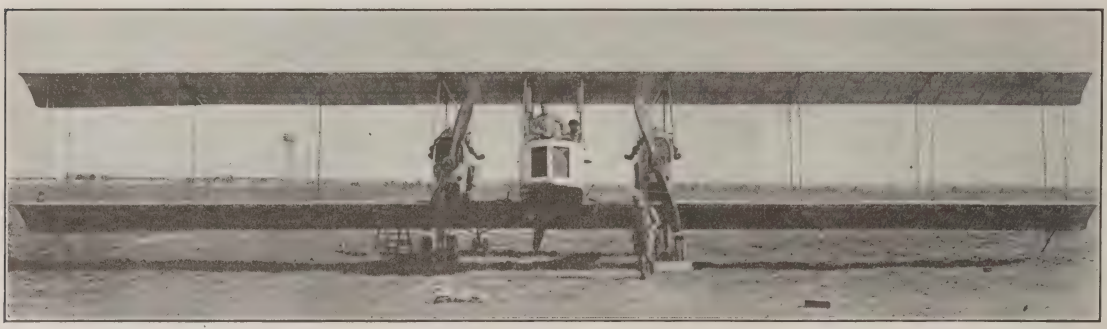
Balloon Beds

MANY different kinds of beds for balloons have been tried in the Allied armies since war broke out. As has been the case with a great many present-day practices the present bed was evolved after many trials. The best features of all the experiments have been retained and those things which have hindered the greatest efficiency of the balloons have been gradually eliminated. Not all these things have been done away with, however. The balloon bed as it is in general use today in France is not all that could be desired, but it is immeasurably better than any which were used near the beginning of the war. Previous to the declaration of war, balloons in military service were almost a nonentity. The tremendous amount of publicity the aeroplane got almost completely overshadowed the silent sausages. Balloons of the spherical type were used for sporting purposes and a few—a very few—observation balloons of the Drachen type were the property of the Army and Navy.

(To be continued)



Royal Naval Air Service Cadets laying out the fabric of a kite balloon of a small dirigible airship previous to inflation with gas. The envelope is laid out evenly on a ground sheet and the rigging attached before the gas is admitted. Behind the cadets can be seen the car and lower portion of the envelope of a "Blimp," the small dirigible airship before referred to. The filling hose, made of rubberized canvas, can be seen attached to the inflation sleeve preparatory to inflation with hydrogen. The car is very much like the body or fuselage of an aeroplane. Two men can be seen standing on the car while they adjust the engine.



This is a Caproni biplane for bombing work. It is equipped with three Liberty motors. This plane was built by the Standard Aircraft Corporation of New Jersey, and first flown on July 4, 1918, at Mineola, L. I., by three Italian officers

AMERICAN CAPRONI MEETS TEST IN AIR

Equipped with Liberty Motors, It Reaches Altitude of 14,000 Feet, Carrying 3,000 Pounds

THE American-built Caproni bi-plane, equipped with Liberty motors, September 21st surpassed expectations of allied officers in the first of a series of altitude, weight-carrying, and speed tests to determine its qualities as a bombing plane. In a flight of an hour the aeroplane reached an altitude of 14,000 feet, carrying three men, gasoline for a five-hour flight, and 1,900 pounds of lead. Allied army officers said they thought the test was extremely successful, and particularly because a brisk wind was blowing throughout the flight.

Captain Ugo d'Annunzio and Lieutenant Julian Parvis, of the Italian Flying Corps, piloted the machine throughout the test, and they were accompanied by Captain H. Harris, an American army officer, who made observations with instruments and kept a record of the flight. The average weight of the men was about 170 pounds, so that the plane was carrying a burden of almost 3,000 pounds.

Major Gen. J. Franklin Bell, commander of the Eastern Department, made an official observation of the flight, and Colonel Brant, of the Department of Military Aeronautics, was delegated by Major General William L. Kenly, in command of the department, to compile a report. With him were Major Martin, Lt.-Col. Rhinehardt and Major Brown. John D. Ryan, Second Assistant Secretary of War, in charge of the aviation program, was represented by J. Gilmore Fletcher, A. A. Landon and William Erb. G. Bevione, head of the Italian mission, with other Italian, French, and Canadian officers, observed the flight so that they could make reports to their aviation departments upon the efficiency of the Caproni as a bombing machine.

Before the official flight 500 cadets from the ground school of the Aviation Section at Princeton University arrived. They were permitted to study the construction of the machine and its engines, and were taken to all the hangars at Hazelhurst Field to examine the De Havilands, the Nieuports, and other planes there.

Much admiration for the performance of the motors was expressed by the allied officers. Other tests for speed will be made within a few days.

The plane, with its sweeping wing-spread of almost 100 feet, and its three Liberty motors, each capable of exerting the energy of 325 horses, averaged 105 miles an hour for one hour and soared to an altitude of 13,500 feet in sixteen minutes.

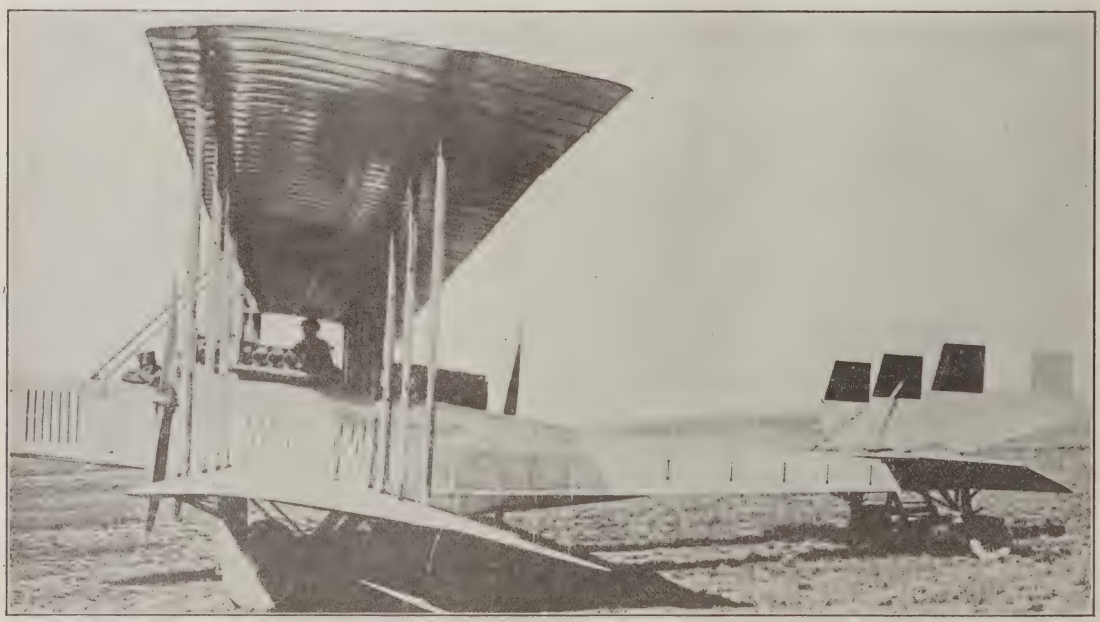
After the tests, over which officials expressed delight, Lieutenant Parvis said he would take up as many present as could crowd into and around the roomy cockpit. Nine clambered in. The biplane rose with them to 10,000 feet with apparently as much ease as when less heavily burdened.

Unofficial witnesses of the flight agreed that no one could mistake its train-like roar for the flight noise of any other flying machine.

Among those present at the tests were Mr. Alan R. Hawley, president of the Aero Club of America; Henry Woodhouse, editor of AERIAL AGE; Captain Robert Bartlett, the famous Artic explorer; Major Falchi, Captain Carlo Tappi, two veteran Italian aviators who participated in the Italian-Turkish war in 1912.

Sir William F. Bailey, president of the Canadian Aeroplanes, Limited, was also present.

Major Barsetta and other officers of the French Aeronautic Mission, including Captain Jacques Boyriven, who flew the last Nieuport and made a speed of 163 miles an hour with the wind—while his disconsolate Boston terrier "Billiken" cried pitifully because he was not taken along. Captain Harris is the officer who piloted the machine that took Major La Guardia from Milan to Rome recently.



"FIRST LIBERTY CAPRONI"

The first of the "Liberty" Caproni biplanes which is being built for army service. The plane is of the famous Italian manufacture with the new American "Liberty" motor installed.

The AIRCRAFT TRADE REVIEW

Aircraft Celebration

More than 5,000 men and women, employes of the Wright-Martin Aircraft Corporation at their Long Island City plant, joined recently in a patriotic demonstration under the direction of the Bureau of Aircraft Production, New York District. The program was directed by Charles E. Mack of the bureau, assisted by E. G. Pratt. The assemblage was in one of the big new buildings, capable of housing nearly 1,000 men at work, which is being completed for the company under special requisitions given by the Government.

A band marched at the head of more than 1,000 men employed as the night shift. Sergeant Ed Doyle of the First Canadian Contingent made an address and played his violin to lead the singers. George Houston, president of the Wright-Martin Company, announced that his company has furnished the United States Government with 3,000 motors and that the Government has now made demand for more than three times that number, to be completed before the summer of 1919. Captain A. P. Simmons, formerly of the 18th Regulars, said the workers of the industrial army were as essential as the men in the trenches. Congressman Charles Pope Caldwell of the Second District, who prepared the draft of the bill providing for the $614,000,000 for aircraft production, told of the necessity for rushing supplies needed by the army and the aero squadrons.

Goodyear Gets Aero Mail Letter

F. A. Seiberling, president of the Goodyear Tire & Rubber Company, Akron, Ohio, was among those who received mail carried by aeroplane, on the inaugural trip of the newly-established New York-Cleveland-Chicago Aerial Mail Line. The letter received by Mr. Seiberling was from Mr. Henry Woodhouse, the editor of *Flying*, a leading aeronautical magazine, expressing appreciation of his energetic efforts in hasting the production of aircraft at the Goodyear plant.

Personal Pars.

William B. Stout has resigned his position as technical adviser to the Aircraft Board at Washington and has returned to Detroit to take up the manufacture of a plane of his own design. The experimental work and preliminary construction is being carried out by W. C. Rands, of the Rands Mfg. Co., Detroit.

The following is a list of purchases contracted for by the Bureau of Aircraft Production:

[NOTE.—The first number at the beginning of each paragraph is the Order Number, the second the Contract Number.]

August 9, 1918

30442-18. 2250-2. Wright-Martin Aircraft Corporation, New Brunswick, N. J., spares for 150-horsepower type A Hispano-Suiza engine.

380630. 4453. Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., hexagon-head bolts with castellated nuts.

710121. 4448. Cherry Lumber Co., Cincinnati, Ohio, 60,000 feet walnut lumber.

710122. 4449. Brown & Harris Lumber Co., Holmesville, Ohio, 50,000 feet walnut lumber.

720116. 4452. West Virginia Aircraft Corporation, Wheeling, W. Va., spares for 500 JN4D training planes: Engine-bed bearers, elevators, rudders, wings, landing gears, etc.

720238. 4441. John A. Roebling's Sons Co., Trenton, N. J., 240,000 feet balloon cable.

720254. 4451. Pyrene Manufacturing Co., care of H. B. Vandergrift, Continental Hotel, Washington, D. C., 5,000 Pyrene fire extinguishers.

720257. 4454. Liberty Iron Works, Sacramento, Cal., spares for 100 JN4D planes: Elevators, vertical fins, landing gears, rudders, wings, etc.

750028. 4450. International Register Co., Chicago, Ill., 3,500 mechanical interrupter gears.

August 13, 1918

20038A10. 1816A. Dayton-Wright Airplane Co., Dayton, Ohio, spares for D.H.4 planes: wings, stabilizer braces, front direct-wire fitting with tie rods.

20038A11. 1816A. Dayton-Wright Airplane Co., Dayton, Ohio, parts for D.H.4 planes: wings, right and left ailerons, elevators rudder, landing gears, etc.

30442-20. 2250-2. Wright-Martin Aircraft Corporation, New Brunswick, N. J., spares for Hispano-Suiza motors; Speedometer shaft and bushing assembly, cotter pins, air pump parts, gaskets, nuts, etc.

320017. 4472. N. C. L. Engineering Corporation, Providence, R. I., 50 N. C. L. windlasses, complete.

320018. 4473. James Cunningham Son & Co., Rochester, N. Y., 25 Cacquot windlasses.

320019. 4474. McKeen Motor Car Co., Omaha, Nebr., 25 Burton windlasses.

480057. 4481. Cleveland Tractor Co., Cleveland, Ohio, 10 standard model H Cleveland tractors.

710115. 4439. Livingston Radiator & Manufacturing Co., New York, N. Y., 541 Handley-Page type radiators.

710129. 4484. Whittaker-Glessner Co., Portsmouth, Ohio, 700 steel drums, 110-gallon capacity.

710131. 4487. Chase Metal Works, Waterbury, Conn., seamless copper tubing.

710132. 4490. Sheffield By-Products Co., New York, N. Y., 40,000 pounds casein.

August 14, 1918

320020. 4482. N. C. L. Engineering Corps, New York, N. Y., 1 N. C. L. kite balloon windlass.

370117. 4493. Gilbert & Barker Manufacturing Co., Springfield, Mass., 10 tanks of 10,200 gallons' capacity each.

380702. 4492. Dobbie Foundry & Machine Co., Niagara Falls, N. Y., 100 No. 21 single-drum hand-power hoists.

380705. 4494. Henry Cheney Hammer Corporation, Little Falls, N. Y., 14,400 hammers.

380706. 4495. Henry Cheney Hammer Corporation, Little Falls, N. Y., 13,150 hammers.

380708. 4498. Collieries Supply & Equipment Co., Philadelphia, Pa., 48 electrical engineers' chests.

450020. 4497. Blaw-Knox Co., Pittsburgh, Pa., furnishing and fabricating necessary structural steel and accessory structural material for the construction of 70 hangars.

450021. 4406. Belmont Iron Works, Philadelphia, Pa., furnishing and fabricating 576 columns (approximately 1,500 pounds each).

710130. 4485. Whittaker-Glessner Co., Portsmouth, Ohio, 1,000 steel drums, 110 gallons' capacity.

70135. 4477. Ayer & McKinney, Philadelphia, Pa., 30,000 pounds casein.

720169. 4488. Standard Aero Corporation of New York, Elizabeth, N. J., 30 E-1 advanced planes constructed to mount Gnome motors.

720190. 4480. Standard Aero Corporation of New York, Elizabeth, N. J., 6 E-1 advanced planes constructed to take LeRhone motors.

720280. 4483. Fedders Manufacturing Co. (Inc.), Buffalo, N. Y., 109 radiators complete, with inlet and outlet connections.

720285. 4496. Hartzell Walnut Propeller Co., Piqua, Ohio, 1,000 wooden air fans.

720290. 4499. Hardman, Peck & Co., New York, N. Y., 500 sets of laminations for Handley Page propellers.

720295. 4501. Parsons Pulp & Lumber Co., Philadelphia, Pa., 4,800,000 feet spruce.

730204. 4500. Dayton Adding Machine & Tire Leek Co., Dayton, Ohio, 1,000 gun synchronizing generators.

730210. 4503. Light Manufacturing & Foundry Co., Pittstown, Pa., spares for OX5 engine, upper and lower crank case, bearing caps.

840041. 4489. Lamb, Finlay & Co., New York City, for services in connection with the handling, paying of duties, and shipping of airplane linens, tapes, and balloon cloths, which are being imported from Great Britain for the Bureau of Aircraft Production.

August 15, 1918

410087. 4505. Louisiana Oxygen Co., New Orleans, La. 500,000 cubic feet hydrogen gas.

710137. 4504. Isaac McLean Sons Co., Dorchester, Boston, Mass., 10,000 feet African mahogany and 25,000 feet Mexican or Central American mahogany.

730198. 4491. Ericsson Manufacturing Co., Buffalo, N. Y., parts for Berling, type D8I magneto (99 items).

780031. 4508. Link Tool & Machine Corporation, New York City, miscellaneous thread gauges to be furnished from time to time.

820017. 4506. Paul Whitin Manufacturing Co., Northbridge, Mass., 25,000 yards cotton airplane fabric.

August 16, 1918.

30442-21. 2250-3. Wright-Martin Aircraft Corporation, New Brunswick, N. J., spares for type 3 engine (43 items).

31072-2. 2250-3. Wright-Martin Aircraft Corporation, New Brunswick, N. J., spares for type 3 engine (43 items).

370124. 4519. Universal Grinding Machine Co., Pittsburg, Mass., 1 No. 2 grinder with C equipment.

710139. 4512. Steward-Hartshorn Co., New York, N. Y., 2,000 sets complete streamline tie rods for D. H. 4 machines.

710140. 4513. Witherow Steel Co., Pittsburgh, Pa., 2,000 sets complete streamline tie rods for D. H. 4 machines.

710141. 4518. Eastman Kodak Co., Rochester, N. Y., 5,000 United States Army unit sights.

710142. 454. J. V. Stimson & Co., Owensboro, Ky., 50,000 feet walnut lumber.

710143. 4516. Hoosier Veneer Co., Indianapolis, Ind., 500,000 feet walnut lumber.

720233. 4440. Canadian Aeroplane (Ltd.), Toronto, Ontario, Canada, 12 wings for JN4D Canadian planes.

730212. 4515. Disco Manufacturing Co., Detroit, Mich., 3,000 C. C. gun synchronizing generators.

740092. 4517. Wireless Improvement Co., New York City, 1,500 S. C. R., 65 sets.



An interior view of the Springfield Aeroplane Company's plant

THE FUTURE OF THE AIRCRAFT INDUSTRY

By BENJAMIN L. WILLIAMS

THE future of the aircraft industry as outlined by Mr. Henry Woodhouse of the Aero Club of America has been studied with deep interest and, having been actively associated with the Aircraft Manufacturers in peace and war times and with an intimate knowledge of the many difficulties which they have encountered in the production of aircraft in the past, it appears to me that with the extended use of commercial aeroplanes, the furture for the air craft manufacturers is at the dawning.

The most progressive nations in the world have maintained their position by reason of their commercial enterprise and development. In America, this phase of progress has been overshadowed for the moment by our war time activities which have now reached a stage where some consideration can be given to the advantage of commercial development along lines that will assist the war program. The manufacturers who have been sadly handicapped in their business enterprises by a limited market in pre-war times and a restricted market at the present time, will have something to look forward to in the manufacture of commercial aeroplanes, and should now be seriously contemplating "stock products" with a view to actually engaging in commercial work.

With the advent of the Aerial Mail Service as a forerunner of the commercial expansion of the United States and the fact that the Standard Aircraft Corporation of Elizabeth, New Jersey, was the first of the American Aircraft Manufacturers to design, construct and deliver aeroplanes, especially for this service, we have conclusive evidence of already having placed the aircraft industry on a commercial basis; it being reasonable to predict that what one company has accomplished, as a pioneer in the commercial field, that other similar organizations can do also, and more easily now that the way has been opened for them.

The United States is depended upon by the civilized world to support the conduct of the war and, it is obvious that the commercial expansion within our own borders should concurrently parallel our war work in order that it, too, may be efficient.

Italy has numerous air routes in daily operation for mail, express and contact service with her air forces, using the Caproni type of machine flown on schedule time and covering practically every part of the country. This type of machine has been duplicated in America and successfully flown at its first trial.

France was highly active in the development of the high speed aeroplanes and has always been at the front in the progressive science of aeronautics.

England has astonished the world by the size of her aircraft, the great weights carried and the long distances that they have traveled in order to render a service urgently needed.

Austria has already established Aerial Mail routes and is employing them as means of close communication between strategic points, thus relieving the railway and wire service.

Germany has copied the English Handley Page type of machines which are now made in America and has in the past been extremely active in the commercial development of the air service.

America's opportunity to establish a commercial air service will never be more advantageous. Her manufacturers have been able to successfully reproduce the leading types of aircraft of England, France and Italy and at the first trial, the flights of these machines have been successful. The past three years' experience of the countries have established a fund of accurate information relating to aircraft design and service upon which we can draw, and, by the experiences of the friendly nations, we will be able to pass rapidly through the difficult pioneer period without loss of time or energy due to experimentation with a hitherto unknown quantity.

Within the next six months, many additional routes for mail carrying should be in active operation. The equipment necessary to carry out this work can fairly be expected to be released from the war work, since commercial aeroplanes will aid materially the war program in securing a closer contact with bases of supplies in this country and shortening the time of communication between manufacturing and administrative centres.

It has already been demonstrated that the manufacturers can build the commercial type of aeroplanes in rapid time and fly them from their factories and from the performances of the Aerial Mail Service, it is evident also that commercial aeroplanes can be economically operated, and on a business basis.

To adequately prepare for the commercial expansion of the future, it is now opportune for the Government to release for this service raw materials in sufficient quantities to construct the commercial aeroplanes and to permitt he aeroplane manufacturers to divert a part of the present organization to commercial use and to utilize their war experience, in order to meet the demands that will be made upon them in the commercial field.

However rapid the future developments of the commercial Aerial Service may take place, the aircraft manufacturers and the allied industries can be relied upon to meet its requirements and with their co-operation and by their coordination of effort, now already completely established by reason of the war, will be able to take an active part in placing America in the foremost ranks of the civilized nations and maintain that supremacy through the intensive development of peaceful pursuits.

THE ZEPPELIN BOMBING BIPLANE

THROUGH the courtesy of *L'Aerophile* we are enabled to present outline drawings of the large Zeppelin bombing machine which was brought down on the Western Front south-east of Soissons. It is equipped with four Maybach engines delivering a total of 1200 horsepower. Each motor is independent. All are placed at the same level and in pairs. They are set up one behind the other. The front ones are tractors and the rear ones are pushers. Being of the same type they revolve in opposite directions because of this, thereby neutralizing the torque. The same idea was advanced and tried out in France in 1916. Each motor is placed between the two legs of the cockpit AR and AV. Half of the length on the motor is placed behind these legs and half ahead of them. Each of the platforms to which they are bolted is a beam made of two pieces of wood with a small strip laid in between vertically.

The fuselage, as in the smaller types, is unique. It shows the general characteristics of the old German fuselage, and not as the new ones which have wooden frames. The length is 21 meters, 35 centimeters.

Ailerons

As on all German biplanes except the Albatros C.X. and Friedrichhafen types this machine does not have ailerons on the upper wings. Although the third longeron has a shape like a gutter to receive it it is a matter of certain fact that the third longeron is not used as a bearing and the machine does not have ailerons on the lower wings.

The total wing spread is 41 meters, while the total length is 22 meters.

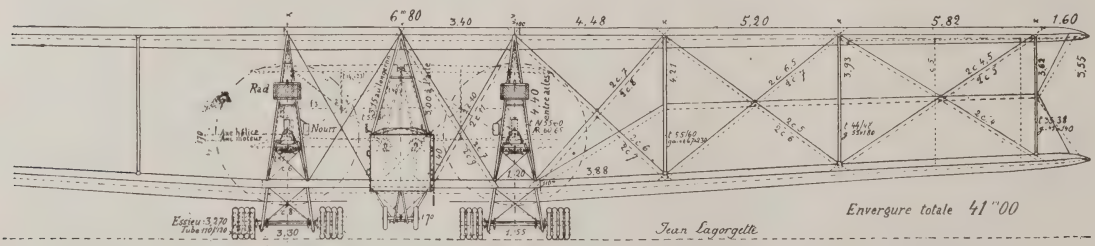
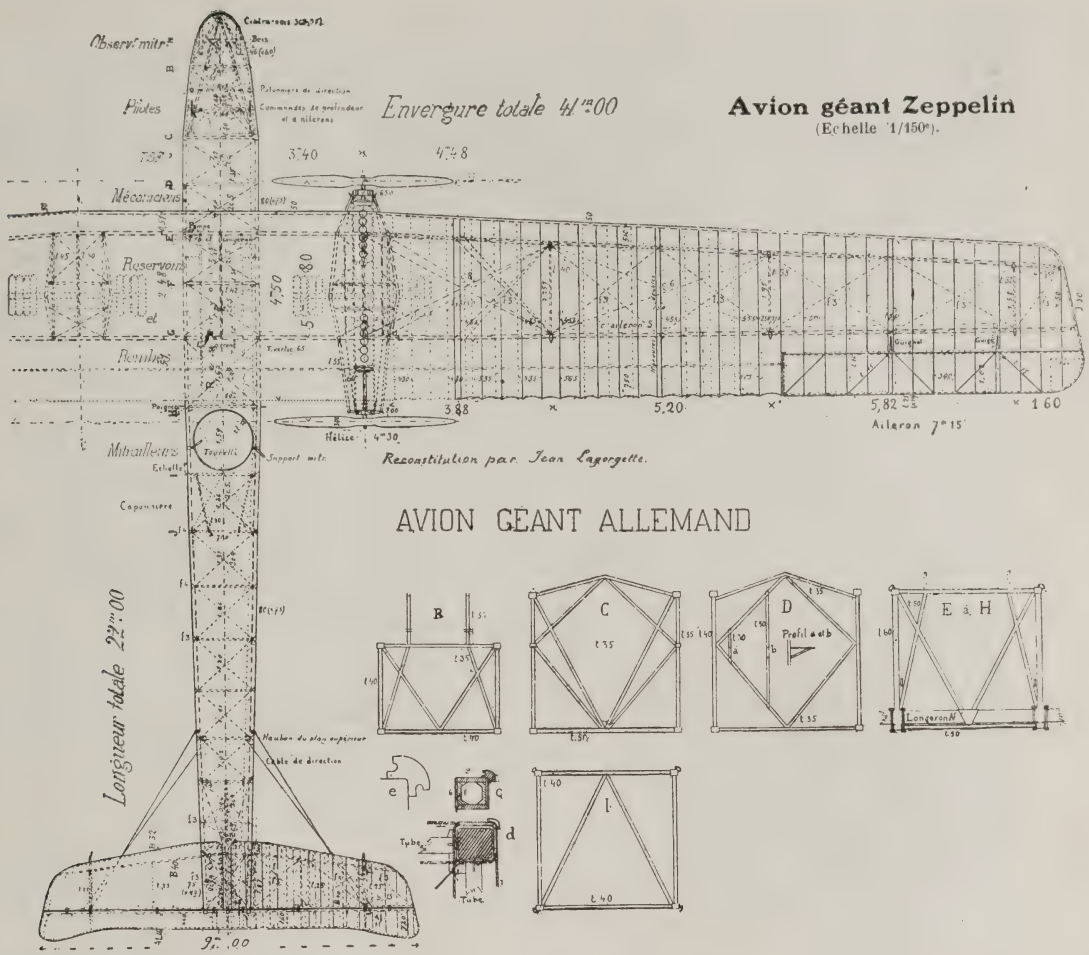


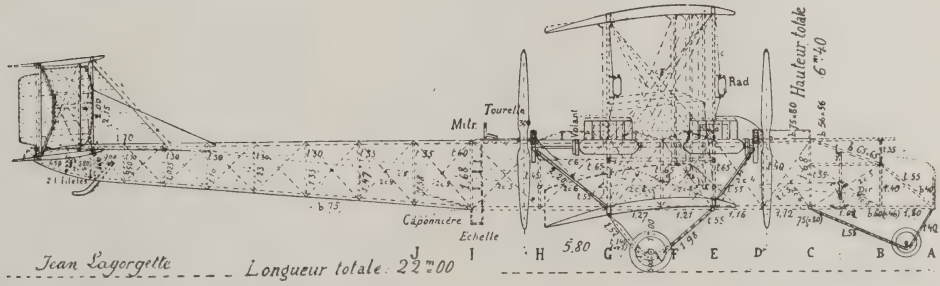
FIG. 3 et 4. — **Avion géant Zeppelin.** — Echelle 1/150e. — *al.* duralumin: *b.* bois; *c*, câble; *f.* fil d'acier; *g*, gaine; *t*, tube. — Vue de face des tirets indiquent le dessous du longeron A R, son haubannage, ainsi que les gouvernes.

GIANT ZEPPELIN AEROPLANE

al—duralumin; b—wood; c—cable; f—steel cable; g—sheath; t—tubing.

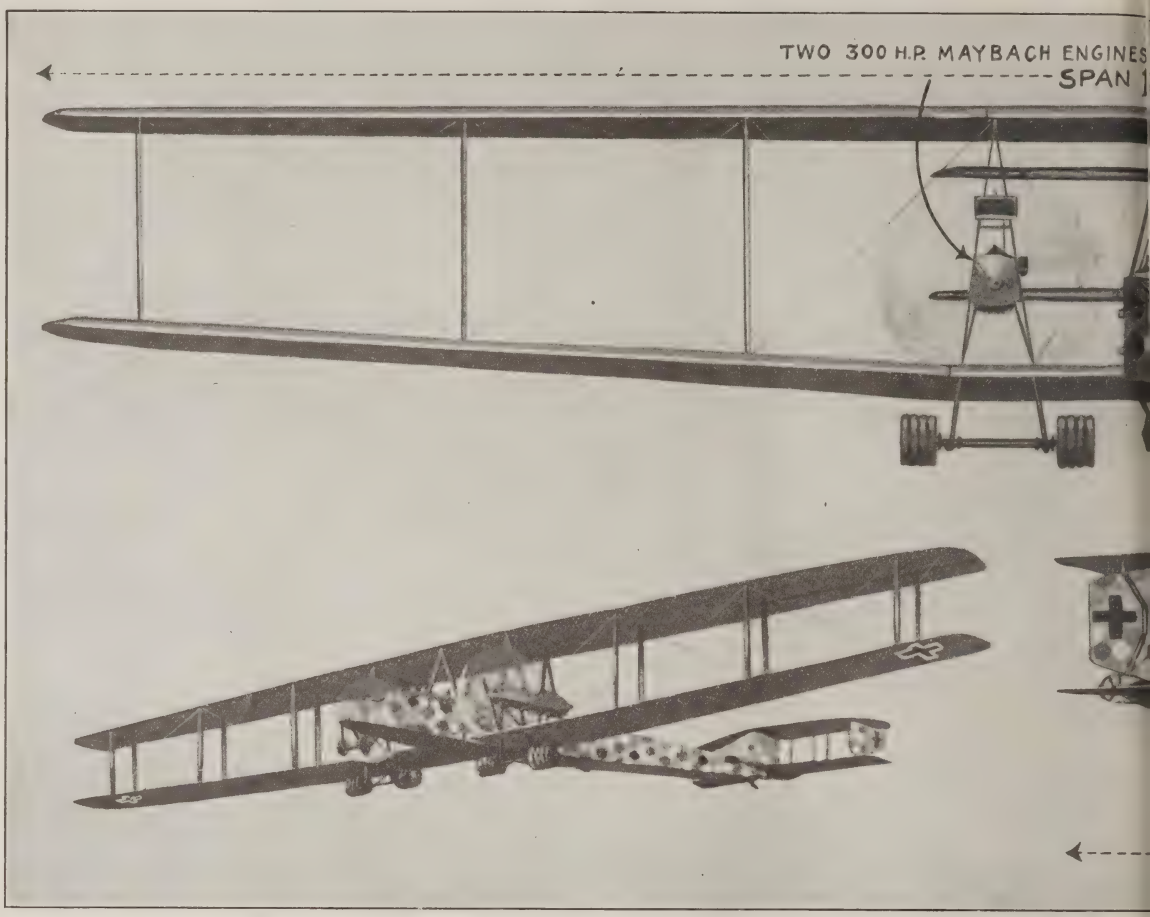


The ribs of the lower wings and lower elevators are shown in dotted lines, also the rudders. To the left and out of the fuselage figures three and four show the diameter of the transversal struts. The upper wings are in reality 45cm. out of center. B and I are transversal frames. In G frame the wing longeron is placed somewhat underneath the position it occupies in E and it replaces the tube cross bracing above frames E to H. The dotted lines indicate longitudinal beams. c is the sectional longeron of the fuselage. e is a section of the corner angle of the fuselage in the angle of the longeron



A side view of the Zeppelin Bomber. The upper wings are really out of center at the rear about 45 cm. The angle of incidence is such that the struts are at right angles to the chord. The propeller and motors are about 12 cm. back. The ribs of the central section are extended into the legs of AR of the cockpit. There are two elevators in similar directions and the central section comprises a large triangle besides the lateral planes, the inside apex of which forms a semi-ellipse. The parts B-A in the sketch may be taken to pieces without spoiling the main part of the machine

THE NEW FOUR-MOTO



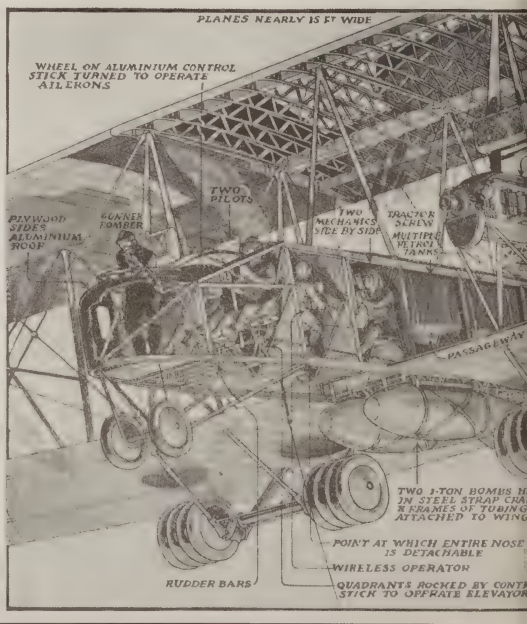
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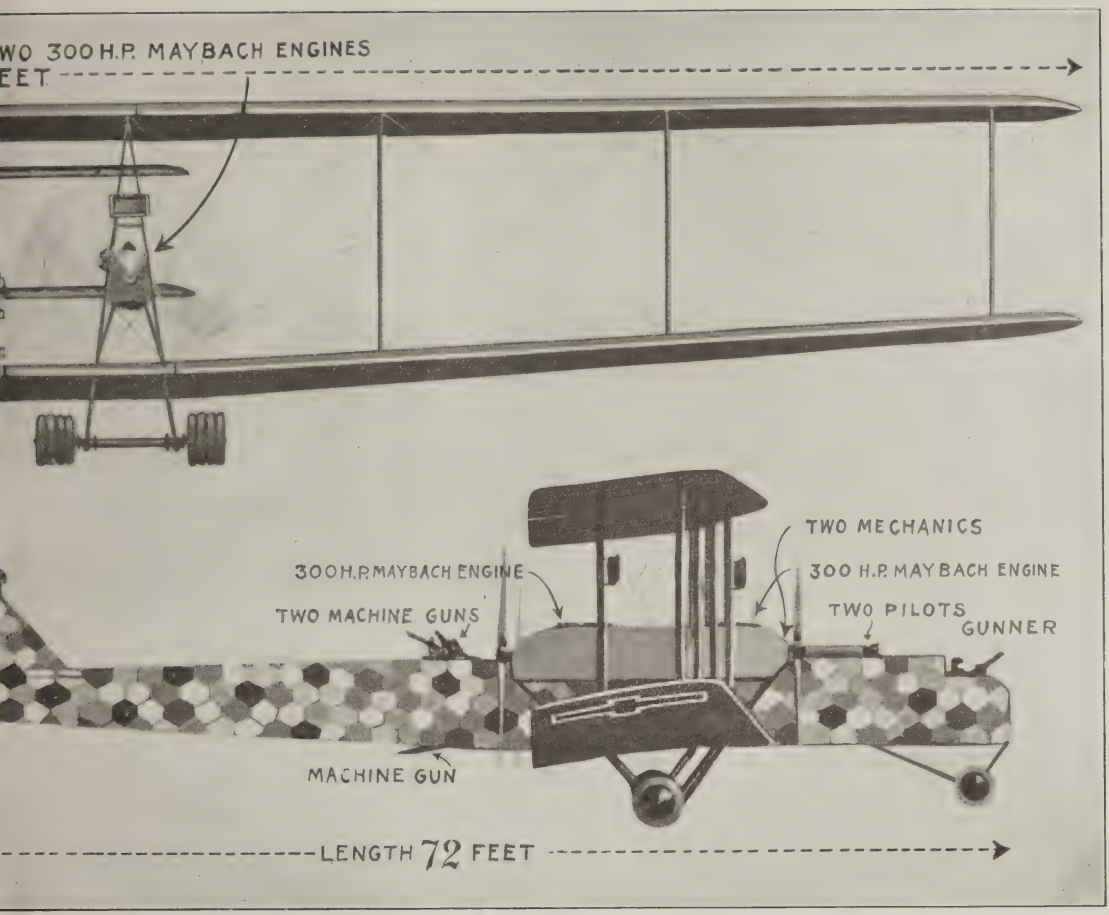
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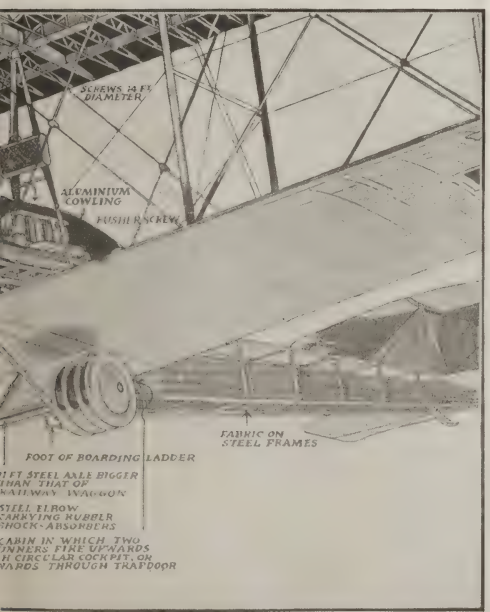
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D ZEPPELIN BOMBER





THE NEW GERMAN AEROPLANES

A despatch from the British front in France reports the appearance in a bombing raid over the Allied line in the St. Quentin sector of a number of German aeroplanes of huge size, carrying bombs "thirteen feet long, which contained 2,000 pounds of explosives." This is evidently the new Zeppelin bomber to which the German military authorities referred in connection with their plans for the building of "monster submarines" and giant long-distance guns, and which is illustrated herewith.

THERMODYNAMIC CYCLES IN INTERNAL COMBUSTION ENGINES

With Particular Reference to Aircraft Requirements

By WM. J. WALKER, B. Sc., A. M. I. C. E.

(With twelve line illustrations)

SIR DUGALD CLERK, in a recent paper,* gave it as his opinion that "British engineers and scientific men are still convinced that other methods must be found of increasing power in internal combustion engines than mere increase of dimensions of cylinders and massive construction of parts as practised in Germany." The recent paper on "The Possibilities of the Constant Pressure Cycle" read before the Society of Automobile Engineers of America, and printed in the July, 1916, number of *The Automobile Engineer*, is evidence of the prevailing feeling that a *cul de sac* is being approached, although, perhaps, the direction indicated by the authors of the paper in question would appear to lead to nothing more than another such blind alley in a much less prosperous neighborhood.

The three most obvious methods by which increase of power may be obtained are:

(1.) An increase of the mean effective pressure of the cycle.

(2.) An increase of engine speed.

(3.) An increase of the number of working strokes per revolution.

The second of these, perhaps, has not been so fully utilized as it might be, but its limitations are certainly well recognized. The third is typified by the many endeavors to produce a successful two-stroke motor. It is upon the first method of obtaining increased power that the main ideas of the following notes are based. For the purpose of this investigation thermodynamic cycles will be divided into two main classes, designated types A and B.

The Dual Combustion Cycle, Type A

This is shown graphically in fig. 1. It will be noticed that part of the heat of combustion is developed first at constant volume, and the remainder at constant pressure, hence the term "dual combustion." All the heat rejected is rejected at constant volume. The best example of an engine operating successfully on this cycle is the Blackstone heavy oil engine.

In fig. 1,

Let r = compression ratio $= \frac{v}{v_0}$

ρ = cut-off ratio $= \frac{v_2}{v_1}$

α = explosion ratio $= \frac{p_1}{p_0}$

and γ = the adiabatic constant = (1.4 for air).

The efficiency of the cycle is then given by

$$\eta = 1 - \frac{1}{r^{\gamma-1}} \left(\frac{\alpha \rho^{\gamma} - 1}{(\alpha - 1 + \gamma \alpha (\rho - 1)} \right) \quad (1)$$

If $\rho = 1$, the expression (1) gives the efficiency of the constant volume cycle in its well-known form:

$$\eta_t = 1 - \frac{1}{r^{\gamma-1}}$$

If $\alpha = 1$, (1) gives the expression for the cycle on which the Diesel engine operates, *i.e.*,

$$\eta_t = 1 - \frac{1}{r^{\gamma-1}} \left(\frac{\rho^{\gamma} - 1}{\gamma (\rho - 1)} \right)$$

The mean effective pressure of Type A is given by

$$p_m = \eta_t \, p \left(\frac{r^{\gamma} (\alpha - 1) + \gamma \alpha (\rho - 1)}{(r - 1) (\gamma - 1)} \right) \quad (2)$$

where p is the pressure at the beginning of compression.

If $\rho = 1$, this gives for the mean effective pressure of the constant volume cycle

$$p_m = \eta_t \, p \, \frac{r^{\gamma} (\alpha - 1)}{(r - 1) (\gamma - 1)}$$

If $\alpha = 1$, as in the Diesel cycle, then

$$p_m = \eta_t \, p \, \frac{\gamma r^{\gamma} (\rho - 1)}{(r - 1) (\gamma - 1)}$$

The convenience and simplicity of the expressions thus obtained for calculating the thermal efficiency and mean effective pressure for different values of p, a, and r are apparent, since *temperature values* are entirely eliminated.

* *Journal of the Royal Society of Arts*, December, 1916.

The Dual Combustion Cycle, Type B

This is shown graphically in fig. 2. It is similar to type A, except that the heat is rejected at constant pressure instead of constnat volume. There is no internal combustion engine of any kind of which the writer is aware which operates on this cycle. It is introduced here because of many interesting points which are revealed by examination of the cycle from a thermodynamic standpoint. This interest is not merely because of the theoretical points which will appear, but also because of its practical bearing on the subjects of complete expansion and compounding for internal combustion engines. It is, of course, obvious that this cycle must have a lower mean effective pressure than the one previously discussed.

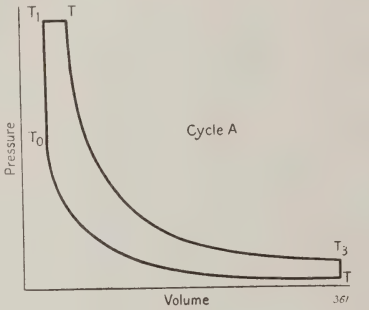


Fig. 1.

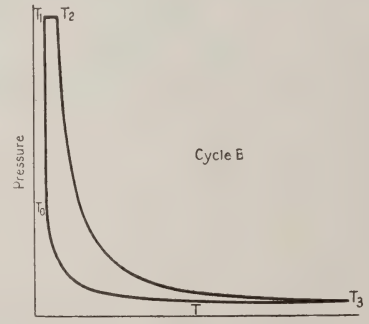


Fig. 2.

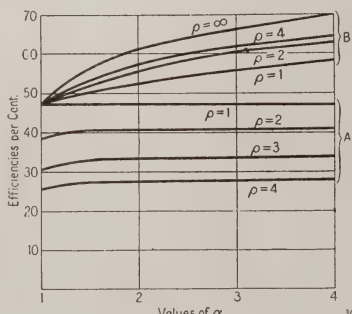


Fig. 3.

The thermal efficiency of the cycle is given by

$$\eta_t = 1 - \frac{1}{r^{\gamma-1}} \left(\frac{\gamma (\alpha^{\frac{1}{\gamma}} \rho - 1)}{(\alpha - 1) + \gamma \alpha (\rho - 1)} \right) \quad (3)$$

If $\alpha = 1$, (3) becomes the expression for the constant pressure cycle, which, as is well-known, is the same as for the constant volume cycle, *i.e.*,

$$\eta_t = 1 - \frac{1}{r^{\gamma-1}}$$

If $\rho = 1$, the efficiency is

$$\eta_t = 1 - \frac{1}{r^{\gamma-1}} \quad \frac{\alpha^{\frac{1}{\gamma}} - 1}{\alpha - 1} \left(\frac{\alpha^{\frac{1}{\gamma}} - 1}{\alpha - 1} \right)$$

This example of type B (*i.e.*, when $\rho = 1$) is the cycle designated type 3 by Clerk in his book "The Gas, Petrol, and Oil Engine."* The expression for the efficiency given there is

$$\eta_t = 1 - \gamma \frac{T' - t}{T - t_c}$$

and involves four different temperatures in the cycle. This is pointed out to indicate the advantage of casting the expressions into the forms given here, temperature values not being involved.

The mean effective pressure of type B is given by

$$p_m = \eta_t \, p r^{\gamma} \left(\frac{(\alpha - 1) + \gamma \alpha (\rho - 1)}{(\alpha^{\frac{1}{\gamma}} \rho r - 1) (\gamma - 1)} \right) \quad (4)$$

which, for the constant pressure cycle with $\alpha = 1$, becomes

$$p_m = \eta_t \, p r^{\gamma} \frac{\gamma (\rho - 1)}{(pr - 1) (\gamma - 1)}$$

For $\rho = 1$

$$p_m = \eta_t \, p r^{\gamma} \left(\frac{\alpha - 1}{(\alpha^{\frac{1}{\gamma}} - 1) (\gamma - 1)} \right)$$

Comparison of Types A and B

From the formulæ (1) to (4) thus obtained, the thermal efficiencies and mean effective pressures in types A and B have been plotted in figs. 3 to 6 against values of α and ρ and on the basis of a compression ratio $r = 5$, γ being assumed = 1.4. The conclusions to be arrived at will clearly be quite independent of the values thus arbitrarily chosen. Figs 3 and 4 show the variation of thermal efficiency of the two cycles with α and ρ, while figs. 5 and 6 show the variation of mean effective pressure with the same quantities.

The first point to be noted is that the efficiency of type A increases with an increase of α, representing constant volume combustion, but is diminished by an increase of ρ, representing constant pressure combustion. In type B the efficiency increases with both α and ρ. This difference in the effect of constant pressure combustion upon the efficiencies of the two types is interesting. A glance at figs. 5 and 6 shows that, as far as mean effective pressures are concerned, type A has all the advantages.

For purposes of comparison, four particular cases of the two types of cycle will now be investigated, each with the same maximum pressure of 545 lb. per sq. in. All the cases are represented in fig. 7.

CASE 1.—This is an example of type B with $r = 1$, $\rho = 2$, and $\alpha = 36.3$, and is represented by the area FABCF. Its efficiency $\eta_t = 59.3\%$.

CASE 2.—Type B with $r = 13$, $\rho = 2$, and $\alpha = 1$. This is represented by the area FEBCF. Its efficiency $\eta_t = 64.1\%$.

CASE 3.—Type A with $r = 13$, $\rho = 2$, and $\alpha = 1$. This is represented by the area EBCDE, and is an example of the cycle on which the Diesel engine is operated. Its efficiency $\eta_t = 58.2\%$.

Attention is drawn here to the fact that the difference in efficiency between cases 2 and 3 is 5.9%, expressed as a percentage of the total heat supplied. This will be observed to be due entirely to the difference between the work areas in the two cases represented by the area DEF in fig. 7.

CASE 4.—The same as case 1, with the omission of the area DEF. Its efficiency $\eta_4 = 55.5\%$.

Comparing the two cases 3 and 4, it appears that from $r = 1$ to $r = 13$ the difference in efficiencies is only 2.7%.

The relative possibilities of operating these cycles in practice have no bearing on the argument which follows.

The important point to be noted is the relative value of the area DEF to the total work obtained. It is evident that the smaller the compression ratio r, the less will be the relative value of the area DEF to the whole area. It is for this reason that the diminution in efficiency between cases 3 and 4, where $r = 13$ and $r = 1$ respectively, is only 2.7%. In such a cycle, therefore, the compression ratio would be chosen, not at all from the point of view of efficiency to be obtained, but from its likely effect upon the reliable working of the engine. In other words, *although increase of compression ratio generally increases the efficiency of any cycle, some other portion of the cycle (such as the constant pressure combustion process in type B) may exert such an influence as to render the effect of compression ratio upon the efficiency negligible.*

It is usual to look upon compression ratio as the theoretical limiting factor in the attainment of a high efficiency. This is partly a contradiction of the old scientific principle deduced from Carnot's cycle—that efficiency depends upon wide temperature limits. The fact that both principles are true under the assumptions proper to each evidently indicates that there must be some compromise between them. Such a compromise is indicated in type B, where the advantages of both principles may be retained without the intervention of the disadvantages due to too extreme an application of either.

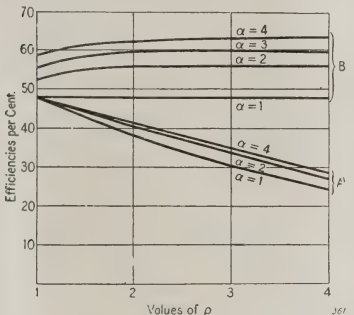


Fig. 4.

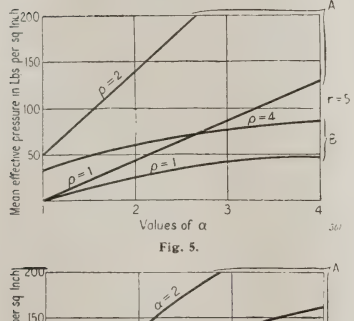


Fig. 5.

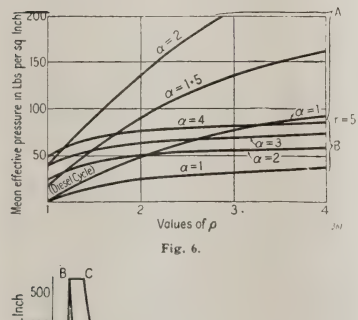


Fig. 6.

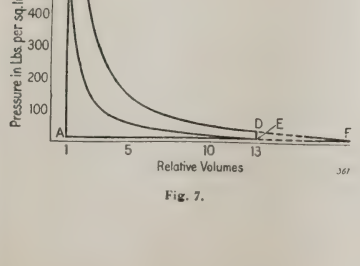


Fig. 7.

For the purpose of considering these types further with regard to their application to aero engines, the power requirements of aeroplanes will be dealt with briefly.

Power Required for Flight

In order to obviate the necessity of going into a close investigation of the theoretical aspect of this question, the writer has constructed a series of graphs calculated from reliable data. The graphs are based upon the requirements of two aeroplanes of equal total weight but of different wing loadings, the two values chosen for the latter being 8.5 and 4.7 lb. per sq. ft. of wing area. The ratio of *supporting area* A to the *equivalent normal* area a is assumed to be = 60. The first graph is shown in fig. 8, which gives the thrust-speed relationship for the two machines during horizontal flight, showing minimum thrust values at speeds of 83.5 and 107.5 miles per hour. These are evidently the speeds which give the *least fuel consumption for flights of given range,* or the *least energy speeds.* Fig. 9 shows the corresponding power speed graphs. These indicate at a glance the difference between the power requirements of heavily and lightly loaded machines. At high speeds the power required by the lightly loaded machine becomes excessive, and the reason for this is obvious. Both machines have the same total overall weight of 2,210 lb., so that the lightly loaded machine, presenting, as it does, a large surface area to the wind currents, will experience, while attaining the higher speeds, a rapidly increasing head and skin resistance which will eventually cause an absorption of power largely in excess of what would be required to propel the heavily loaded machine of the same total overall weight. Minimum power is required in the two cases at speeds of 61 and 81 miles per hour with the light and heavy loading respectively. These are the speeds which give *least fuel consumption for flights* of given duration of time, or *least power speeds.*

Adaptability of Power Available to Power Required

In fig. 10 is shown in the full line graph, convex upwards, a characteristic power curve of an engine and propeller plant, while the other full line curve, concave upwards, is the power speed graph of the machine whose loading is 4.7 lb. per sq. ft., derived from fig. 9. Fig. 11 gives the same engine power graph in conjunction with the required power graph of the machine whose loading is 8.5 lb. per sq. ft.

At first sight it would seem that the lightly loaded machine appears to lend itself to a slightly wider range of flying speeds with a given power unit than is possible with the heavily loaded machine. The difference in this respect between the two cases chosen is given by the ranges comprised between the vertical dotted lines in each case. On the other hand, however, referring first to fig. 10, the limiting speeds there of 59 and 107 miles per hour correspond at that particular loading to angles of incidence of 6.6° to 2°, the lower limiting angle being therefore beyond the generally accepted danger limit of 3°. In order to bring the whole machine within safe limits of operation, a smaller powered motor is necessary, or else the pilot, if he wishes to attain the horizontal speed of 90 miles per hour, which corresponds in this case to the limiting angle of 3°, must perform the double operation of opening the throttle and setting the angle of incidence of his machine to suit. If a smaller powered motor is installed, the inclusion of the characteristic power speed graph of such a system shown dotted in fig. 10 reveals how the speed range has been reduced when the intersecting point of the two graphs at the higher speed corresponds to the limiting safe angle of incidence. In fig. 11, again, the limiting speeds of horizontal flight there are about 73 and 114 miles per hour, corresponding to angles of incidence of 3½° to 8°, both within safe limits. Hence, in this case, a higher powered motor can be safely installed such as that, the power speed graph of which is represented by the dotted line, giving the much wider speed range shown. The crosses in figs. 10 and 11 indicate the position of the least energy speeds, and it is obvious that the intersecting point of the two graphs at the higher speeds should be at, or as nearly as possible to, this value, so that the normal speed of the aeroplane, with the engine at full power, will take place, as nearly as possible, under the least energy conditions. This condition is more nearly met by the heavily loaded machine. It may be argued that a more favorable correspondence between the available and required power of the lightly loaded machine could be obtained than has been depicted here in fig. 10. On the whole, however, it will be found that the balance of advantage in this respect lies with the heavily loaded machine.

Types A and B in Their Relation to Adaptability

Although it is absolutely necessary to obtain the minimum of weight in all parts of the structure which go to make up an aeroplane, it does not necessarily follow that, in the case of the power unit, the engine working on a cycle with the greatest mean effective pressure is to be preferred without qualification. The question of efficiency intervenes to upset such a notion, and it is quite clear that in any case of prolonged flight, such as the Transatlantic project, the efficiency must easily play the predominating part. For machines whose sole purpose is quick climbing during short flights only, an engine with a high mean effective pressure is essential. From these two extreme cases it is evident that there is much room for compromise, and this compromise may be stated in terms of the relation between engine weight and efficiency, as has been done already by the writer in another place. This

(*Continued on page 142*)

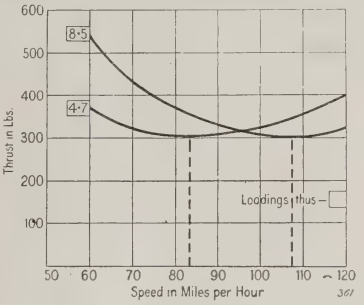


Fig. 8.

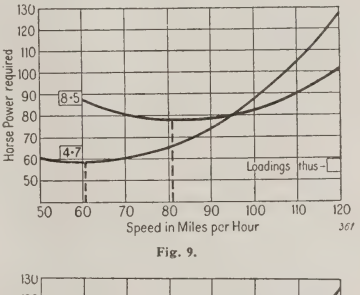


Fig. 9.

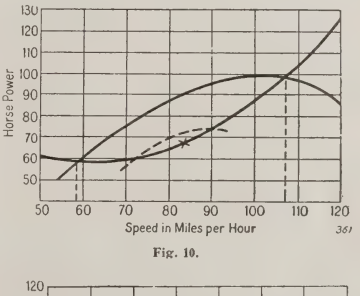


Fig. 10.

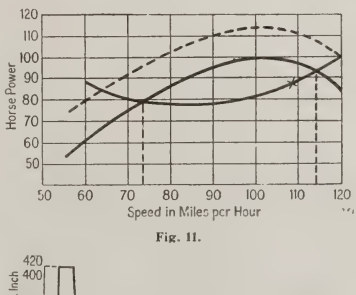


Fig. 11.

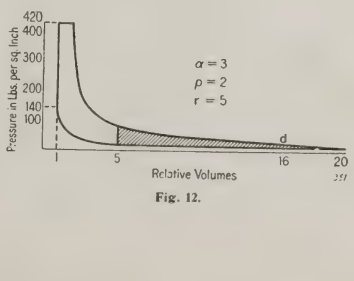


Fig. 12.

THIRD ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE ON AERONAUTICS

IN accordance with the provisions of the act of Congress approved March 3, 1915, establishing the National Advisory Committee for Aeronautics, the committee submits herewith its third annual report.

This report reviews the activities of the committee during the past year, the work accomplished in the study of scientific problems, the assistance rendered by the committee in connection with aerial preparedness for war and in the development of the aircraft industry to meet the demands of the Government, and contains a statement of expenditures, estimates for the fiscal year 1919, and certain recommendations for the consideration of Congress. Technical reports covering the various subjects under investigation during the past year are submitted as appendixes.

The National Advisory Committee for Aeronautics

The National Advisory Committee for Aeronautics was established by Congress by act approved March 3, 1915. Under the law the committee is charged with the supervision and direction of the scientific study of the problems of flight with a view to their practical solution, the determination of the problems which should be experimentally attacked, their investigation and application to practical aeronautics. The committee is also authorized to direct and conduct research and experiment in aeronautics in such laboratory or laboratories, either in whole or in part, as may be placed under its direction.

The committee has 12 members appointed by the President. As authorized by Congress, the personnel of the committee consists of 2 members from the War Department, from the office in charge of military aeronautics; 2 members from the Navy Department, from the office in charge of naval aeronautics; a representative each of the Smithsonian Institution, of the United States Weather Bureau, and of the United States Bureau of Standards; and not more than 5 additional persons acquainted with the needs of aeronautical science, either civil or military, or skilled in aeronautical engineering or its allied sciences.

During the past year the two naval members of the committee, Capt. Mark L. Bristol, United States Navy, and Naval Constructor Holden C. Richardson, United States Navy, the latter being also secretary of the committee, resigned on account of transfer to duty away from Washington; and Brig. Gen. George B. Scriven, United States Army, resigned on account of retirement. To fill the vacancies thus occasioned, the President appointed the following members: Rear Admiral D. W. Taylor, Chief Constructor, United States Navy; Lieut. Commander J. H. Towers, United States Navy; and Lieut. Col V. E. Clark, Signal Corps. Dr. S. W. Stratton succeeded Naval Constructor Richardson as secretary.

The organization of the Advisory Committee as of October 4, 1917, the date of the annual meeting, is as follows:

Dr. William F. Durand, chairman.
Dr. S. W. Stratton, secretary.
Dr. Charles D. Walcott, chairman, executive committee.
Dr. Joseph S. Ames.
Lieut. Col. V. E. Clark, United States Army.
Prof. John F. Hayford.
Prof. Charles F. Marvin.
Hon. Byron R. Newton.
Dr. Michael I. Pupin.
Maj. Gen. George O. Squier, United States Army.
Rear Admiral David W. Taylor, United States Navy.
Lieut. Commander John H. Towers, United States Navy.

The annual meetings of the Advisory Committee are held in October and the semi-annual meetings in April. The present report includes the activities of the committee between the annual meeting held on October 5, 1916, and that held on October 4, 1917.

Amendments to Regulations

At the semi-annual meeting on April 19, 1917, the regulations were amended to provide:

That the secretary be not ex-officio member and secretary of the executive committee as had formerly been the case, but that the executive committee elect its secretary by ballot to serve for one year.

That the executive committee, in addition to the seven members elected by ballot, should include further any member of the Advisory Committee not otherwise a member of the executive committee but resident in or near Washington and giving his time wholly or chiefly to the special work of the committee.

That the members and employees of the Advisory Committee and of all sub-committees may be allowed traveling expenses and $4 per diem in lieu of subsistence while traveling under orders of the committee on official business.

That the executive committee shall appoint a special disbursing agent for such funds as may be appropriated for the use of the Advisory Committee and that the chairman, or acting chairman, of the executive committee shall approve all accounts for the disbursement of funds.

That amendments may be made by a two-thirds vote by letter ballot or at a special meeting, subject to approval by the President, and need not necessarily wait upon stated meetings for consideration.

The Executive Committee

For carrying out the work of the Advisory Committee the regulations provide for the election annually of an executive committee, to consist of seven members, and to include further any member of the Advisory Committee not otherwise a member of the executive committee, but resident in or near Washington and giving his time wholly or chiefly to the special work of the committee. The executive committee, as organized on October 9, 1917, is as follows:

Dr. Charles D. Walcott, chairman, Secretary, Smithsonian Institution.
Dr. S. W. Stratton, secretary, Director, Bureau of Standards.
Dr. Joseph S. Ames, physicist, Johns Hopkins University.
Prof. Charles F. Marvin, Chief, United States Weather Bureau.
Dr. Michael I. Pupin, physicist and electrical engineer, Columbia University.
Maj. General George O. Squier, Chief Signal Officer, United States Army.
Rear Admiral D. W. Taylor, Chief Constructor, United States Navy.
Dr. W. F. Durand, chairman, National Advisory Committee for Aeronautics, additional member.

The executive committee, in accordance with the general instructions of the Advisory Committee, controls the administration of the affairs of the committee and exercises general supervision over all arrangements for research and other matters undertaken or promoted by the Advisory Committee. It keeps written records of all transactions and expenditures and submits an annual report to the Advisory Committee, the details of which furnish the material for the present report.

The executive committee held regular monthly meetings throughout the year, and in addition, held 13 special meetings on the following dates:

Regular meetings.—October 12, 1916; November 9, 1916; December 7, 1916; January 11, 1917; February 10, 1917; March 8. 1917; April 12, 1917; May 10, 1917; June 14, 1917; July 12, 1917; August 9, 1917; September 13, 1917.

Special meetings.—October 9, 1916; November 23, 1916; February 1, 1917; February 3, 1917; February 4, 1917; March 22, 1917; March 29, 1917; April 5, 1917; April 10, 1917; April 23, 1917; May 26, 1917; September 27, 1917; October 2, 1917.

The committee has organized the necessary small clerical and technical staffs. All work is performed under the personal supervision of one or more officers of the committee. An assistant secretary, who also serves as special disbursing agent, has charge of the office, records, and property of the committee.

Subcommittees

The following subcommittees organized under the executive committee have greatly facilitated the work of the committee during the past year. Under proovision of the regulations for the conduct of the work of the committee the membership of subcommittees is not limited to members of the Advisory Committee. The committees marked with an asterisk have been superseded or discharged:

*AERIAL MAIL SERVICE:
Maj. Gen. George O. Squier, United States Army, chairman.
Prof. Charles F. Marvin.
Dr. S. W. Stratton.
Lieut. Col. V. E. Clark, United States Army
Lieut. Commander J. H. Towers, United States Navy.

AERO TORPEDOES:
Lieut. Commander J. H. Towers, United States Navy, chairman.
Lieut, Col. V. E. Clark, United States Army.

AIRCRAFT COMMUNICATIONS:
Dr. Michael I. Pupin, chairman.
Dr. Joseph S. Ames.
Dr. S. W. Stratton.
Dr. E. B. Rosa.

AEROPLANE MAPPING COMMITTEE:
Maj. Gen. George O. Squier, United States Army, chairman.
Dr. Charles D. Walcott.
Capt. J. W. Bagley, Engineer Officers' Reserve Corps.
Carl G. Fisher.

BIBLIOGRAPHY OF AERONAUTICSS
Prof. Charles F. Marvin chairman.
Dr. Joseph S. Ames.

BUILDINGS, LABORATORIES, AND EQUIPMENT:
Dr. S. W. Stratton, chairman.
Dr. Joseph S. Ames.
Dr. W. F. Durand.
Lieut. Col. V. E. Clark, United States Army.
Lieut. Commander J. H. Towers, United States Navy.

CIVIL AERIAL TRANSPORT:
Dr. W. F. Durand, chairman.
Dr. S. W. Stratton.
Prof. Charles F. Marvin.
Lieut. Col. V. E. Clark, United States Army.
Lieut. Commander J. H. Towers, United States Navy.

DESIGN, CONSTRUCTION, AND NAVIGATION OF AIRCRAFT:
Maj. Gen. George O. Squier, United States Army, chairman.
Dr. Joseph S. Ames.
Lieut. Commander J. H. Towers, United States Navy.
Lieut. Col. V. E. Clark, United States Army.
Dr. A. F. Zahm, secretary.
Frederick Alger.
M. D. Hersey.
J. H. Nelson.
Aeronautic instruments—
Dr. Joseph S. Ames, chairman.
Commander W. T. Jewell, United States Navy.
M. D. Hersey.
Maj. C. E. Mendenhall, Signal Corps.
Dr. Lyman Briggs.

EDITORIAL:
Dr. Joseph S. Ames, chairman.
Dr. S. W. Stratton.
Dr. W. F. Durand.

*FOREIGN REPRESENTATIVES:
Dr. Charles D. Walcott, chairman.
Maj. Gen. George O. Squier, United States Army.
Rear Admiral D. W. Taylor, United States Navy.

FREE FLIGHT TESTS:
Prof. John F. Hayford, chairman.
Dr. W. F. Durand.
Dr. S. W. Stratton.
Lieut. Col. V. E. Clark, United States Army.
Prof. A. Klemin.
Dr. Lyman Briggs.
Dr. A. F. Zahm.
Lieut. G. P. Thomson, R. F. C.

GOVERNMENTAL RELATIONS:
Dr. Charles D. Walcott, chairman.
Dr. S. W. Stratton.

HELICOPTER, or DIRECT-LIFT AIRCRAFT:
Dr. W. F. Durand, chairman.
Dr. Michael I. Pupin.
M. B. Sellers.
Dr. A. F. Zahm.
Prof. E. B. Wilson.

NOMENCLATURE FOR AERONAUTICS:
Dr. Joseph S. Ames, chairman.
Dr. S. W. Stratton.
Maj. Gen. George O. Squier, United States Army.
Capt. Mark L. Bristol, United States Navy.
Navy Constructor H. C. Richardson, United States Navy.

*PATENTS:
Dr. Charles D. Walcott, chairman.
Dr. S. W. Stratton.
Lieut. Commander J. H. Towers, United States Navy.
S. D. Waldon.
Frederick P. Fish.
W. Benton Crisp.
Dr. W. F. Durand.

*POLICY:
Prof. John F. Hayford, chairman.
Dr. Joseph S. Ames.
Dr. S. W. Stratton.

POWER PLANTS:
Dr. S. W. Stratton, chairman.
Maj. Gen. George O. Squier, United States Army.
Dr. W. F. Durand.
Lieut. Commander J. H. Towers, United States Navy.
Dr. H. C. Dickinson, secretary.
Prof. J. C. Riley.
Prof. E. Newcomb.
Lieut. Commander A. K. Atkins, United States Navy.

*QUARTERS:
Dr. S. W. Stratton, chairman.
Maj. Gen. George O. Squier, United States Army.

*RADIATOR DESIGN:
Naval Constructor H. C. Richardson, United States Navy, chairman.
Dr. S. W. Stratton.
Maj. Henry Souther.

RELATION OF THE ATMOSPHERE TO AERONAUTICS:
Prof. Charles F. Marvin, chairman.
Dr. Joseph S. Ames.
Prof. John F. Hayford.
Lieut. Commander J. H. Towers, United States Navy.

*SITE FOR EXPERIMENTAL FIELD:
Dr. Charles D. Walcott, chairman.
Prof. Charles F. Marvin.
Dr. S. W. Stratton.

SPECIAL COMMITTEE ON ENGINEERING PROBLEMS:
Dr. W. F. Durand, chairman.
Dr. S. W. Stratton.
Dr. A. F. Zahm.
Dr. H. C. Dickinson.
Herbert Chase.
Grover C. Loening.

STANDARDIZATION AND INVESTIGATION OF MATERIALS:
Dr. S. W. Stratton, chairman.
Dr. Joseph S. Ames.
Maj. Gen. George O. Squier, United States Army.
Dr. W. F. Durand.
Prof. John F. Hayford.
Naval Constructor J. C. Hunsaker, United States Navy.
J. H. Nelson.
E. D. Walen.
Light alloys—
Dr. G. K. Burgess, chairman.
Naval Constructor J. C. Hunsaker, United Navy.
Charles M. Manly.
E. Blough.
Z. Jeffries.
Prof. C. H. Mathewson.

STEEL CONSTRUCTION FOR AIRCRAFT:
Dr. W. F. Durand, chairman.
Dr. S. W. Stratton.
Dr. A. F. Zahm.
F. G. Diffin.
W. B. Stout.
J. H. Nelson.
H. L. Whittemore.
J. W. Smith.
Jesse Coates.

Quarters for Committee

The office and headquarters of the committee are located in rooms 515-519 Munsey Building, Washington, D. C. The technical work of the committee, performed largely by or under the direction of the various subcommittees, is carried out in various laboratories and shops belonging to the Government and universities of learning whose facilities for scientific research are at the disposal of the Government.

To carry on the highly scientific and special investigations contemplated in the act establishing the committee, and which have, since the outbreak of the war, assumed greater importance, and for which facilities do not already exist, or exist in only a limited degree, the committee has contracted for a research laboratory to be erected on the Signal Corps Experimental Station, Langley Field, Hampton, Va. The dimensions of the research laboratory building are 123 by 52 feet. The building is two stories in height, constructed of red brick, with limestone belt courses, coping, and main entrances, including ornamental pediment. In the west half of the building, on the first floor, it is planned to locate a well-equipped machine shop and structural testing laboratory, with a pattern shop directly above the laboratory on the second floor. In the east half of the building, on both floors, it is planned to locate the executive offices, drafting rooms, photographic, physical, and chemical laboratories. The plot of ground on which the building is placed was assigned to the committee by the War Department and will allow the addition of two wings of the same size as the present building. There is also room for two wind tunnels which are contemplated in the near future. An engine test shed will be placed in a convenient location. Authority for the construction of small additional buildings necessary in connection with the laboratory was contained in the urgent deficiency act approved October 6, 1917.

Activities of the Committee in Connection with Preparation of an Aerial Fleet for War

In the latter part of March, 1917, when war with Germany seemed imminent, the committee, in conference with United States military and naval officers and manufacturers of aircraft, reviewed the condition of the aeronautic industry, the facilities then existing in this country for meeting the requirements of the Government, the possibilities of adequate expansion, and the then patent situation and its influence on the aeronautic industry.

A subcommittee was appointed to cooperate with representatives of aircraft manufacturers and to investigate all problems entering into the quantity production of aircraft for the Government. After careful study of the conditions then existing, the Advisory Committee submitted recommendations to the War and Navy Departments for increasing the quantity production of aircraft and urging the adoption of a continuing program of manufacture for the next three years.

In early April the chairman of the executive committee conferred with the Secretary of the Navy and the Secretary of War as to the best method to obtain the most efficient results in the development of aviation and the supply of aircraft for military and naval purposes, stating that the Advisory Committee deemed it desirable to create an aeronautical production board with a civilian head, but not a distinct Government department. This met the informal approval of the two secretaries, and after a thorough study of the problem and in the light of the history of the air services of England and France since the beginning of the war in Europe, the committee recommended to the Council of National Defense that a board be appointed by the Council of National Defense, with the approval of the Secretary of War and the Secretary of the Navy, to be known as the aircraft production board, whose duties would be to consider and deal with the problems arising in connection with the quantity production of aircraft in the United States for military purposes. The committee had previously undertaken a census of the production facilities of manufacturers of aircraft and aeronautic engines, and this information was made available to the aircraft production board at the beginning of its work in April. The Advisory Committee further recommended that the Secretary of War and the Secretary of the Navy appoint a joint technical board of the Army and Navy for determining specifications and methods of inspection for all aircraft requirements for the two services.

Ground Schools for Aviators

Supplementing the recommendations made to the Secretary of War and to the Secretary of the Navy that a continuing program be approved for the production of aircraft, on April 13 the committee recommended to the Council of National Defense that the several problem connected with the establishing of cadet training schools for aviators and with the production of aircraft should be considered together as interrelated problems and should also be considered jointly for the uses both of the Army and Navy.

The committee further, at the suggestion of and in cooperation with the War Department, took the initiative in organizing the several ground or cadet schools for the preliminary training of aviators in this country, and in determining the curriculum and methods of carrying on this instruction.

To this end the committee took under consideration the different methods of training used by Great Britain and France. A special commission was sent to Canada to study the methods of training used at the Camp Borden Military School of Aeronautics at Toronto. The committee called into conference representatives of the War Department, and of six established engineering schools in the United States in connection with the organization of this work. On recommendation of the committee the War Department selected the following six colleges for the establishment of ground-school training in aeronautics: Massachusetts Institute of Technology, Cornell University, Ohio State University, Illinois University, University of Texas, and University of California. Later Princeton University and Georgia School of Technology were added. After the desired organization and program of training had gained preliminary form, the work of further development and routine supervision was taken over by the War Department.

Naming of Flying Fields

In May, 1917, the committee suggested to the Secretary of War that flying fields be named in commemoration of individuals who had rendered conspicuous service or contributed to the development of aeronautics, and recommended that the aviation schools established near Dayton, Ohio; Champaign, Ill.; and Detroit, Mich., be named in honor of Wilbur Wright, Octave Chanute, and Lieut. Selfridge, respectively.

Department of Aeronautics

In connection with the consideration of a bill before Congress for the establishment of a separate department of aeronautics, the War Department, under date of May 16, 1917, asked the committee for a recommendation in the matter. The question was considered at the next meeting of the executive committee, and it was recorded as the sense of the meeting that all parties and governmental agencies connected with the development of the air service of the nation were cooperating in an efficient manner, and that nothing could be gained by the establishment of a department of aeronautics at that time.

Aeronautic Patents

In January, 1917, the War and Navy Departments called the attention of the Advisory Committee to the prohibitive prices of aircraft charged by the various aircraft manufacturers, attributing these prices to the extra item of royalty added by each firm in anticipation of infringement suits by owners of alleged basic aeronautic patents who were then threatening all other aeroplane and seaplane manufacturers with such suits, and causing thereby a general demoralization of the entire industry. After numerous meetings with Government officials, owners of patents, and aircraft manufacturers, extending over a period of several months, the committee recommended the organization of an association among aircraft manufacturers for the purpose of cross-licensing aeronautic patents between the members, such association to be known as the Manufacturers Aircraft Association. The committee cooperated also actively in the determination of the general terms and conditions of this agreement and in securing its adoption by the leading aircraft manufacturers of the country. The question of the legality of this association under the anti-trust statutes of the United States having been raised by the Aeronautical Society of America, the matter was submitted by the Secretary of War to the Attorney General of the United States for his opinion. Under date of October 6, 1917, the Attorney General rendered an opinion "that the association (incorporated), as now constituted, and the cross-license agreement under which it is now operated, are not in contravention of the anti-trust laws of the United States." The purposes in view in the formation of this association and which it is believed has been achieved, are the following:

(1) The prevention of the virtual deadlock with danger of monopoly existing under the patent situation as obtaining previous to its consummation, and the removal of restraint upon the trade operative under the existence of this patent situation.

(2) The settling or avoiding of all litigation, actual and prospective, under the previously existing patent situation.

(3) The opening of the industry to free competition of all aeroplane manufacturers and the opening of all patents held by the membership of the association to equal use and on equal terms.

(4) Provision, as set forth in the articles of agreement, whereby a design originating with a given manufacturer may be put into production and used by another manufacturer with all design data, drawings, specifications, etc., on the payment of a small fee, thus facilitating quantity production of an approved design and stimulating the production of new designs or processes.

(5) The development of financial stability and confidence in the aeroplane industry, thus making possible the financing of the absolutely needed expansion in order to take care of the expected demands.

(6) Reduced cost of aircraft to the Government by reduction of aeroplane royalties payable under all patents made available under the association to an amount less than one-half the figures previously demanded under a part only of these patents.

(7) Broadly speaking, the encouragement of aeroplane production to the highest practicable degree and with reference to the demands of the Government under war conditions.

Information from Europe

In March, 1917, the committee arranged, in conjunction with the National Research Council, for representation on the foreign committee sent abroad by the National Research Council to obtain detailed information on scientific matters of importance in connection with the war, and Dr. J. S. Ames, member of this committee, was appointed such representative.

Associate Members

In order to further develop contact with sources of information from abroad, Lieut. Col. L. W. H. Rees, R. F. C., a member of the British commission, together with Maj. Joseph Tulasne, Capt. Armand de Guiche, and Capt. Amaury de La Grange, of the French Flying Corps and members of the French commission, were made associate members of the committee, and as such attended its meetings, contributing valuable information and suggestions regarding matters with which they were especially familiar.

Sample Forms of Aeroplanes from Europe

In connection with the bringing of sample forms of aeroplanes from Europe for use in developing new designs in the United States, the committee cooperated with the War Department in the search for a site and in arranging for the construction of a suitable building.

Site for Experimental Laboratory

In October, 1916, the committee took under consideration the question of the selection of a suitable site for the committee's proposed experimental laboratory. In this study the committee acted in cooperation with a board of officers of the United States Army which had been appointed to inspect sites for the experiment station and proving ground of the War Department.

At the suggestion of the War Department requesting recommendation by the Advisory Committee in the matter, this committee inspected several proposed sites and after making inquiries as to the general health conditions and the problems of accessibility to Washington and the larger industrial centers of the East, protection from naval attack, climatic conditions, and cost of the site, it made recommendation to the War Department for the purchase of a site about 4 miles north of Hampton, Va., which had been appointed to inspect sites for the experiment station and proving ground of the War Department. This recommendation was accepted by the War Department and the site was purchased.

On this field the War Department has allotted to the committee a space suited to the erection of the committee's proposed research laboratories. The committee has designed the first building of the group contemplated, and the design has been approved by the architects for the War Department. Contract has been entered into for the erection of the laboratory at an estimated cost of $80,900. The laboratory building is now in the course of construction. At this laboratory the committee will carry on, in wide variety, research and investigation relating to aeronautic science and including a study of planes in free flight. The committee has also under preparation plans for the first aerodynamic laboratory to be installed at Langley Field, intended for the development of high wind speeds. The work of this laboratory will be begun as soon as plans are ready.

(*Continued on page* 143)

THE LONDON ENEMY AIRCRAFT EXHIBIT

The Halberstadt Two-Seater

By G. DOUGLAS WARDROP

THE little Halberstadt single-seater, two-strutter, which played its part on the Western front in the spring and summer of 1917, has been little seen during the last year, but recently there has appeared a two-seater Halberstadt, one of which is on view at the London Enemy Aircraft Exhibit.

The Halberstadt two-seater belongs to the C class, or general utility machines, variously employed for reconnaissance, artillery spotting, photography, etc. From a small plate on the machine the year of manufacture is 1917, but the exact date could not be ascertained. This will probably be found later on, when the wings have been stripped, to be stamped on the wing spars. The same plate bore the marking CLII, the exact meaning of which is not clear at the moment, but which evidently indicates some special employment of machines of the general C class. The general arrangement of the Halberstadt is not greatly different from other makes of German machines of the same class, although in minor details some unusual features were noticed.

The body resembles in shape that of the smaller single seater, being of rectangular cross section, surmounted by a curved top, and terminating at the stern in a horizontal knife's edge. Constructionally, however, the two-seater is different, inasmuch as it is covered with three-ply, whereas the single-seater body was of the girder type and covered with fabric.

The internal framework of the body appeared to be of the form usually employed with this construction. In the nose the body terminates in a "spinner" and on the whole the body appears to have a fairly good stream-line form. The engine fitted is a 160 h.p. Mercedes.

The seating accommodation is somewhat unusual in that both gunner and pilot are housed in a common cockpit, separated only by a deep transverse beam forming the back rest for the pilot. The armament consists of two machine guns, one fixed on the starboard side of the engine and operated by the pilot in the usual manner via an interrupter gear. The gunner's machine gun is mounted on a gun ring, of somewhat unusual appearance, mounted a considerable distance above the top of the body on a structure of tubes. A wireless set appears to have been fitted, judging from certain brackets in the gunner's cockpit.

The main planes, which were not in place on the machine examined, and which have not, therefore, been included in our drawing of the machine, apeared to be of equal span, but the chord of the lower plane is considerably smaller than that of the top plane. The mounting of the upper plane is somewhat unusual. From the body two struts slope outwards at a considerable angle, to the top plane. The two struts on each side connect the body and the rear top spar, coming to apoint on the spar, and apparently being vertical in front view. The aileron control is of the type originated by the Nieuport firm, i. e., the leading edge of the ailerons is formed by a steel tube, which extends through the wing into the center section of the top plane, where crank levers are fitted, connected up to the controls by vertical tubes. The latter are indicated in the drawing. The bottom planes are attached to the sides of the body.

The tail plane of the Halberstadt is of symmetrical cross-section, and is built up in two halves, attached on each side of the body. As the balanced rudder is wholly on top of the body, the elevator is in one piece, as shown in the sketch. There is no external bracing of the tail plane.

The undercarriage is of the usual Vee type, with stream-line steel tube struts. The apices of the two Vees are connected by two cross tubes, but no attempt has been make at stream-lining, the axle and the two cross tubes being left fully exposed to the air.

Huge Enemy Planes Seat 8 Men, Carry Bombs 13 Feet Long

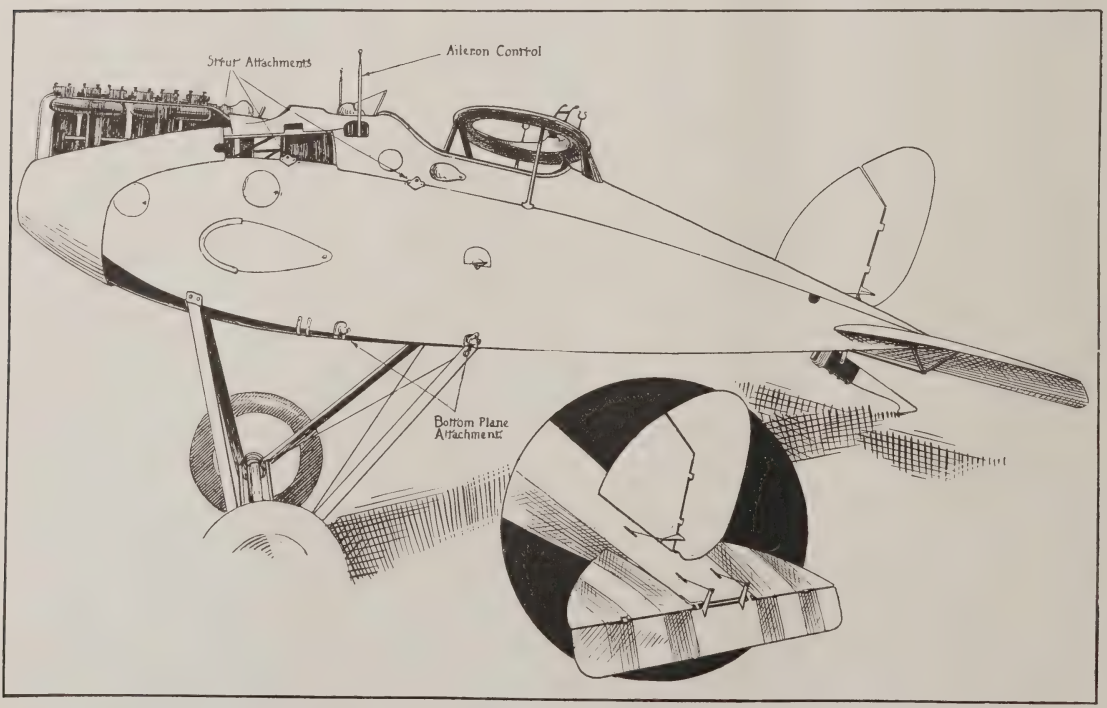
With the British Army in France.—On September 12 German aeroplanes bombed the St. Quentin sector, and the enemy utilized a number of new type planes of huge size. Three of these were shot down east of Peronne. They were capable of seating eight men.

The most astounding thing about them, however, was that they carried bombs thirteen feet long, which contained 2,000 pounds of explosives. This is by far the biggest bomb the Germans have yet produced.

Big Martin Plane on Trial Flight

Another trial flight of the New Glen L. Martin passenger aeroplane was made Sept. 13th at Wilbur Wright Field.

While the Government censor does not permit the printing of a technical description of this aeroplane, it is permissible to state that the ship will easily carry from seven to ten passengers, although the seating capacity is built to accommodate four passengers.



Outline of the body of the Halberstadt two-seater biplane, 160 h. p. Mercedes engine. The inset is a sketch of the tail planes.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Aviation Gen. Supply Depot, Detroit, Mich. Wire DAP.
Note 3—Report to S. C. Supply Depot, 39 and Winchester St., Chicago, Ill.
Note 4—Report to Supply Section, Dept. Mil. Aeronautics, Washington, D. C.
Note 5—Report to Aircraft Production Depot, Buffalo, N. Y.
Note 6—Report to Capt. R. J. MacKenzie, Standard Aero Corp., Elizabeth, N. J.
Note 7—Report to Maj. F. W. Leadbetter, 119 D. St., N. E., Washington, D. C.
Note 8—Report to U. S. Army Training Detachment, Iowa City, Iowa.
Note 9—Report to Dayton, O., Production Engineering Dept.
Note 10—Report to Dayton, O., Chief Technical Section.
Note 11—Report to Dayton, O., Aircraft Production Park.
Note 12—Report to Wright-Martin Corp., Long Island City, L. I.
Note 13—Report to Valparaiso University, Valparaiso, Ind.
Note 14—Report to Army Balloon School, Arcadia, Cal.
Note 15—Report to U. S. Industrial Chemical Co., Baltimore, Md.
Note 16—Report to Carnegie Inst. of Technology, Pittsburgh, Pa.
Note 17—Report to Dis. Mgr. Production, Bureau Aircraft Production, Chicago, Ill.

Special Orders Nos. 204 to 209, Inclusive

A

Atwell, William Benefiel....SLA; DAF
Agee, William T....PFO
Anderson, Seymour Elmer....SLA; BST
Allen, Thomas B....PMT
Adams, Harold Verne....SLA; KST
Atkins, Edwin F., Jr....FLA
Ahl, Parker V....FLA
Aub, Anthony....CPA
Alvey, Aloysius B....FLA
Anderson, Albert McWhorter....FLA
Atkins, James F....CWT
Anderson, Albert E....UIU
Aney, Melvin C....FLA
Addington, Wayne W....PFO
Agramonte, Mariano Ignacio....SLA; ELA
Adams, James E....DMA
Anderson, George Francis....SLA; GLC
Akers, Claude....SLA; BST
Allison, Elmer Curtis....SLA; GLC
Anderson, Milton S....TFT

B

Boose, Budd B....SLA; DAP
Betz, Carl Milton....SLA; EOT
Braden, Howard Herndon....SLA; FOB
Bahl, Errold Grover....SLA; RWT
Beauvais, Octave Peterson....SLA; HHN
Barnard, Frank L....TFT
Brown, Sewall....SLA; KST
Berthold, Oscar Hudson....SLA; MSC
Buffum, Frederick Cyrus, Jr....SLA; PMT
Behne, Thomas Darl....SLA; AAD
Boole, Samuel Harris....SLA; CRI
Bloomer, Asa Schoonmaker....SLA; FOB
Browning, Robert L....PMT
Bartlett, Lowell Wilson....SLA; DAF
Bazell, Grover C....CGC
Britton, John Stephen....SLA; APR
Black, John Nelson....SLA; CJW
Bonneville, William Henry....SLA; AAD
Bostrom, Hjalmar O....CWT
Boerner, Eugene Sonnenberg....SLA; ELA
Baxter, Marcus Luling....SLA; ELA
Beaven, Joseph C....CUI
Booth, Morrison....SLA; FOB
Beasley, Henry Carrington....SLA; KST
Brown, Robert James, Jr....FLA
Belkrap, Clifford Burton....SLA; CAF
Brenneman, Charles Gage....SLA; LDT
Bickerton, Howard Dewitt....SLA; DAF
Botts, Laurel Winter....SLA; BST
Burns, Thomas Russell....FLA
Broderson, Roy....GLC
Byerly, Frederick Marion....FLA
Bither, Tom Allen....FLA
Blood, Frank Leroy....FLA
Belding, Hiram H., Jr....UIU
Barone, Tony....CWT
Blystone, Raymond John....BFT
Bullis, Leland Storey....SLA; DAF
Burk, Elmer E....VBW
Bash, Philip B....HHN
Burnam, Samuel P....DMA
Benson, Harry Constable....SLA; DAP
Backus, Paul Milford....SLA; LDT
Bushman, Ralph John....SLA; DMA
Blair, Frank W....BST
Bridgman, Orlando W....BST
Brodd, Earl F....BST
Barber, Clifford Lamatte....SLA; GLC
Barr, George D....TFT
Blanchard, Leslie D....TFT
Brady, William T....TFT

Burch, Mark H.....TFT
Burge, Kemp S.....SMM
Byrne, Melvin Graves.....SLA; GLC
Bolsinger, Clifford R.....LHV
Blystone, Raymond J.....WFO
Barmore, Henry D.....Note 8
Borden, John A.....Note 8
Balinger, Albert Joseph.....FLA; Note 2
Brown, Fred L.....Note 12
Brown, Homer.....PFO

C

Clark, Bruce.....SLA; ELA
Chamberlain, Rowland L.....Note 10
Conway, Joseph Cleveland.....SLA; KST
Calkins, Richard William.....SLA; DAF
Carnes, Donald B.....SLA; LDT
Coe, Bernard.....SLA; LDT
Culver, Howard P.....DMA
Caulfield, Hughes Joseph.....SLA; LDT
Cannon, Walter Dewitt, Jr.....SLA; LDT
Clark, Anson L.....FLA
Cotton, Horace G.....MAT
Callender, Marshall C.....GLC
Carter, Samuel Oliver.....SLA; CRI
Cooper, Edward Irving.....SLA; ELA
Clark, Charles.....SLA; DAF
Citron, Alvin Harold.....SLA; DAF
Coolidge, Homer H.....FLA
Clark, Carl F.....CWT
Craig, Britt.....SLA; KST
Carpell, Otto C.....SLA; KST
Corbett, Thomas Cyril.....SLA; LDT
Carter, Frank L.....CWT
Culver, Rufus B.....CWT
Campbell, Harold G.....FLA
Camnitz, Edward.....FLA
Carrington, George Daer.....FLA
Cake, Joseph Paul.....FLA
Cummins, Albert S.....FLA
Cane, Bernard M.....CPA
Clark, John L.....FLA
Culver, Edward P.....SMM
Cuff, James W.....FLA
Comegys, Leonard M.....SMM
Catlin, Robert W.....CWT
Carlberk, Don P.....PFO
Coulter, Marion E.....PFO
Case, Ira H.....BFT
Cameron, Ralph McVean.....SLA; GLC
Chandler, Homer B.....JMA
Chamberlain, Stephen B.....PFO
Callender, Leonard.....SMM
Carmody, Arthur Roderick.....SLA; KST
Cummins, John W.....Note 17
Crisp, Marshall Claiborne.....SLA; KST
Carrere, Charles Fitzhugh.....SLA; LDT
Clark, Samuel Gilbert.....SLA; GLC
Crouse, James Aubrey.....SLA; LDT
Cate, Theodore Webster.....SLA; GLC
Cressey, George Good.....SLA; FOB
Charlton, Howard C.....CWT
Condit, Kenneth H.....WFO
Combs, Lester Samuel.....SLA; CRI
Colman, Ben.....SLA; LDT
Clark, William Patrick.....SLA; CRI
Crowe, Dorsey Ryan.....SLA; KST
Cameron, Charles R.....MJA
Cabell, Philip F.....TFT
Carney, Paul Julian.....SLA; GLC

D

Dusossoit, Florimond Joseph.....SLA; LDT
Dore, Charles Henry.....SLA; LDT
Drumm, John Raymond.....SLA; LDT
Dunn, Charles Albert.....SLA; KST
Dodge, Vernon M.....PFO
Doherty, George Daniel.....SLA; PFO
Davis, John Williams.....DMA
Dewey, John Payton.....SLA; LDT
Dayton, William H.....MAC
Dunlap, John Robertson, Jr.....FLA
Durphy, Emmett Clinton.....FLA
Dudley, Frank B.....CPA
David, Earl.....FLA
Doyle, Benton A.....PrO
Denton, George R. S.....FLA
Dickinson, Raymond S.....CPA
Devine, Harold James.....SLA; APR
Dwinell, Ralph Milton.....SLA; PMT
Dolphin, Adrian James.....SLA; LDT
Dale, Russell Charles.....SLA; CRI
Draper, Gus A.....BFT
Douglas, Albert N.....CWT

E

Edgerton, James C.....DMA
Eble, Ferdinand, Jr.....SLA; DAF
Emig, Howard A.....DAP
Evans, Elmer L.....MAT
Evans, Earl F.....TFT
Ennis, Elin D.....CWT
Elliott, Merle A.....MAT
Eastman, Harold F.....EOT
Eichelberger, George H.....MJA
Emery, Forrest S.....FLA
Eylers, John D.....CGC
Eisenbeis, Herbert Oscar.....SLA; GLC
Eustis, Edwin M.....DMA
Elgin, Paul De Witt.....SLA; Note 7
Ebbett, Percy J.....DMA
Edwards, Richard D.....BFT

F

French, Leigh Hill, Sr.....CPA; VBW
Fredell, Edwin J.....DAP
Frank, Walter H.....JMA
Frazier, Walter Stephen, Jr.....SLA; ELA
Fowler, Robert L., Jr.....RWT
Ford, Bernard W.....DMA
Fisher, Frank W.....GLC
Fish, Farnum T.....MAT
Finlay, George Dick.....FLA
Ford, Donald.....UIU
Frazer, Allen F.....DAF
Fouts, Kenneth C.....FLA
Fuller, Harold Chipman.....SLA; LDT
Foxon, Roy Draper.....SLA; ELA
Faucher, Joseph A.....AAD
Fuhrman, Daniel Kennedy.....FLA
Fisher, Stanton Baird.....SLA; EOT
Fernhoff, Fred Bert.....TMA
Foster, Edwin Beall.....SLA; TFT
Frank, Philip Raymond.....SLA; FOB
Flynn, Frank J.....ELA
Farley, Henry Chester.....SLA; LDT
Finlay, William P.....TFT
Funsten, Randolph F.....LDT

G

Grant, William Wulfing.....SLA; TMA
Gifford, Raymond M.....SMM
Graham, James L.....SMM
Griffith, Edward C.....SMM
Giblon, Earl Z.....DAP
Guest, David P.....GLC
Gault, John Bennett.....SLA; LDT
Gardner, Kelsey B.....CUI
Goetz, Fred Samuel.....SLA; PMT
Gary, Francis P.....CWT
Gri..th, John, Jr.....SLA; PMT
Garver, Benjamin G.....SMM
Gardner, Thomas A.....CWT
George, Walter S.....CPA
Grant, William W.....WFO
Gish, Daniel Brailey.....FLA
Grolman, Aaron.....TFT
Grenawalt, Harold V.....FLA
Gallagher, John J.....CPA
Garner, Jack A.....Note 5
Griffin, Norval B.....ADT
Grekila, John H.....CWT
Guinee, John William.....SLA; CJW
Garrett, George A.....FLA
Gateley, Francis Paul.....SLA; CJW
Geary, Edward Andrew.....SLA; CJW
Galbraith, George R.....FLA

H

Huntington, Ralph Oscar.....SLA; KST
Hearn, James Allan.....SLA; DAF
High, Stanley Hoflund.....SLA; DAF
Haight, Samuel.....SLA; PFO
Hatfield, Paul Morrison.....SLA; FOB
Holcombe, John M., Jr.....WFO
Hagemeyer, Frank Herbert.....SLA; LDT
Hudson, Harold.....SLA; LDT
Hughes, Robert William.....SLA; DAF
Harrison, Stanley Herbert.....SLA; LDT
Hyde, Charles J.....LDT
Hinckley, George Curtis.....SLA; LDT
Houghton, Henry S.....TFT
Hailey, Edward Gee.....SLA; CAF
Handy, Homer Allen.....SLA; LDT
Harris, Andrew Ross.....SLA; FOB
Hamby, William F.....CPA
Hanscon, Charles L.....SMM
Hammond, Wilbur A.....FLA
Hagerty, Edwin B.....CPA
Hynds, Harold D.....CPA
Hine, William H.....FLA
Hearn, James A.....GLC
Haugen, George A.....CWT
Hay, Malcolm.....PFO
Hunter, Leon W.....PFO
Haile, Thomas J., Jr.....CWT
Happ, Clarence W.....DMA
Hall, Howard A.....TFT
Hollopeter, Orville C.....TFT
Hammond, Reginald G.....TFT
Haynes, Grissom E.....TFT
Harris, Henry L., Jr.....CPA
Halbrook, Sidney W.....BST
Hutson, John Raymond.....SLA; Note 15
Hill, Lon C., Jr.....CPA
Hughes, Archibald J.....PFO
Hamer, Robert S.....LHV

I

Imrie, Henry John Norman.....SLA; LDT
Icenhower, Fred J.....CPA
Irving, Elmer Ellsworth, Jr.....SLA; KST

J

Jiskra, Joseph B.....SRC
Jernigan, John Albert.....FLA
Johnson, Renus E.....CWT
Johnson, Perry V.....TFT
Joralemon, Ira B.....MJA
Johnson, Renus Edward.....SLA; KST
Johnson, Edward L.....CWT
Jones, Daniel B.....Note 9
Jones, Roy L.....LHV
Johnson, David S.....FLA
Jacoby, Joseph Harry.....SLA; KST
Jacobson, Hilding Leonard.....SLA; CJW
James, Edward David.....SLA; SAG



In the interior of a hangar. Planning a night bombing raid into the enemies' country

Jordan, Edward Francis.....SLA; TFT
Jennings, John D.....CWT
Johnston, Lloyd E.....MAC
Jackson, Norris D.....SLA

K

Keale, Charles Frederick, Jr.....SLA; LDT
Kirksey, Guy.....SLA; BST
Kerr, Henry H., Jr.....CWT
Keltus, John Aloysius.....SLA; CAF
Kingsbury, Joseph J.....CJW
Kiplinger, Edmund E.....PFO
Knauff, Calvin N.....CWT
Kelly, Harold Richard.....CPA
Keys, Douglas Leighon.....CPA; DMA
King, Frank L.....MAT
Kelly, Ralph M.....MAC
Kerr, Robert H.....FLA
Keeler, Horace Bushnell.....SLA; FOB
Kehoe, Frank, Jr.....CPA
Knight, Morris E.....CPA
Keltus, John A.....TFT
Keeble, Donald G.....CPA
King, Joseph Garnet Wolseley.....SLA; LDT
Kelly, Daniel James.....FLA
Kelley, Ralph Leverett.....FLA
Koontz, Ralph Grant.....FLA
Kolb, William Mackpice.....OBS
Korfhage, Harry G.....CFT
Krotzer, Henry W.....OBS
Kelleher, William P.....MJA

L

Loderwyck, Arthur G.....Note
Lithgow, John McMahan.....SLA
Lee, Arthur.....CPA
Ludwig, Nicholas H.....FLA
Lewis, Mars.....GLC
Lanfall, John T.....GLC
Lewis, William Curtis Hill.....SLA; LDT
Ledbury, Francis H.....EOT
Lawton, Malcolm S.....GLC
Lyon, William L.....CWT
Levi, Henry.....PUP
Lawrence, Theodore B.....CPA
Lewis, Mars.....SLA; DAF
Lobitz, Carl H.....FLA
Lilley, Leonard E.....Note 10
Ludwick, William Alfred.....CPA; DMA
Lloyd, Milton DeGraw.....SLA; CRI
Lincoln, Russell Fisher.....SLA; DAP
Lawton, William W.....BST
Lyons, Thomas Barton.....Note 14
Loderwyck, Arthur G.....Note 9
Lutz, David Brenton.....SLA; LDT
Lyon, Alfred J.....HHN
Lucas, Philip D.....DMA
LaBelle, Claude A.....Note 3



Air Chiefs in conference at Rockwell Field. Major-General W. L. Kenly, Director of Military Aeronautics and Major Burwell, Chief at Rockwell Field

Loseth, August Lindor.....SLA; CJW
Lamb, Donald Wingate.....SLA; PMT
Leonhardt, Elmer G.....DMA
Loriks, Carl Emill.....SLA; GLC

M

Mitchell, Clark G.....Note 9
Morgan, Lewis Hadyn.....SLA; LDT
Moore, Donn C.....GLC
Matthews, Thomas K.....MAT
Murphy, Bernard Michael.....SLA; FOB
Merritt, Wilson Parks.....SLA; DAP
Martin, Thomas H.....GWT
Merrill, Richard S.....DMA
Murphy, George Valentine.....SLA; LDT
Morton, Benjamin Rhoten.....SLA; CRI
Marshall, William J.....MAC
Mabee, David W.....GLC
Maurer, Paul G.....GLC
Moser, William C.....GLC
Mapes, Samuel H.....CGC
Myers, Carl E.....MAT
Moffatt, James.....CWT
Marschuetz, Elmer G.....FLA
Miller, Ernest Huber.....SLA; RWT
Mozley, Warren Merrill.....SLA; LDT
Madenford, Raymond Sheridan.....SLA; DAF
Miller, George Alfred.....FLA
Montague, Enos J.....UIU
Myers, Norman H.....CWT
Mahan, John H.....SBI
Mucklestone, Melville.....SLA; LDT
Miller, Felix B.....LDT
Morel, Emerson L.....SMM
Maher, Cornelius C.....CWT
Martin, Albert Aloysius.....SLA; LDT
Milnes, Ralph Leslie.....SLA; CJW
Mitchell, Oliver F.....HHN
Munroe, George Cotton.....SLA; LHV
Meller, Harry B.....Note 16
Moore, Donn Clark.....SLA; DAF
Myers, Vernon.....SLA; LDT
Moery, Ralph.....SLA; LDT
Millington, Russell Meader.....SLA; KST
Meek, Frederick James.....SLA; GLC
Menefee, Jesse I.....DMA
Meng, Walter Joseph.....SLA; KST
Mercer, Charles Philip.....SLA; EOT
Metcalf, Frank.....SMM
Meyen, Bert P.....GLC
Minges, Henry V.....GLC
Muehlberg, Clarence E.....LHV
Meyer, Edward.....LHV
Martin, Douglas E.....LHV
Morrow, William M.....CWT
Moses, Leonard.....CWT
McWhirter, Louius Bransford.....SLA; CAP
McManus, John Joseph.....FLA
McCaulley, Edgar Lassell.....SLA; DAP
McCabe, John E.....SMM
McKay, Leo Hugh.....SLA; DAF
McMorrow, William F.....UIU
McMillan, James E.....SLA; RSD
McCoy, Daniel C.....CPA
McClellan, Charles William.....SLA; LDT
McCluer, Charles F.....CWT
MacEwen, Herbert Nathaniel.....SLA; RWT
McNabb, David W.....CPA
McRaith, Joseph G.....LHV
McCabe, John H.....CGC
McLaughlin, Dennis James.....SLA; KST
McLeod, Leland S.....CWT
McMinn, Wiley W.....GLC

N

Norby, Erling S.....MAC
Nellson, Frank Justin.....SLA; KST
Norwood, John Stokes.....SLA; KST
Newberry, Hawley DeWitt.....SLA; KST
Nelson, Frank J.....CWT
Neill, William C.....FLA
Neidig, William N.....CPA
Newmeyer, William L.....CAF
Neff, Clarence A.....FLA
Nelson, Martin A.....CWT

O

O'Brien, Roland Henry.....SLA; LDT
O'Brien, John Joseph.....DMA
O'Brien, Frank E.....CWT
O'Neill, Grover.....CPA
Ordway, Lucius P., Jr.....DMA
Organ, Vernon C.....GLC
Oliver, William Bryant.....FLA
Olmstead, Rossiter D.....CWT
Oldys, Robert.....CPA
Ordway, William F.....TFT

P

Poppic, Arnold, Jr.....SLA; TMA
Phelps, Allen Cleveland.....FLA
Pell, Clarence Cecil.....FLA
Schreeppel, Harold H.....SAG
Peters, Walter LeRoy.....SLA; SBI
Preston, Ord.....CPA
Peters, Crawford A.....TFT
Pugh, Harvey M.....MAC
Potter, Charles M.....GLC
Porter, Lester Leon.....SLA; KST
Patrick, Howard.....SLA; ELA
Pulliam, Ellis P.....CRI
Peterson, Frank Seth.....SLA; LDT
Pennybacker, Percy V.....CPA
Painter, Theophilus S.....CPA
Proctor, David Cogswell.....CPA
Pentland, Henry B.....CWT
Phillips, Charles T.....CPA
Pierce, Walter Griffin.....FLA

(Continued on page 140)

FOREIGN NEWS

GREAT BRITAIN

On the night of Aug. 21-22 the weather conditions were exceptionally good, and a large amount of work was carried out by our squadron.

Military objectives at Frankfort and Cologne were heavily attacked. Very good results were observed, and bombs were sent all around the stations and barracks.

A railway junction of Treves was also successfully attacked. All our machines returned safely.

Four hostile aerodromes were heavily bombed and many hangars hit. Machine guns were freely used on aerodromes, trains, and searchlights as well as anti-aerial batteries. One of our machines is missing.

On the morning of Aug. 22 one of our squadrons attacked the chemical factories at Mannheim. During the heavy fighting on the outward journey two of our machines were brought down. The remainder reached and successfully bombed their objective. Very fierce fighting again took place on the return journey, as a result of which five more of our machines are missing. Three hostile aeroplanes were destroyed. Two of these seemed to crash, and one went down in flames.

Two other squadrons attacked the railway sidings at Coblenz at about 7:30 o'clock on the morning of Aug. 22, and a hostile aerodrome at Hagenau was bombed with very good results. All these machines returned safely.

During the night 194 tons of bombs were dropped, and 215 tons of projectiles were dropped during the day.

The feature of recent air work has been the bombing of enemy aerodromes by overwhelming forces of our aircraft. Two of these raids, on August 16-17, give an idea of their effectiveness.

A large number of our machines started about noon for the Habourdin aerodrome. Arriving there about 1 o'clock, they attacked from an average height of about 200 feet and at this elevation in daylight made good hits with their bombs. No enemy aeroplanes tried to interfere, but two were seen and attacked; one shot down crashed into some trees close to the aerodrome; the other was driven down and presumably crashed, although it was not observed actually to hit the ground.

The machine guns and anti-aircraft guns, which were plentiful about the aerodrome, were attacked from above by machine guns on our aeroplanes as soon as they opened fire or disclosed their positions. All were silenced; none did any harm. Hundreds of bombs were dropped. Three large iron hangars containing numbers of enemy machines were destroyed; six others were known to have been hit and partly wrecked. Two machines on the ground outside of the sheds were hit by bombs and burned.

Fires were caused in the officers' and men's quarters and a building supposed to be the officers' mess was blown up and destroyed. A number of other outbuildings, including one ammunition shed, were set afire and a large number of casualties were caused among the mechanics and other personnel, who when the raid began ran toward a hospital in the neighborhood for shelter.

After half an hour spent in destroying the aerodrome, other objects were sought. A train on the railway was shot at, chased and finally stopped. One staff motor car was shot at on the road and overturned into a ditch; another was made to run up a steep bank, where it stuck; no occupant was left in either, presumably all were killed. Finally several transports were shot at on the road and men and horses were seen to fall. All our machines returned home safely.

The raid on the following day started earlier, the machines going out at 7 o'clock. The objective this time was the Lomme aerodrome, where the sheds were of wood or canvas. More than 100 bombs were dropped, some from heights as low as fifty feet, which was too low because the concussion strained our own machines. Four sheds were set afire and it is believed three others were destroyed. A number of outbuildings were wrecked and the personnel running in all directions, were chased and killed or driven to shelter.

Large workshops near by were hit by several bombs and left smouldering. Two enemy aeroplanes which were met dived to the ground and crashed on the aerodrome in mere terror, without being shot at. Afterward our men attacked troops and transports. One of our machines was shot down by the anti-aircraft defences; all the others returned undamaged.

It is believed that in each case the result of the raid was the practical obliteration of the aerodrome and the destruction probably of all the machines in them and of a large part of the personnel.

The official statement on aerial operations issued Sept. 6th says:

Much reconnaissance and photographic work was accomplished by the air force on Sept. 4 and a large number of artillery and contact patrols were carried out. The weight of bombs dropped by us during the day was twenty-three tons. No bombing was possible after dark.

Enemy machines, working in large formations on the German side of the lines, showed considerable activity. Twenty-five hostile machines were brought down by our airmen and no less than nine ballloons were shot down in flames. In addition fourteen hostile machines were driven down out of control. Sixteen of our machines are missing.

One of our machines reported as missing in the fighting of Sept. 2 has since returned.

In the course of the weeks which have elapsed since the commencement of our offensive on Aug. 8, 465 enemy machines have been brought down by our airmen, their destruction being in every case clearly established. In addition, the total of enemy machines proved to have been driven down out of control, many of which must actually have crashed, is exactly 200.

The above figures are exclusive of the considerable number of enemy machines brought down by gunfire from the ground. Sixty-one German balloons have been set on fire. Nine hundred and eleven and one-half tons of bombs have been dropped by us.

Practically the whole of the air fighting has taken place on the enemy's side of the line. The number of our machines which have failed to return during this period is 262.

The storm centre of British aerial activity throughout the week has been the sector from Lens to Peronne, the airmen materially assisting in piercing the immensely strong Hindenburg defences and harassing the retreating enemy. German organizations behind the Wotan line, including the vital railways radiating from Valenciennes, were heavily bombed. In the course of the week 166 tons of explosives were dropped in the battle area. Ninety-two enemy machines were destroyed and forty-five disabled, while seventy-five British machines were reported as missing.

Eleven German aeroplanes were brought down on Sept. 6, in air fighting, and twelve were driven down out of control. One enemy balloon was destroyed. Five of our machines are missing.

Observation for the artillery was continued both by aeroplane and balloons. Some valuable reconnoisances were carried out by our machines, and a large number of photographs were taken, while our balloons reported much useful tactical information.

During the day and the following night thirty-two tons of bombs were dropped by our airmen, the railway connections at Armentières, Lille, Douri, Denain, Cambrai, and St. Quentin being heavily attacked. All our night-flying machines have returned.

On the night of Sept. 6-7 our squadrons carried out attacks against two hostile aerodromes. Fires were caused, but observation of the results was hindered by weather conditions, as were operations generally. All of our machines returned.

On the morning of Sept. 7 our squadrons attacked the railways at Ehrang, (four miles northeast of Treves, Prussia,) and the chemical works at Mannheim Good bursts were observed on and beside the railway lines at Ehrang.

Fierce opposition was met with in the raid on Mannheim, but, despite this, the objective was reached and successfully bombed. Eight direct hits and many other good bursts were observed on the chemical works. Our squadrons fought largely superior numbers of enemy aeroplanes both before and after reaching the objective.

One squadron had a hard, continuous fight for a distance of seventy miles before reaching its objective, and the fight continued for another seventy miles on the way back. Over two tons of bombs were dropped on Mannheim.

As a result of the fighting one enemy aeroplane was destroyed and two more were driven down out of control. Four of our machines are missing.

Clouds and rainstorms limited work in the air on Sept. 7, but a good deal of artillery observation was carried out, as well as reconnoissances and contact patrols. Eight hostile machines and one balloon were destroyed by our airmen. Three of our machines are missing.

Thirteen tons of bombs were dropped by us during the twenty-four hours. Our night bombing machines all returned safely.

FRANCE

The French War Office, in reporting on operations in Macedonia, says that French, Serbian, and British aviators dropped two tons of bombs on enemy encampments.

Marshal Foch has made the following announcement on September 16:

"Fair weather enabled our aviators to do a great amount of work on our own front, as well as in connection with the American Army. There were many severe combats. Fourteen enemy aeroplanes were brought down or put out of action and seven captive balloons set on fire. Our airmen attacked the enemy with machine guns and bombs. On enemy concentrations seven tons of explosives were dropped.

"Our airmen continued their activity during the night and dropped more than twenty-three tons of explosives on the railroad stations at Laon, Hortier, Juniville, Conflans, Mars-la-Tour and other places. Our observation aeroplanes made numerous reconnaissances, regulated the artillery fire and took some photographs far behind the enemy lines."

The Allied pursuit groups played a large part in maintaining an aerial barrage over the sector of the advance and attacked enemy planes and balloons wherever found. The work of the observation corps was greatly facilitated thereby.

The pilots and observers of the Allied units fired more than 30,000 rounds from their machine guns at convoys on the roads, artillery and troop concentrations.

Several enemy squadrillas came in the direction of Paris during the night. Our lookout posts followed and reported their movements and they were subjected to a particularly intense barrage. Other methods of defense were also put into operation. Several bombs are reported to have been dropped, causing a certain number of victims and material damage. The alarm was given at 1:25 and the "all clear" at 3 o'clock.

One of the enemy planes was brought down by a shot from the artillery. The machine fell in one of the northern suburbs. In the wreckage were found the bodies of an officer and two men.

The French War Office has issued the following upon aviation activities:

"On September 16 eight enemy planes were brought down or damaged and one captive balloon was burned. Night bombing machines, notwithstanding the storm, dropped ten tons of projectiles on enemy stations, bivouacs and aviation grounds. Several fires broke out."

In aerial fighting on September 16, French aviators destroyed 12 German aeroplanes and set on fire 16 captive balloons. Sunday night bombing squadrons dropped forty-six tons of bombs on military targets behind the German lines from Laon to Metz.

GERMANY

The German official report for September 16 says:

"As a reprisal for the continued bombing of German towns, 22,000 kilograms of bombs were dropped on Paris last night.

"We shot down four enemy aeroplanes and fifteen captive balloons."

The official statement on aviation activities for September 17 says:

"Yesterday we shot down 44 enemy aeroplanes. Colonel Lorzer achieved his fortieth and Lieutenant Rumey his thirty-fifth victory. Lieutenant Thuy achieved his fiftieth aerial victory."

MODEL NEWS

Edited by John F. McMahon

Model Aeroplane Building as a Step to Aeronautical Engineering

Gasoline Engines

WE will now take up Gasolene Motors. This type of motor is of more difficult construction than the Compressed Air or Steam Engine. The principal of the engines are much the same, the only difference is, the gasolene engine works on internal combustion, by that I mean that the compressed air motors or the steam engines are driven by means of pressure forced into a tank for the former and generating steam in a boiler for the latter.

The Gasolene Engine does not need a boiler or a tank. The gas is sucked into the cylinder by the piston and then compressed by the action of the piston as it again ascends to its highest point where it is exploded by a spark. This explosion expands the highly explosive mixture and forces the piston down. Of course the reader will readily see that the constant explosions cause wear and tear on the cylinders, pistons, and bearings and the construction must be better and heavier than is needed in the other types.

The construction of a gasolene engine presents many difficulties and very few are known to be successful, the main reason for this being the saving of weight without sacrificing strength, so for this reason I do not think it advisable to start work on this type of motor. Of course if the reader happens to be a machinist, he can attempt to construct the motor from the data which follows.

It is not necessary to build a Gasolene motor to be a good Aeroplane pilot, but he must have a thorough knowledge of the workings of a Gasoline Engine.

The accompanying cut will show the working principle of two different types of gas engines.

Figures 1, 2, 3, and 4 show the four cycle type which means that in order to suck in the gas, compress it, explode, and last exhaust it, the engine must make four separate strokes.

Figures 5 and 6 are for the two cycle type which only needs two strokes to do the same as the four cycle.

Figure 7 shows the piston at its highest point and about to start down. This action will cause a suction of gas through the intake valve, which is automatic, being held in a closed position by the spring, only opening when the suction becomes strong enough to pull it out of place.

When the piston reaches its lowest point, the intake valve closes and the piston starts upward and compresses the gas because it has no possible channel in which to escape Figure 2.

In Figure 3, the gas being compressed the spark is timed to fire just as the piston reaches top centre, and the piston is forced down. This is the power stroke.

Figure 4, the piston is at its lowest point and starts upward, forcing the burnt gas out through the exhaust valve which is opened by the cam, rotated by the gear arrangement at half speed.

The piston travels to its highest point again and is now in position to suck in raw gas. These are the four strokes of a four cycle engine.

The Figure 5 shows the first stroke of the two cycle engine, or explosion stroke. The explosion drives the piston down which compresses the gas in the crankcase. When the piston reaches the bottom the compressed raw gas is released and shoots up through a channel uncovered by the piston and into the chamber at the top. To keep the gas from shooting directly across and out through the exhaust parts a baffle plate is attached to the piston. This baffle plate causes the gas to shoot upward and to force the burnt gas out at the same time.

The piston now starts back and compresses the new gas, at the same time forming a vacuum in the crank case which sucks in raw gas which will be compressed and forced into the top chamber when the piston reaches the bottom centre. See Figure 6.

A close study of these figures will show the reader without any explanations, the working of a two cycle engine.

Another point to be remembered is the elimination of valves in this type of engine. This saves considerable weight and makes it adaptable to model aeroplane practice, and but for its cranky ways would be an ideal piece of mechanism. A one cylinder two cycle engine of a certain size is almost as powerful as a *two* cylinder engine of the four cycle type as it gets a power stroke for each revolution while the four cycle engine gets a power stroke for every other revolution.

To the right of the cut are two views of a small motor of the two cycle type to give the reader an idea of the proportions. The cylinder and crankcase are of aluminum castings machined later. The piston is made of cast iron with two rings and is almost a shell. The connecting rod is made of thin steel casting, the wrist pin bearing is just a ½" hole while the big end is two piece and babbited with white metal.

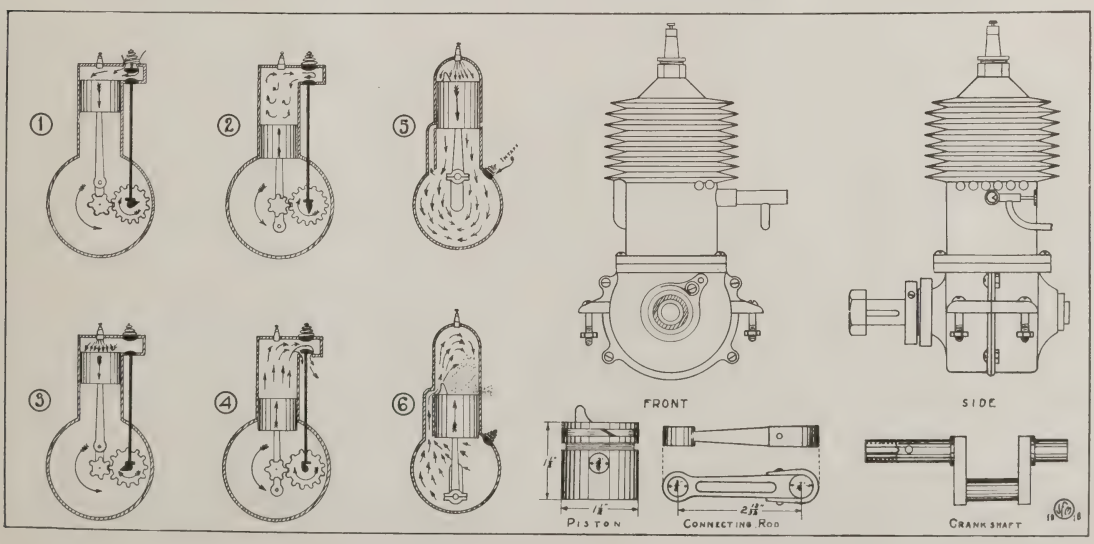
The bearings of the crankshaft are fitted with bronze bushings. The crankshaft is turned from a solid piece of steel and fits tightly into the bearings so as not to leak compression.

The carburetor is in name only it would be better to call it a mixing valve, it is clearly shown in the drawing. The stroke and bore of this engine are 1½".

This motor weighs 19 ounces and gives ½ h.p. at 2000 R.P.M.

So much for motors we will now start on our man carrying glider.

(To be continued)





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Colonel Meets Some New Uniforms

They wore new serge uniforms, leather puttees, and Stetsons just out of the box which showed the recently purchased silver and black hat cord off to a great advantage. The trio stood near the Post Office waiting for a bus to go to town. They appeared well satisfied with themselves and the world in general and when the commandant of the field rounded the corner in his car not one of the three appeared to notice him. In fact, they ignored him. Nary a ripple from them did the Colonel get. The car stopped.

"Come here," said the Colonel to the trio, at the same time motioning to an interested M. P. to be ready for action.

"Don't you know enough to salute superior officers?" asked the Colonel severely.

"Well, I'll tell you old man," answered one of them taking a cigarette from his mouth and blowing the smoke smoothly over the ash, "we've talked among ourselves about it and Washington has given no word to satisfy us. Some say we should, others say we shouldn't, so there you are. I suppose it's alright for you but we're not so sure." "Say," he broke off suddenly, "that dog's face is queerly marked. Ever try using mange soap for those flees?"

The Colonel gasped. "How long have you three been on this field," he thundered. The M. P. trembled and prepared to do his duty. The P. O. C. puffed on a cigarette and said calmly:

"About three months. And let me tell you, old scout, it's hotter than hell in that post office since they made us wear uniforms."

"Drive on!" said the Colonel to his chauffeur.

"Wonder who that guy was," one of the P. O. C. said. "He sure acted as though he thought he knew us."

Keeping Up With the Joneses—Nothing Like a Quick Brain.—By Pop.



Courtesy N. Y. Globe.

Omar Kayyenne

(A Hot-Aircraft Poem)

Awake! for Morning in the Bowl of Night
Has flung the Stone that put the Zepps to flight.
The Men who sought the Raiders have returned.
They very nearly found them—but not quite.

And as the Cock crew, those beside the Shed
Welcomed them Home, believing them all dead;
Put the Machines away, and talked a while,
Brought forth the Wine—and then went back to Bed.

And strange, among the Anti-Aircraft Lot
Some could articulate, while Others not;
And suddenly One more impatient cried:
"Who is the Potter, pray, who failed to Pot?"

Then somewhat peevishly there answered One,
In private Life a local Butcher's Son,
"To-night it was my Turn to Biff the Zepp—
But I forgot to load the Beastly Gun."

Thinking this deeply o'er, as best I may,
I turn aside, and Someone comes my Way—
An Expert, knowing All there is to know,
And to himself I hear him softly say:

"Indeed, the Slide-Rules I have loved so long
Have done my Credit in Men's Eyes much Wrong,
Have set The Aeroplane upon my track,
And sold my Reputation for a Song."

Myself when young did eagerly frequent
Whitehall and Thereabouts, and Months I spent
Hoping to gain one Stripe at least; alas!
I left by the same Door as in I went.

How sweet is learning how to fly, think Some;
Others—how blest the D.S.O.'s to come!
Ah, take the Cash in Hand, and damn the Rest—
Test new Machines, and you will make Things hum.

To wander round the Haunts of Flying Men
Gives Inspiration to the Poet's Pen.
On every Hand one hears, with grateful Joy,
A Touch of true Refinement now and then.

For in an Aerodrome, one dusk of Day,
I watched a School-'bus sticking in the Clay,
And one Mechanic to the Other said:
"Go gently with it, Brother—gently, pray!"

Then said an Engine, with a long-drawn Sigh:
"My Bearings with Neglect have long gone dry,
But, fill me with the old familiar Juice—
Methinks I might recover by-and-by!"

The Scout no Question makes of Ayes or Noes,
But right or left, as banks the Pilot, goes,
And he who dropped One down into the Field—
He knows about it all—he knows, he knows!

Here with a Dud Machine, if Winds allow,
A Flask of Wine, a Load of Bombs—and Thou
Before me sitting in the Second Seat—
A Midnight Raid is Paradise enow.

And when I turn upon the Homeward Trail,
Dreaming of Decorations, Cakes, and Ale,
How bitter on the First Day's Leave to find
My Name spelt wrongly in the "Daily Mail"!

TRANS-OCEANIC FLOAT SYSTEM

Alfred W. Lawson, Vice-President and General Manager of the LAWSON AIRCRAFT CORPORATION, who has spent the last eleven years helping to develop the aircraft industry in the United States, is the inventor of a system of transporting airplanes across oceans by their own power.

According to this system any airplane that is capable of flying and carrying more than one hour's fuel and oil can be flown across the Atlantic or any other ocean.

Any aviator who has graduated from one of the United States training schools will be qualified to pilot an airplane across the ocean, according to Mr. Lawson's system, the chief requirement being that he knows how to make a good landing.

It will be easier for a pilot to fly across the Atlantic Ocean by this system than for one to make a cross country flight of the same number of miles for the simple reason that by this system the landing place is always within sight and within gliding distance.

Briefly an outline of the plan is as follows:

Approximately 25 miles apart between the coast of America and the coast of France will be placed floats upon which the pilot can land and depart from whenever he wants to descend for fuel or repairs.

These floats are to be approximately 500 feet long and 100 feet wide, but can be increased in length and width if preferred.

These floats are built in the shape of regular steamship hulls and are kept in their position of latitude and longitude by their own power.

These floats are protected from submarines by carrying longer range guns than the submarines carry and also by a system of nets which protect them against torpedoes. They are also further protected by the airplanes which carry a supply of bombs for that purpose.

In the holds of these floats are carried the supplies of fuel and spare parts for airplanes, as well as a repair shop, and sleeping apartments, and dining rooms, etc., for the pilots and crew.

The float will contain a slowing up process whereby the speediest machines can be stopped within 300 feet and slow machines within 100 feet.

There will be elevators arranged at both the bow and the stern of the float whereby airplanes can be let down into the hold and receive their fuel and repairs out of the way of other machines while landing.

The float is always headed into the wind so that the pilot always lands into the wind from the stern, while he is let down into the hold at the bow and then moved back in the hold to the stern again where he is elevated to the deck, from whence he starts off on his journey again into the wind. By this method, airplanes can be landed and sent off again at the rate of one every five minutes.

On condition that each machine stopped at every 4th float more than 1,000 airplanes can be transported from America to France every day that the weather is suitable.

It is estimated that there are more than 150 suitable flying days over the Atlantic Ocean during the course of a year, so that by this system it is possible to send to France more than 150,000 airplanes of every description in a year.

By this system, airplanes can be sent across the Atlantic Ocean within 24 hours, or they can be sent from factories in the interior of the United States to the battlefronts in the interior of France within 48 hours, thus saving all of the material and labor necessitated in crating the machines at the factory and uncrating them and setting them up at the battlefields.

At the present time by steamship methods it requires more than 30 days to deliver airplanes from the factory to the battlefront, and therefore more than 90% in time will be saved by this system in delivery of machines.

This system will also save the transportation cost of the pilots, who will also receive some much needed practice in flying en route. If 100,000 airplanes were transported across the Atlantic by this system that would mean a saving in shipping facilities for 200,000 more troops alone. It would also save enormous shipping facilities for other war materials that would take the place of the space occupied by the extremely bulky airplanes.

Besides the time and shipping facilities saved on the transportation of 100,000 airplanes an approximate saving in the cost of transportation will total more than $100,000,000.

This system can be put into operation within 4 months after it has been begun, and Mr. Lawson is ready to give an actual demonstration of its practicability immediately if called upon to do so.

Many letters have been received from the leading aircraft engineers and manufacturers of the United States in which they say, that they have examined Mr. Lawson's system and find it practical in every way.

The engineering force of the LAWSON AIRCRAFT CORPORATION are unanimous in their praise of the system, and the LAWSON AIRCRAFT CORPORATION herewith publicly advocate and recommend that the United States Government give it a trial and if found practical to utilize it at the earliest possible moment as one of the short cuts to the heart of the Kaiser.

THE LAWSON AIRCRAFT CORPORATION

GREEN BAY, WISCONSIN

Petterson, Alfred William....SLA; DAF
Powel, Harford W. H., Jr....CPA
Purcell, Robert Francis....FLA
Peck, Theodore Abbott....FLA
Peterson, Hugh C....FLA
Pollock, Jacques J....SMM
Pratt, George Wollage....SLA; LDT
Pawson, James M....PFO
Prosser, James R....PFO
Port, John Thomas....SLA; TFT
Pierce, Karl Nelson....SLA; TFT
Pickett, Norman Otto....SLA; EOT
Patton, Alexander E....Note 9
Parfet, Clarence C....SMM
Penberthy, Paul....TFT
Parsons, Charles Wesley Darwin....FLA; DAP

R

Renz, Walter Frederick....SLA; CRI
Redmond, Joseph John....FLA; DAP
Robbins, Oliver Kendall....SLA; CRI
Rascovar, Frank James....FLA
Rodgers, Edward F....CWT
Ridenour, Carlyle H....MAC
Rothfeld, Tracy L....CWT
Richards, Homer M....GLC
Reese, Paul J....WFO
Toronto, Albert H....FLA
Rogers, George Walter....FLA
Rodgers, Edward Francis....SLA; KST
Riddle, Sydney W....LDT
Randolph, Roy J....SMM
Roberts, Carroll McLean....FLA
Reitenbaugh, John Smith....FLA
Runstrom, Albin Leonard....SLA; TFT
Rauch, George LaVerne....FLA; VBW
Rummey, Raymond Corsin....SLA; ELA
Raber, Oran Levi....SLA; CJW
Russell, Lindsey....SLA; RWT
Regan, Joseph John....SLA; CRI
Robb, Louis Maurice....SLA; TMA
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S

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Staples, Julian Price....SLA; KST
Sullivan, Edward Michel....SLA; BST
Simmons, Ernest Pitkin....SLA; FOB
Sipp, Edward A....Note 9
Scupham, Edward Jefferson....SLA; PMT
Smith, Albert D....RSD
Sonntag, William Douglass....SLA; DAF
Salisbury, Glen David....SLA; ARV
Small, Clement....CWT
Salyers, Charles David....SLA; SBI
Schick, Hebert M....WFO
Spain, Thomas H....WFO
Steele, Armstrong Steele....SLA; TMA
Spencer, Haven Henry....SLA; KST
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Shannon, Torrance T....FLA
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Saucier, Loren R....GLC
Somerby, Philip B....KST
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Shedd, Paul Wesley....SLA; ELA
Saxton, Harold George....SLA; ELA
Smith, Lyle Calvinee....SLA; LDT
Stromme, Joseph Leonard....FLA
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Sheppard, Robert Z....BST
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Stevenson, William Forest....WDA
Scudders, Lawrence Williams....SLA; DAP
Smith, Harold Francis....SLA; LDT
Spangberg, Leonard Victor....SLA; KST
Simm, Percy Roy....SLA; TFT
Shroyer, David Mirven....SLA; GLC
Schofield, Earl S....MJA
Shaver, John B....TFT
Sears, Kenneth Craddock....SLA; FOB
Sullivan, Elliott M....CWT
Switzer, Stanley Thomas....SLA; CJW
Shook, Charles H....FLA
Sullivan, Daniel J....GLC

T

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Torrey, Marshall George....SLA; ELA
Tolbert, Benjamin H....GLC
Tuska, Clarence D....FLA
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Tingle, Charles Guy....CPA
Trask, Verne A....CWT
Tempest, Rolland....FLA
Taylor, Ryland G....FLA
Thorndike, Herbert A....CPA
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Taft, Frank W....FLA
Teague, Newton N....LC
Templeton, James Bourland....FLA
Tandy, Howard N....CUI
Thompson, Ernest A. U....CWT
Tommers, Andrew E. B....FLA
Taylor, Emerson L....WFO
Tucker, Albert J....FOB
Topping, Nathaniel Howell....PMT
Tilbrook, Milton A....LHV
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Tanner, Ned Virgil....FLA; Note 4
Tickell, Samuel Alexander....SLA; Note 6
Todd, Clarence Welhoff....SLA; KST
Titus, Silas J....HHN
Tomlinson, John Wilder....SLA; PMT
Taylor, Carroll G....GLC

U

Uhler, Thedore Clay....SLA; AAD
Underwood, Harry Theodore....CPA
Utrich, William Joseph....FLA

V

Van Ness, Carl Condit....SLA; PFO
Van Arsdale, Ray C....LDT
Van Horn, Daniell Rowell....SLA; KST
Vaughan, Harper Burnice....SLA; BST

W

Wuenker, Ralph Frederick....SLA; EOT
Whitbeck, John E....Note 9
Webster, Julius Prince....CPA; DAP
Wells, Howard H....MAC
Waldon, Sydney D....DMA
Wood, Seth F. A....DMA
White, Ralph Kirk....SLA; BST
Ware, Lawton Henry....SLA; DAF
Weyant, Romber G....GLC
Williams, Paul L....GLC
Wright, Ellijah F., Jr....GLC
Watt, David....FLA
Wentworth, Harry David....SLA; CRI
Wirz, Walter....PFO
Warren, Robert Edwin....SLA; BST
Watson, Philip Wilder....SLA; ELA
Wilder, Myles S....CWT
Wallace, Arthur E....GLC
Wright, Charles N....GLC
Whitelaw, James C....MAC
Wieslander, Leslie R....MAT
Wetherbee, Alex Perron....SLA; CAF
Williams, William C....CWT
Woodland, Stanley....CPA
Weems, Wharton E....CPA
Wilson, John L....CWT
Wenzlau, Charles Norman....SLA; KST
Woods, Clyde....CWT
Wolf, Irwin D....CPA
Williams, Philip Roy....ELA
Woodies, Arthur F....FLA
Warner, Harold J....FLA
White, Fred J....CPA
Welch, James Wells....FLA
Worthington, John A....ELA
Witmer, David J....CPA
Wyman, Franklin....ELA
Wheeler, Chester E....FLA
Walker, Henry E....CPA
Warfield, Robert L....CWT
Wetzel, John R....ELA
Ward, Charles Paul....SLA; SAG
Wade, Herbert C....TFT
Williams, Isaac J....TFT
White, Earl F....WFO
Wyatt, John Albert....SLA; GLC
Willkins, Charles Lincoln, Jr....SLA; GLC
Weaver, Warren....SLA; DAP
Williamson, Robert C....Note 9
Walsh, Clarence Edward....SLA; ELA
White, Leonard Maxwell....SLA; UCB
Wood, Norman Horatio....SLA; CWT
Wiley, Clarence Donald....SLA; KST
Wiegand, Vernon I. E....TMA



AN OVERHEAD PHOTOGRAPH SHOWING THE POSITION OF THE BLOCK SHIPS SUNK AT THE ENTRANCE OF ZEEBRUGGE HARBOR

This official photograph was taken from an aeroplane flying over Zeebrugge, and clearly proves how effective the fairway into the port was obstructed by the block ships sunk there. The "Iphigenia" and the "Intrepid," their funnels showing above water, can be seen lying in the entrance to the Bruges Canal, while the "Thetis" was sunk outside the mouth of the canal in the main channel of the harbor. Some small enemy craft are also visible



Y

Young, Fred.....MAC
Yocis, Anthony J.....SMM
York, John Y., Jr.....FLA
Yaple, Lee G.....CWT
Younglove, Roy S.....WFO
Yeomans, James H.....Note 11
Yeiser, Henry Craig.....SLA; FOB

Z

Zahner, Louis Cappell.....SLA; DAP
Zeller, Marquis S.....FLA
Zoline, Orrin B.....PWT

The World of Worthy Appeal

(*Written Exclusively for Aerial Age Weekly*)

During the Fourth Liberty Loan Drive, which begins on September 28 and ends on October 19, think and talk nothing else. Nobody knows where a word may sell a bond, so talk, talk, talk! Buy all you can yourself; then sell all you are able to sell by a word of mouth appeal to anybody who will listen to you.

Remember how much the Kaiser accomplished by just *talk*. He and his henchmen knew better than any other persons in the world the value of the talk of the fellow in the street to the other man, nor did they under-estimate the importance of the petty conversations between housewives over the back fences.

They sent their ideas trickling by word of mouth from the poisoned source in the place of the All Highest, down through half the valleys of the world, a stream that gathered force and volume as it sped, until it flowed out into an ocean of blood.

They called it propaganda; literally, it is plain gossip, sent abroad to work its will in the plastic minds of the Germans at home and to convince all else who might heed. In New York, San Francisco, London and Paris and Hong Kong, the vile stream flowed, overlapping its banks and fertilizing new field for German kultur.

Some of that stream of talk we have been able to dam by building up dykes made of the bodies of men, dykes that now run over half the world.

You can help to tend these dykes by fighting talk with talk. Talk Allied Ideals, Americanism, all the time, but for the twenty-two days of the Fourth Liberty Loan Drive, talk Bonds, and Bonds.

Even if your propaganda only persuades one person to buy one bond, you will be directly loading a gun for a soldier.

Naval Aviation Schools

Washington, D. C.—The Navy Department authorizes the following:

The first aviation unit organized in America and sent abroad using American-made material, was the First Marine Aeronautic Company, equipped for water flying only, which is now stationed abroad at a Naval Base. This information is given in an announcement of the progress of Marine Corps aviation which has just been made public at Marine Corps Headquarters.

In addition to the flying field maintained at Miami, Florida, where all training in actual flying is given, the Aviation section of the Marine Corps gives candidates instruction in ground work at the Massachusetts Institute of Technology, Boston, Mass., and has two schools for instruction in aviation mechanics.

The course in actual flying at the Marine Flying Field, Miami, which covers a period of 75 days, includes preliminary, acrobatic and formation flying. All students receive instruction in bombing, gunnery and reconnoissance work. The reconnoissance work, the most hazardous feature of aviation, includes following up bombing squadrons for making photographic records. In obtaining these photographic records, the aerial photographers must make their way to the scene of activity and not only record the result of the bombing but evade the prepared enemy fire as well.

At the Massachusetts Institute of Technology, where all ground work instruction is given, there are now 289 students. One hundred and thirty-two men are in classes and 157 are awaiting assignment. When marines are assigned to this school they are enrolled as Gunnery Sergeants for the duration of the course and receive the pay allotted to this rank. Those who show themselves to be promising material are made officers after completing their training as fliers. The ground course lasts about 10 weeks and 80 men are graduated each month. No break is allowed in the supply of men to the school, by keeping 100 men in reserve to be passed upon by Aviation officers. If a man fails to be graduated he has the option of being transferred to training for regular duty in the Marine Corps, or being discharged.

Of the two schools for mechanics, the larger is maintained at the Naval School for Mechanics, Marine Corps Section, Great Lakes Training Station, Chicago, Ill. Here marines are trained as mechanics, riggers and armorers. At present there are 120 enlisted men taking the course at Great Lakes, and 60 men are sent each month from the Marine Corps. The total number of men allotted to the Marine Corps at one time is 360.

The second school for aviation mechanics is located at the Naval School, Marine Corps Section, San Diego, California. The training is the same as given at the Great Lakes School. Ninety-three enlisted marines are taking the course at the present time. The capacity is 120.

At present the Marine Corps Aviation Forces in France, equipped for land flying only, are performing pursuit, combat, bombing and reconnoisance duty. In addition, they are performing duties which involve actual flying with heavier and lighter-than-air craft, the former consisting of pursuit, combat and gunnery machines, seaplanes and flying boats. Kite balloons are used in performing the duties connected with lighter-than-air craft.

An Aviation Section is maintained at Headquarters, U. S. Marine Corps. All selections for the personnel of the Marine Reserve Flying Corps are made by this office. It also makes all requests for material for the use of the Aviation Section, obtained from the army and navy. It is estimated that in addition to the personnel at present attached to Aviation, it will need 1,500 officers and 6,000 enlisted men to carry on the work assigned to the Aviation Section of the Marine Corps during the next year.

The Aviation Section of the Marine Corps will be called upon to furnish replacements for duties abroad. Since the recent arrival of Marine Aviation Forces in France, the operations have been very successful. One officer has been recommended for the Distinguished Service Cross and Medal of Honor for bringing down enemy planes.

The standard of the Marine Reserve Flying Corps is very high. No men are accepted for entrance into its Ground School with the prospect of becoming officers unless they are as nearly physically perfect as possible. Applicants must weigh not less than 135 pounds and not over 165 pounds. The enlisted personnel has been selected from the very best in the Marine Corps. They are highly trained and given every opportunity for promotion to a commission.

Swimmer Saves Air Pilot

Babylon, L. I.—Quick action on the part of Dr. Harold E. Hewletts saved the life of a cadet who had fallen four hundred feet this afternoon with his hydroplane alongside Wagstaff Creek.

Dr. Hewletts was in swimming near the Babylon Club. He saw the plane about four hundred feet in the air and that the pilot seemed to have trouble in making a bank. Suddenly the machine buckled and fell to the bank alongside the creek, pinning the pilot beneath it.

Dr. Hewletts jumped into a rowboat and with others hurried to the young man, who was unconscious when finally extricated from the tangled mass. An automobile was pressed into service after Dr. Hewletts had partially revived the cadet and he was taken to the naval aero station at Bayshore.

It was impossible to learn the name of the pilot. At the station, however, it was said that he would recover. He was badly cut and bruised about the hip.



(*Continued from page 127*)

relation was given in the following form:

Let x = ratio of $\frac{\text{engine weight less fuel}}{\text{aeroplane weight less engine}}$

If, then, the engine weight is increased y times in order to obtain a thermal efficiency a times the first, a must be greater than $\frac{x+y}{x+1}$, if the maximum range of flight of the machine is to be increased. Thus, if $x = 4$, which is a fairly normal value, and $y = 1.5$ (*i.e.*, engine weight increased by 50%), the new efficiency required to give increased range of flight must be greater than $\frac{5.5}{5} = 1.1$ times the first, or the efficiency must be increased by more than 10%. From this, therefore, it is apparent that the choice of types A and B will depend entirely upon the purpose to be achieved, *i.e.*, upon the range of flight.

Referring to figs. 10 and 11 again another fact is apparent. The heavily loaded machine is best suited by an engine possessing a large excess of power which can be used readily for climbing purposes, or, if the wing area were variable, for increase of speed at will. Since in such a machine the question of minimum weight is not so pressing as in the lightly loaded machine, it would seem that an engine working as closely as possible to type B, and hence possessing a high efficiency, could be designed more readily for a heavily loaded machine to perform a flight of lengthy range than for a lightly loaded machine in which the question of getting a light enough, and at the same time efficient, engine would present some difficulty. Type A, of course, possesses most of the advantages for flights of ordinary range.

One hesitates to suggest how the problem of the application of the dual combustion cycle to aero engines may be met, so many seem to be the difficulties with which an attempted application seems to be beset. These difficulties conquered, however, means quite a desirable improvement in the power weight factor of an engine, and it would thus appear worth while to devote some attention to the possibility of its successful attainment. The writer is sanguine enough to think that a satisfactory aero engine can be designed to burn the lighter oils at constant volume, with an additional combustion process at constant pressure using the heavier oils, or the lighter oils if desired. The problem might be met by the application of some system of direct injection by positive air pressure of constant velocity past the fuel jet such as proposed by Mr. A. W. Reeves.

The writer would here point out that the successful introduction of dual combustion working would afford an efficient method of governing by the pilot of an aeroplane. At its full power the engine would be working on type A, ρ having its maximum value. This will be when climbing. If control is exercised over the constant pressure combustion period only in order to reduce the power developed, as will be necessary for horizontal flight, there will be an increase of thermal efficiency. Thus, when flying horizontally at its normal speed through the air, an aeroplane would demand from an engine worked satisfactorily on this cycle a smaller fuel consumption per horse-power than when employed in climbing or flying at excessive speeds.

Complete Expansion and Compounding

The remainder of these notes may be taken now to apply to all internal combustion engines in general. They are partly the outcome of an interesting article on "The Case for Compound Engines," by Mr. J. L. Napier, which appeared in the April issue, 1916, of *The Automobile Engineer*.

In Mr. Napier's article a table is given, in which the increase of power obtained by compounding is given in relation to the amount of fuel burned. The Otto cycle is developed exclusively, *i.e.*, all the heat is developed at constant volume. The table is partly reproduced here, with the difference that a is now written for R and r for n. The table was subsequently modified to include possible losses, but for comparative purposes Table I is here sufficient:

TABLE I

a	r	Limit of Expansion Volumes	Maximum Additional Power Per Cent
2	4	6.728	15.4
3	4	9.116	25.0
4	4	11.316	31.8

If, now, fig. 4 is consulted, showing the variation of efficiency in both types A and B, it appears that increase of fuel burned increases the divergence between the efficiency values. It is obvious that if the same amount of fuel is consideerd to be burned in both types, then the difference in the efficiencies will represent the gain of type B over type A. For example, suppose $a = 3$ and $\rho = 2$, r being equal 5, then the efficiency of type A is 41.5%, while that of type B is 60%, *i.e.*, there is an economic gain of $\frac{18.5}{41.5} \times 100 = 44.6\%$ by carrying out the expansion as in type B. In fig. 12 this case is represented by the two sections of the diagram, the unshaded portion representing the power developed in the h.p. cylinder if compounding is adopted, while the shaded portion represents that developed in the l.p. cylinder.

It is interesting to notice that if the case of type B is examined where $a = 1$, the efficiency is independent of fuel burned, since it is equal to $1 - \frac{1}{r^{\gamma-1}}$, the well-known expression for the efficiency of the constant pressure cycle. It is only on the introduction of constant volume combustion in type B that the efficiency increases with an increase of ρ. Thus, if $r = 5$, $\gamma = 1.4$, and $a = 2$, the compression pressure is 145 lb. per sq. in. absolute, and the explosion pressure is 290 lb. per sq. in. absolute. The efficiency is 47.5%, no matter how much a may be increased. If, however, some fuel is burned at constant pressure and the expansion carried out by compounding in the manner of type B, the efficiency goes on increasing up to the limit $1 - \frac{1}{r^{\gamma-1}}$; where r, however, is not the *actual* compression ratio, but the *virtual* compression ratio, giving a final compression pressure of 290 lb. per sq. in. absolute. If $\gamma = 1.4$, this value of $r = 8.2$. It can be seen on reference to fig. 5 that this approach to the limiting efficiency occurs rapidly at the beginning of constant pressure combustion. In other words, it may be said that by means of constant pressure combustion the compression ratio of type B has been raised *virtually* as regards efficiency from 5 to 8, although *actually* it has been unchanged during the engine operation. The following table has been compiled on the lines of Table I, showing the percentage gain to be derived from complete expansion or compounding when dual combustion is adopted:

TABLE II

a	ρ	r	Limit of Expansion Volumes	Maximum Additional Power Per Cent
2	2	5	16.35	36.6
3	2	5	21.9	44.6
2	3	5	24.5	66.2
3	3	5	32.85	75.4

These gains are, of course, subject to diminution from various causes, some pointed out and allowed for by Mr. Napier himself in a revised table. As relative figures, however, they give

New Book On Practical Aeroplane Rigging

For Aviation Officers and Mechanics

Approved for use in U.S. Navy Aviation Mechanics Schools

Written by

JAMES T. KING, formerly mechanic with Canadian and American Curtiss Aeroplane Factory and Royal Flying Corps; now instructor Aviation Dept., Dunwoody Institute; and

NORVAL W. LESLIE, Flight Sub-Lieutenant, R.N., instructor Aviation Department, Dunwoody Institute.

This book is well illustrated and takes up types, parts, alignment, care and maintenance of machines in a practical way; also the theory of flight. Only new book of its kind on Rigging.

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some idea of the possibilities of duel combustion. At the same time it must be borne in mind that the values of α and ρ depend upon the amount of fuel which can be burned, and hence upon the amount of air available for combustion in the cylinder. This fact evidently indicates that decided advantages would accrue from a combination of the two principles of dual combustion and supercharging.

(*Continued from page* 129)

Insurance for Aviators

In the early part of the year 1917 the committee took up the question of insurance for aviators, and after correspondence with various life and accident insurance companies in the United States, it suggested to Congress, the War, Treasury, and Navy Departments the advisability of undertaking at an early date the insurance of aviators or some form of financial cooperation with the insurance companies that would enable them to write insurance at rates possible to the insured.

Aeroplane Design—Aeroplane Materials—Steel for Aeroplane Construction

The committee has cooperated with the Aircraft Production Board in connection with a wide variety of problems relating to the design, specifications, and tests of aircraft. The committee has now in hand (November, 1917) a most important investigation on the use of steel for aeroplane construction and is supervising the development of a design for construction in steel, to be later subject to a program of tests intended to show the possibilities of such type of construction.

In connection with the subject of the materials for aeroplane construction, the committee has given its attention chiefly to the investigation of strut forms for aeroplanes, the strength of spruce spars, and the development of cotton aeroplane fabrics as a substitute for Irish linen.

In the field of power-plant design and construction for aircraft, the committee has cooperated with the Bureau of Standards in the design, construction, equipment, and operation of a large vacuum chamber engine testing laboratory which is intended to reproduce the conditions of aeronautic engines operating at high altitudes. This equipment has been installed with special reference to the development and improvement of the "Liberty" engine, and important investigations bearing on this problem are now being carried forward. The committee has also carried on a number of researches on the subject of radiator design and proportion, carburetor design and adjustment, ignition apparatus, and is continuing its study of the problem of an aeroplane engine muffler.

Tests on Liberty Engine

At the request of the War Department, the committee loaned one of the members of its technical staff for the supervision of tests on the first Liberty engines at Detroit, Pikes Peak, and elsewhere, to determine their mechanical and thermal efficiency and the power delivery of the engines at various altitudes.

Aeroplane Instruments

The committee has undertaken important investigations relating to the development of various instruments used in the navigation of aircraft and in testing aircraft in free flight. In particular, there has been developed an improved form of geographic position indicator which will be of special value in connection with certain free flight tests under consideration.

Aircraft Communications

Regarding the subject of aircraft communications, the committee has cooperated in the development of a generator for wireless sending from aeroplanes and intended to satisfy the requirements of the Army and Navy. Means for receiving wireless signals in an aeroplane have also been investigated, and it has been established that a very efficient receiving set employing the sound method is practicable; investigations are still being carried on regarding means for detecting hostile aeroplanes before they are visible or before they can be heard by the unaided ear.

Mapping from Aeroplanes

On March 8, 1917, the committee took under consideration the development of methods for mapping from aeroplanes which should be rapid, economical, and sufficiently accurate for aviation purposes. Allotments were made for developing a new type of aeroplane mapping camera and gratifying progress has been made in the development of such an instrument. Before regular navigation of the air can be undertaken, it will be necessary to supply maps and to establish and suitably mark aerial routes and suitable landing places for the aviator. In certain sections of the country and through the generous cooperation of patriotic citizens interested in this work, gratifying progress has been made in these directions, notably between Dayton, Ohio, and Rantoul, Ill.

Aeroplanes Transport Troops for First Time

Washington.—Announcement was made on Sept. 21 at the War Department that for the first time soldiers under orders for duty have been transported in the United States by the air route.

On Saturday, Sept. 7, eighteen enlisted men were passengers in aeroplanes piloted by officers and the aeroplanes in formation of three, four and five ships carried the men from Chanute Field, Rantoul, to Champaign, Ill., where the men had been ordered to report at the United States School of Military Aeronautics, University of Illinois.

Navy Aeroplane Base at Galveston

Galveston.—As a result of a revision of the plans of the Navy Department for the construction of a naval air station here the total cost of the improvements will be more than three million dollars, or nearly double the original estimate. The proposed plant will consist of nine large hangars, repairshops, officers' and student aviators' quarters, barracks and medical quarters, for the accommodation of approximately 1,200 men. Of this number about 1,000 will be ground men and mechanics, 100 officers and 150 student aviators.

Each of the nine hangars will be 104 x 105, and will accommodate four machines. The first plans considered by the Navy Department called for six hangars and twenty-four sea-planes.

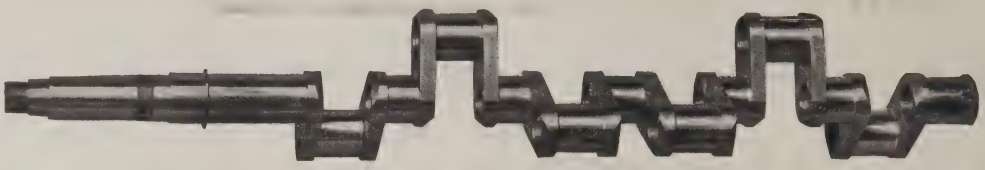
The site is 60 acres, between the railroad tracks leading out of the city and the bay. Three hundred and fifty thousand yards of dredging will be required for the work. Around the front and two sides of the 5-ft. elevation will be built a wooden bulkhead and an earthen levee around the back or south end. From 4,800 to 4,900 lineal feet of bulkheading, or filling material, will be required for filling in the dredged-in portion of the property. The basin will be dredged to a depth of 5 ft. the entire length of the building for a take-off, which will be 200 ft. in length. Construction will begin immediately.

Newspaper Started at Camp John Wise

The Balloon Pilot, the new weekly publication for Camp John Wise, has made its initial appearance. It is an eight-page paper. The aim of the management is to publish news of Camp John Wise and surrounding military fields, in the belief that the men will support a worthy paper.

Lieut. Harold R. Hall is editor, Lieut. H. S. Shultz, business manager, and Sergt. R. J. Kanawyer, advertising manager.

(*To be continued*)



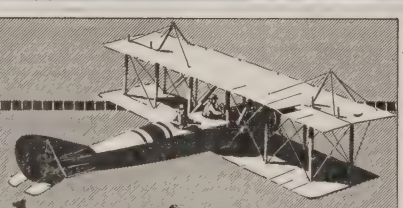
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AEA

AERIAL AGE WEEKLY

Vol. 8, No. 4 OCTOBER 7, 1918 10 CENTS A COPY



The New Jersey Reserves passing in review before Governor Edge on the occasion of their first official outing. An army plane hovering overhead lends a realistic touch to the scene

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.
Subscription: Domestic, $4; Foreign, $6.
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879.

Aero Club of America to have Club for Allied Aviators in Paris



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AERIAL AGE WEEKLY

VOL. VIII OCTOBER 7, 1918 No. 4

TABLE OF CONTENTS

PAGE

President Wilson Speaks for The Liberty Loan 163

Aero Club of America to Have Club for Allied Aviators in Paris..... 164

News of the Week 165

The Aircraft Trade Review 167

The U. S. Aerial Mail..... 168

Military Aerostatics 169

The Increasing of Power Output... 170

Third Annual Report of the National Advisory Committee on Aeronautics 174

Naval and Military Aeronautics... 178

Foreign News 180

Model News 181

Aeronitis 182

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WHEN THE GLORIOVS DAWN OF VICTORY COMES AND THE TRVE
STORY OF THE WAR CAN BE TOLD, IT WILL BE FOVND THAT CVRTISS
AEROPLANES AND CVRTISS MEN HAVE "DONE THEIR BIT."
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AERIAL AGE WEEKLY

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Oct. 7, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII . NEW YORK, OCTOBER 7, 1918 NO. 4

PRESIDENT WILSON SPEAKS FOR LIBERTY LOAN

President Addresses Huge Audience at Metropolitan Opera House

MY FELLOW CITIZENS—I am not here to promote the loan. That will be done—ably and enthusiastically done—by the hundreds of thousands of loyal and tireless men and women who have undertaken to present it to you and to our fellow citizens throughout the country; and I have not the least doubt of their complete success; for I know their spirit and the spirit of the country. My confidence is confirmed, too, by the thoughtful and experienced co-operation of the bankers here and everywhere, who are lending their invaluable aid and guidance. I have come, rather, to seek an opportunity to present to you some thoughts which I trust will serve to give you, in perhaps fuller measure than before, a vivid sense of the great issues involved, in order that you may appreciate and accept with added enthusiasm the grave significance of the duty of supporting the Government by your men and your means to the utmost point of sacrifice and self-denial. No man or woman who has really taken in what this war means can hesitate to give to the very limit of what they have, and it is my mission here to tonight to try to make it clear once more what the war really means. You will need no other stimulation or reminder of your duty.

War Itself Makes Aims Clear

At every turn of the war we gain a fresh consciousness of what we mean to accomplish by it. When our hope and expectation are most excited we think more definitely than before of the issues that hang upon it and of the purposes which must be realized by means of it. For it has positive and well defined purposes which we did not determine and which we cannot alter. No statesman or assembly created them; no statesman or assembly can alter them. They have arisen out of the very nature and circumstances of the war. The most that statesmen or assemblies can do is to carry them out or be false to them. They were perhaps not clear at the outset, but they are clear now. The war has lasted more than four years and the whole world has been drawn into it. The common will of mankind has been substituted for the particular purposes of individual states. Individual statesmen may have started the conflict, but neither they nor their opponents can stop it as they please. It has become a peoples' war, and peoples of all sorts and races, of every degree of power and variety of fortune, are involved in its sweeping processes of change and settlement. We came into it when its character had become fully defined and it was plain that no nation could stand apart or be indifferent to its outcome. Its challenge drove to the heart of everything we cared for and lived for. The voice of the war had become clear and gripped our hearts. Our brothers from many lands, as well as our own murdered dead under the sea, were calling to us, and we responded, fiercely and of course.

The air was clear about us. We saw things in their full, convincing proportions as they were, and we have seen them with steady eyes and unchanging comprehension ever since. We accepted the issues of the war as facts, not as any group of men either here or elsewhere had defined them, and we can accept no outcome which does not squarely meet and settle them. Those issues are these:

Shall the military power of any nation or group of nations be suffered to determine the fortunes of peoples over whom they have no right to rule except the right of force?

Shall strong nations be free to wrong weak nations and make them subject to their purpose and interest?

Shall peoples be ruled and dominated, even in their own internal affairs, by arbitrary and irresponsible force or by their own will and choice?

Shall there be a common standard of right and privilege for all peoples and nations or shall the strong do as they will and the weak suffer without redress?

Shall the assertion of right be haphazard and by casual alliance or shall there be a common concert to oblige the observance of common rights?

There Can Be No Peace by Bargain

No man, no group of men, chose these to be the issues of the struggle. They are the issues of it, and they must be settled—by no arrangement or compromise or adjustment of interests, but definitely and once for all and with a full and unequivocal acceptance of the principle that the interest of the weakest is as sacred as the interest of the strongest.

This is what we mean when we speak of a permanent peace, if we speak sincerely, intelligently and with a real knowledge and comprehension of the matter we deal with.

We are all agreed that there can be no peace obtained by any kind of bargain or compromise with the governments of the Central Empires, because we have dealt with them already and have seen them deal with other governments that were parties to this struggle, at Brest-Litovsk and Bucharest. They have convinced us that they are without honor and do not intend justice. They observe no covenants, accept no principle but force and their own interest. We cannot "come to terms" with them. They have made it impossible. The German people must by this time be fully aware that we cannot accept the word of those who forced this war upon us. We do not think the same thoughts or speak the same language of agreement.

It is of capital importance that we should also be explicitly agreed that no peace shall be obtained by any kind of compromise or abatement of the principles we have avowed as the principles for which we are fighting. There should exist no doubt about that. I am, therefore, going to take the liberty of speaking with the utmost frankness about the practical implications that are involved in it.

If it be in deed and in truth the common object of the governments associated against Germany and of the nations whom they govern, as I believe it to be, to achieve by the coming settlements a secure and lasting peace, it will be necessary that all who sit down at the peace table shall come ready and willing to pay the price, the only price, that will procure it, and ready and willing also to create in some virile fashion the only instrumentality by which it can be made certain that the agreements of the peace will be honored and fulfilled.

That price is impartial justice in every item of the settlement, no matter whose interest is crossed, and not only impartial justice but also the satisfaction of the several peoples whose fortunes are dealt with. That indispensable instrumentality is a league of nations formed under covenants that will be efficacious. Without such an instrumentality, by which the peace of the world can be guaranteed, peace will rest in part upon the word of outlaws and only upon that word. For Germany will have to redeem her character, not by what happens at the peace table but by what follows.

And, as I see it, the constitution of that league of nations and the clear definition of its objects must be a part, is in a sense the most essential part, of the peace settlement itself. It cannot be formed now. If formed now it would be merely a new alliance confined to the nations associated against a common enemy. It is not likely that it could be formed after the settlement. It is necessary to guarantee the peace, and the peace cannot be guaranteed as an afterthought. The reason, to speak in plain terms again, why it must be guaranteed is that there will be parties to the peace whose promises have proved untrustworthy, and means must be found in connection with the peace settlement itself to remove that source of insecurity. It would be folly to leave the guarantee to the subsequent voluntary action of the governments we have seen destroy Russia and deceive Rumania.

No Economic Boycott; All Treaties Public

But these general terms do not disclose the whole matter. Some details are needed to make them sound less like a thesis and more like a practical programme. These then are some of the particulars, and I state them with the greater confidence because I can state them authoritatively as representing this Government's interpretation of its own duty with regard to peace:

First, the impartial justice meted out must involve no discrimination between those to whom we wish to be just and those to whom we do not wish to be just. It must be a justice that plays no favorites and knows no standard but the equal rights of the several peoples concerned;

Second, no special or separate interest of any single nation or any group of nations can be made the basis of any part of the settlement which is not consistent with the common interest of all;

Third, there can be no leagues or alliances or special covenants and understandings within the general and common family of the league of nations;

Fourth, and more specifically, there can be no special, selfish economic combinations within the league and no employment of any form of economic boycott or exclusion except as the power of economic penalty by exclusion from the markets of the world may be vested in the league of nations itself as a means of discipline and control.

Fifth, all international agreements and treaties of every kind must be made known in their entirety to the rest of the world.

Special alliances and economic rivalries and hostilities have been the prolific source in the modern world of the plans and passions that produce war. It would be an insincere as well as an insecure peace that did not exclude them in definite and binding terms.

The confidence with which I venture to speak for our people in these matters does not spring from our traditions merely and the well known principles of international action which we have always professed and followed. In the same sentence in which I say that the United States will enter into no special arrangements or understandings with particular nations let me say also that the United States is prepared to assume its full share of responsibility for the maintenance of the common covenants and understandings upon which peace must henceforth rest. We still read Washington's immortal warning against "entangling alliances" with full comprehension and an answering purpose. But only special and limited alliances entangle, and we recognize and accept the duty of a new day in which we are permitted to hope for a general alliance which will avoid entanglements and clear the air of the world for common understandings and the maintenance of common rights.

I have made this analysis of the international situation which the war has created not, of course, because I doubted whether the leaders of the great nations and peoples with whom we are associated were of the same mind and entertained a like purpose, but because the air every now and again gets darkened by mists and groundless doubtings and mischievous perversions of counsel and it is necessary once and again to sweep all the irresponsible talk about peace intrigues and weakening morale and doubtful purpose on the part of those in authority utterly, and if need be unceremoniously, aside and say things in the plainest words that can be found, even when it is only to say over again what has been said before, quite as plainly if in less unvarnished terms.

As I have said, neither I nor any other man in governmental authority created or gave form to the issues of this war. I have simply responded to them with such vision as I could command. But I have responded gladly and with a resolution that has grown warmer and more confident as the issues have grown clearer and clearer. It is now plain that they are issues which no man can pervert unless it be wilfully. I am bound to fight for them, and happy to fight for them as time and circumstance have revealed them to me as to all the world. Our enthusiasm for them grows more and more irresistible as they stand out in more and more vivid and unmistakable outline.

Masses Know What They Are Fighting For

And the forces that fight for them draw into closer and closer array, organize their millions into more and more unconquerable might, as they become more and more distinct to the thought and purpose of the peoples engaged. It is the peculiarity of this great war that while statesmen have seemed to cast about for definitions of their purpose and have sometimes seemed to shift their ground and their point of view, the thought of the mass of men, whom statesmen are supposed to instruct and lead, has grown more and more unclouded, more and more certain of what it is that they are fighting for. National purposes have fallen more and more into the background and the common purpose of enlightened mankind has taken their place. The counsels of plain men have become on all hands more simple and straightforward and more unified than the counsels of sophisticated men of affairs, who still retain the impression that they are playing a game of power and playing for high stakes. That is why I have said that this is a peoples' war, not a statesmen's. Statesmen must follow the clarified common thought or be broken.

I take that to be the significance of the fact that assemblies and associations of many kinds made up of plain workaday people have demanded, almost every time they came together, and are still demanding, that the leaders of their governments declare to them plainly what it is, exactly what it is, that they were seeking in this war, and what they think the items of the final settlement should be. They are not yet satisfied with what they have been told. They still seem to fear that they are getting what they ask for only in statesmen's terms—only in the terms of territorial arrangements and divisions of power, and not in terms of broad visioned justice and mercy and peace and the satisfaction of those deep seated longings of oppressed and distracted men and women and enslaved peoples that see into them the only things worth fighting a war for that engulfs the world. Perhaps statesmen have not always recognized this changed aspect of the whole world of policy and action. Perhaps they have not always spoken in direct reply to the questions asked because they did not know how searching those questions were and what sort of answers they demanded.

World Wants Triumph of Justice

But I, for one, am glad to attempt the answer again and again, in the hope that I may make it clearer and clearer that my one thought is to satisfy those who struggle in the ranks and are perhaps above all others, entitled to a reply whose meaning no one can have any excuse for misunderstanding if he understands the language in which it is spoken or can get some one to translate it correctly into his own. And I believe that the leaders of the governments with which we are associated will speak, as they have occasion, as plainly as I have tried to speak. I hope that they will feel free to say whether they think that I am in any degree mistaken in my interpretation of the issues involved or in my purpose with regard to the means by which a satisfactory settlement of those issues may be obtained. Unity of purpose and of counsel are as imperatively necessary in this war as was unity of command in the battlefield; and with perfect unity of purpose and counsel will come assurance of complete victory. It can be had in no other way. "Peace drives" can be effectively neutralized and silenced only by showing that every victory of the nations associated against Germany brings the nations nearer the sort of peace which will bring security and reassurance to all peoples and make the recurrence of another such struggle of pitiless force and bloodshed forever impossible, and that nothing else can. Germany is constantly intimating the "terms" she will accept, and always finds that the world does not want terms. It wishes the final triumph of justice and fair dealing.

AERO CLUB OF AMERICA TO HAVE CLUB FOR ALLIED AVIATORS IN PARIS

AT a special meeting of the Executive Committee of the Aero Club of America, held September 30, at the clubhouse, 297 Madison Avenue, the club accepted the offer made by a prominent, wealthy, American in Paris, to establish a club for Allied aviators, to be maintained at his own expense for the Aero Club of America for the period of the war.

Recently the Aero Club of America was advised by the military authorities that there was pressing need for a home or club for tired aviators.

The Foreign Service Committee of the Aero Club of America, of which Ambassador William G. Sharp is Honorary Chairman, the membership of which included the most prominent Americans who reside in Paris, transmitted the information to Mr. Alan R. Hawley, the President of the Aero Club of America, and it arrived two days ago. Yesterday the club received a cable from the Foreign Service Committee in Paris, advising that Mr. Louis D. Beaumont, who is President of the May Department Stores Company of Cleveland, Ohio,

(*Continued on page* 190)



THE NEWS OF THE WEEK



American Caproni Gives Newspapermen Demonstration

The first all-American Caproni bombing biplane equipped with three Liberty motors flew over New York and Brooklyn just previous to the opening of the Liberty Loan Drive on September 27.

The biplane, piloted by Lieut. Giuliano Parvis, an Italian fighting pilot, recently arrived in this country, and Capt. Hugo d'Annunzio, son of the famous Italian poet of that name.

The captain is mechanical chief of the Caproni company, and he supervised the building of the plane.

As passengers these two had nine newspapermen, including two photographers.

The plane left the ground at Hazelhurst Field, Mineola, L. I., at 4:30 P. M., and it was just 5:45 when, after a thrilling corkscrew spiral from 4,000 feet in the air, it alighted gently within a couple of hundred yards of where it had started.

A good part of New York must have seen—and heard—the new American air monster. Briefly, the route was this: from Hazelhurst Field directly to New York, crossing the East River between the Manhattan and Williamsburg Bridges. Down the west side of Manhattan, out over the bay, circled twice above the Statue of Liberty, did a dive just after that, from 4,000 feet down to about 1,500; then went back over the city, keeping above Broadway and Fifth Avenue, to a point over the sheep meadow of Central Park, then down town again, directly above The World and Municipal Buildings and City Hall Park, then back up over Third and Fourth Avenues as far as the Queensboro Bridge, and thence eastward over Brooklyn and back to the starting point.

Speaking of the flight, one of the passengers, J. J. O'Neill, of the New York *World*, said:

"It seemed to all of us a very good thought that America now has a native-built plane, foreign though the design may be, that is capable of bombing the enemy's works or cities, that has the speed and strength to do it, that CAN do it, and it is to be hoped, SHALL do it.

"In addition to making a wonderfully successful demonstration of what this all-American machine can do we broke several records on the flight.

"In the first place, we reached a height of 2,700 metres—8,858 feet—with twelve persons, which is a new American altitude mark for any sort of machine carrying that number of persons. This high mark was attained just as we were coming upon the outskirts of Brooklyn (and a genial soul sitting next to me pointed down to the cluster of cemeteries beneath).

"Then we established a new record of a novel sort which was quite as interesting. This was a "low altitude" record. That is to say, we flew over the City of New York at a lower stage than any aeroplane of any sort had flown previously. The baragraph showed that we came down to within 200 metres—600 feet, roughly speaking—of the sidewalks. This was when we were passing close by the Metropolitan Tower at 23d Street and Madison Avenue.

"We were actually lower than the top of the tower as we swung along northward above Third Avenue. This was rather risky business, as the pilots cheerfully told us when we foregathered afterward on terra firma, but they wanted to show us, they said, that the plane could go anywhere."

New York Air-Raided by Liberty Planes

A novel air raid on New York City was carried out by the Italian and French aces on Saturday, September 28, for the Liberty Loan.

Capt. Jacques Boyriven and Lieut. Georges Flachaire, under the direction of Major Beroetta, of the French Aviation Mission to the United States, flew two fast Nieuport combat biplanes which were used at the recent Somme front by famous French aces, and which arrived in the United States recently. Lieut. Julian Parvis, the famous Italian ace, piloted the new American-made Caproni, which is equipped with three Liberty motors. His passengers were Capt. Hugo d'Annunzio, son of the noted Italian poet and aeroplane observer, and Lieut. Testoni. The Italian officers acted under the direction of Capt. Bevione of the Italian Aviation Mission.

The Caproni and the two Nieuports started from Mineola at five o'clock in the afternoon on September 28 and flew to New York.

The large Caproni represented a bombing machine starting out for a long bombing raid, and the two Nieuports served as escorts, and flew over it and around it as they would at the front if they had to protect it from the attack of the enemy fighting planes.

They flew to New York, and on arriving over Riverside Drive, the Caproni manoeuvred as it would in a raid, dropping bombs, and the Nieuport combat planes went through all the difficult stunts and turns which combat planes have to go through when fighting a large number of enemy planes.



Lieut. George Flachaire, the French Ace, who has spent some months in this country, and flew for the Fourth Liberty Loan. He was a pilot in the 67th Escadrille

Thirty thousand "aerograms," or paper bombs, were dropped by the aviators over New York City. Half of the bombs read:

WE HAVE FOUGHT FOR DEMOCRACY FOR FOUR YEARS!
HELP US WIN THE WAR
BUY LIBERTY BONDS!

These bombs will be dropped by French aviators from fighting Nieuports.

The other half bore the same legend but stated that they were dropped by Italian aviators from the Caproni bombing aeroplane, equipped with Liberty motors.

After bombing New York the planes gave an exhibition of the newest phases of aerial warfare, which is flying low and attacking enemy troops on the ground and in the trenches. To best demonstrate how the planes can fly low and get in and out of tight places, they flew under all the New York bridges.

The French and Italian aviators are very enthusiastic over the Liberty Loan, and they told the Aero Club of America authorities, Mr. Alan R. Hawley, President; Henry A. Wise Wood, Vice-President; and Rear Admiral B. A. Fiske and Henry Woodhouse, Members of the Board of Governors, that nothing would *encourage* the Allied forces, nor *discourage* the enemy more, than the overwhelming success of the Fourth Liberty Loan.

Aeroplane Assembly System Incorporated in Training Course

Washington.—A system of aeroplane assembly has been incorporated with the general training course at Kelly Field, Texas, for both cadets and student officers. This is a departure from the general curriculum, is not general and has not yet been approved by the training section. At present the work includes 12 days of instruction in putting together wings and fuselage only. The other parts of the plane will enter into instruction as the course advances, until the practical assembling of a complete aeroplane is a part of the instruction of every flier. It is expected that this will prevent carelessness, tendency to hurry the work or to overlook anything that may later endanger life. It will take the prospective flier completely through all the shops.

1,000 Planes Have Gone to Pershing

Washington.—A total of 1,440 De Haviland 4 aeroplanes have been delivered and 1,000 have been sent to France, members of the House Committee on Military Affairs were told at their weekly conference with Gen. Peyton C. March, Chief of Staff on September 27. All the Browning machine guns that can be utilized have been furnished, but it has been impossible as yet to build up a reserve sufficiently large for the requirements.



Photo shows, left to right, Colonel Milton F. Davis and Lieutenant-Colonel Mallard F. Harmon. Colonel Davis is in charge of all the training of the American flyers. He is engaged in hammering into shape the team that is going to demoralize the Huns as soon as they are ready to swarm across the German frontier. Lieut.-Colonel Harmon has just returned from the Western battle front, where he had charge of the American flyers. These two officers are playing a prominent part in the creation of an arm of the service that is destined to strike terror into the hearts of the Huns



A Nieuport biplane, which escorted the Caproni bomber on its Liberty Loan bombing expedition. Those aviators shown in the photograph flew for the Liberty Loan. They are, from left to right, Major Phipps, U. S. Air Service; Lieutenant Mandrot, French Air Service; Lieut.-Col. C. K. Rhinehardt, Commander of the 1st Provisional Wing, U. S. Air Service; Captain Boyriven, French Air Service, Instructor on Nieuport, Spad and other combat machines; Adjutant Ravis and Adjutant Royer. The Nieuport advanced training biplane, shown in the photograph, is Colonel Rhinehardt's machine, "Billiken". Captain Boyriven's clever Boston Terrier is shown on the cowl of the machine

Lieut. Campbell Shares in Prize

Lieut. Douglass Campbell of California, the first American-trained aviator to be officially cited as an ace, has been awarded part of the 10,000 francs offered jointly by the Duke and Duchess of Talleyrand and Curtiss Tilton of Philadelphia to the first five American aviators to down three Hun planes.

Others who will share in the awards will be Lieuts. Eddie Rickenbacher, John Mitchell and Sumner Sewall.

Lieut. Campbell filed his claim for the monetary prizes before he left Paris for San Diego. According to the rules, the prizes were open to aviators who went overseas with the first American forces. Veteran airmen who had been transferred to the American Air Service from other Allied branches were not eligible.

Campbell crashed his first Boche aeroplane near Toul on April 14 last, his second on May 18 and the third on May 19. Sewall destroyed his first Hun machine on June 3, his second July 16, and the third on July 25. Mitchell is credited with victories on May 27, May 30, and July 8. Rickenbacher downed his three between July 5 and August 2.

Lieut. Campbell left Rockwell Field the early part of this week for a short visit at his home in San Jose. He will return at an early date.—*Rockwell Field Flyleaf.*

New Identification Mark

From a German source the *Nieuwe Rotterdamsche Courant* learns that a change has been made in the marking on German machines. The arms of the black cross are now straight—and not curved—with white edges. The change is said to have been made because the previous form made recognition of German machines very difficult, and because it easily led to confusion with the circular signs on hostile aeroplanes.—*March Field Flyleaf.*

Aero Estimate Cut

The House Appropriations Committee today pared $1,000,000 from the maintenance and production item of the $170,000,000 aircraft estimate included in the $7,000,000,000 asked for by the War Department for its new man-power program.

The $1,000,000 was taken off after Chairman Sherley had elicited the information from War Department representatives who appeared before the committee that certain items in the maintenance and production estimates were also provided for in the quartermasters' and other departmental estimates.

Licenses for Air Flights

Licenses must be secured for experimental aeroplane flights, even at plants manufacturing planes for the army and navy, under a ruling announced on September 23 by the joint army and navy aeronautics board.

Flyer's Digits Freeze

Canton, Ohio.—What is thought by Capt. R. W. Schroeder, of Chicago, to be very nearly a new record in altitude was achieved by him in a test aeroplane flight from the Dayton aviation field to Canton. He ascended more than 28,000 feet, his records show. He found a temperature of 32 degrees below zero centigrade. His finger tips were frozen.

Joseph Pulitzer Joins Aero School

Chicago.—Joseph Pulitzer, editor of the St. Louis *Post-Dispatch* and director of the New York World Corporation, has enrolled in the aviation training school at Great Lakes naval training station, and has been given a temporary rating as chief quartermaster.

Calls Our Airmen Equal to British

With the American Army in France.—In the course of a statement on the extent and importance of the work of the British independent air force, Major Gen. Trenchard, its commander, spoke in highest praise of the American airmen. He said they were as good as his own men, and more praise he could not give, as he did not believe anything better could be said.

Their daring, ability, discipline, and organization could hardly by improved upon, said General Trenchard. He added that he recently bestowed the distinguished Flying Cross to an American airman.

Among some captured German letters that General Trenchard quoted was one describing the destruction wrought by Allied aircraft. This said that the Opera House and the greater part of the splendid street, "Die Zieh," in Frankfort was a heap of ruins and that 120 persons had been killed.

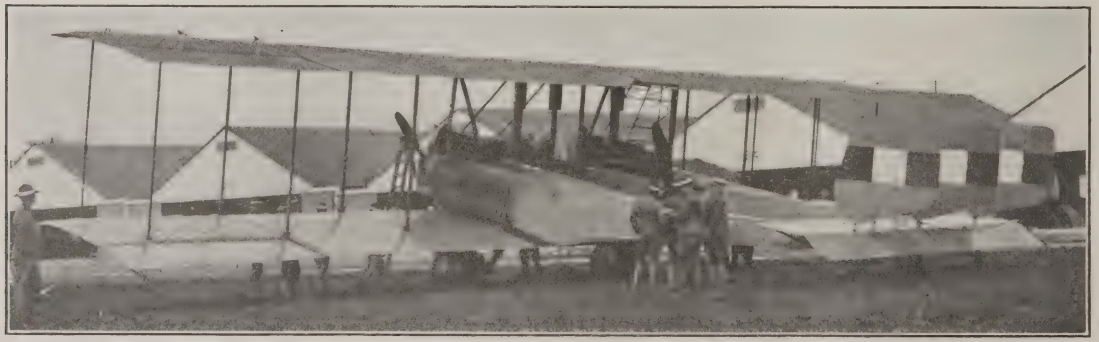
New Quick-Dodging Plane Used by Enemy

American Headquarters in France.—Patrols report having encountered an entirely new type of enemy aeroplane, designed especially to make it easy to manoeuvre. They also report that the Germans are adopting the parachute as a means of escape from damaged planes.

British, French and Italian Flyers Join with Americans

With the American Army on the Lorraine Front.—British aeroplanes, which are cooperating with American squadrons on this front, flew far back of the enemy lines on September 16 and bombed aerodromes at several places. Eleven tons of bombs were dropped on aerodromes at Longuyon, Boulay, Marhange and Bohm.

French and Italian units cooperated with American squadrons in carrying out nine missions, in addition to which patrolling and photographic work was successfully conducted.



The American-made Caproni which bombed New York from the skies with leaflets in aid of the Fourth Liberty Loan is equipped with three Liberty motors. It was piloted by Lieutenant Parvis, the noted Italian Ace, with Captain d'Annunzio and Lieutenant Belloni as passengers.

The AIRCRAFT TRADE REVIEW

Standard Inspectors Hold Annual Dinner

The first annual dinner of the Standard Aircraft Inspectors and the United States Government Inspectors stationed at the Standard Aircraft plant at Elizabeth, was held on Saturday, September 14th, at Sea Girt, N. J.

In addition to the inspectors, a number of the officials of the company were present.

Mr. J. M. Meirick, Superintendent of Publicity, acted as toastmaster.

Mr. A. M. Jeffords, Assistant General Manager, represented the management.

Addresses were made by A. M. Jeffords; William Tynam, Chief Inspector; Fred Sinon; Harry C. Austin; etc.

The toastmaster read letters from H. B. Mingle, President of the Standard Aircraft Corporation, and Edward E. Pennewill, Vice-President and General Manager of the Standard Aircraft Corporation.

The Government Inspectors who were present at the dinner, included the following: Mr. George M. Pace, Mr. Harry Austin, Mr. Eaton, Mr. O. Kalning, Mr. August Bauer, Mr. Robert Mason, Mr. Samuel Kriney, Mr. Augustus T. Schmidt.

Among the Standard Aircraft Corporation Inspectors who were present were: Mr. Russell O. Wirtz, Mr. Ed. J. Mansfield, Mr. Anthony E. Rubino, Mr. Charles Azzara, Mr. Louis Barbier, Mr. E. M. Morel, Mr. William Lean, Mr. Duncan MacKinnon, Mr. Frank Morris, Mr. Nelson Bordeaux, Mr. Arthur Weiber, Mr. Wm. Sandford, Mr. George Keller, Mr. Clarence Daly, Mr. Harry A. Cohen, Mr. Fred Scheidegger, Mr. Frederich Wm. Sinon, Mr. Andrew Guaniello, Mr. W. H. Rittenhouse, Mr. George Rhoderick, Mr. J. Roden, Mr. John H. Lizelan, Mr. Valentine Steenson, Mr. Flannery.

New Company to Build Aeroplanes

The Stacy Aeroplane Company of this city, has been granted incorporation papers by the Secretary of State.

This company has been organized by Charles E. Stacy and will manufacture aeroplanes with the use of patents owned by him and C. D. Stacy, his brother. The work of organizing the company will start at once and definite plans of operation will be announced in the near future.

Both brothers are engineers and machinists of experience, at present being employed by local firms.—Dayton *Evening Herald*.

Wings of German Aeroplanes Now Being Made of Wood

The Hague—The New York *Times* correspondent learns on excellent authority that the last German aeroplane to land in Holland was one of the Brandenburg type, which had wings covered with three thin layers of wood instead of textile material. The extra weight was saved by doing away with wire stays. The machine flew well.

The question of textiles and, in fact, of all materials has been one fraught with tremendous difficulties to Germany for some time and is one that monopolizes the attention of the experts, in spite of efforts to prove the contrary.



Graham W. Brogan, newly appointed advertising manager of the Duesenburg Motor Corporation

Automobile Shows Cancelled Because of War Exigencies

B. M. Baruch, chairman of the War Industries Board, authorizes the following:

The National Automobile Chamber of Commerce has canceled the national automobile shows of 1919, to have been held during January and February in New York and Chicago, at the request of Bernard M. Baruch, chairman of the War Industries Board, and George N. Peek, commissioner of finished products.

Going further to meet the views of the War Industries Board, the automobile industry leaders have urged promoters of local shows for automobiles, trucks, or accessories to abandon all plans for such during the coming winter.

The reason given to the industry for this action by the Automobile Chamber of Commerce is a desire to co-operate with the War Industries Board in plans for conservation of fuel, labor and transportation.

The question of advisability and practicability of holding these shows, both national and local, was taken up with Messrs. Baruch, Peek, Alexander Legge and Judge Edwin B. Parker, of the War Industries Board, by Hugh Chalmers and Alfred Reeves, of the National Automobile Chamber of Commerce, and Mr. Peek strongly urged that all such exhibitions be abandoned for the winter. Mr. Chalmers presented the views of the War Industries Board to his chamber of commerce and Mr. Peek has received from Mr. Reeves, general manager of the chamber, a letter stating that the directors of the chamber concurred unanimously in the opinion of the board and has adopted the following resolution:

"*Resolved*, That the promotion of national automobile shows during the winter of 1918-19, with consequent use of transportation, fuel and labor, would, in the opinion of this board, be inconsistent with the patriotic obligations of the industry and that, therefore, national shows be suspended until further action of the association.

"*Resolved*, That for reasons expressed in the foregoing resolution, promoters of local and other shows be respectfully requested not to hold automobile, truck or accessories exhibitions during the winter of 1918-19."

Standard Fabric for Aeroplne Wings

Government tests of silk for aeroplane wings were made last year, and now there has been a cotton fabric evolved instead. It is reported that one of the largest mills in Phiiadelphia is virtually ready to manufacture aeroplane cloth in large volume.

The standard cloth, textile experts say, is a cotton fabric of great strength, with almost no "stretch" to it. It is regarded as equal in every way to the linen cloth used by England, although it is a trifle heavier. Mill conditions are such that orders for millions of yards can be handled with comparatively no trouble.

Ball Bearing and Steel Ball Industries Recognized as Essential

The Priorities Division of the War Industries Board, in circular No. 19, dated September 3, 1918, has placed manufacturers of ball bearings and steel balls on the Preference List with a rating of "Class B-3," conditioned upon their executing and filing pledges of co-operation with and observance of the rules of the Priorities Division.

Overland Gets Curtiss Engine Contract

Washington.—The Willys-Oevrland Co. has received a contract for 1,500 Curtiss O. X.-5 aeroplane engines of the 8-cylinder type, to be used in training planes.

Washington Office for Duesenberg

Washington.—The Duesenberg Motors Corp. has established a Washington office in the Munsey Bldg. It is in charge of General Sales Manager N. G. Rost.

Glenn L. Martin Tests First Plane

Cleveland.—The first plane produced by the Glenn L. Martin Co. has been completed and has flown from Cleveland to Dayton for experimental tests with a crew of four men.



Mr. and Mrs. "Billy" Parker of the Dewey Aeroplane Company, Dewey, Oklahoma

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville

Aerial Mail Scores 100%

The Aerial Mail has scored 100% daily for September, including the rainy period of the last of the month. The worst day was on September 18, when the planes left Washington and New York in the midst of rainstorms. On that day it was raining so hard that the machine had to be started in the hangar, Aviator Shank leaving Washington in a downpour of rain, the landing gear of his plane sinking in the mud up to the hubs in parts of the field and making the take-off from the ground very difficult. Notwithstanding the stormy weather, he made the trip from Washington to New York in three hours and five minutes. He flew nearly the entire distance through rain and storm and landed in rain both at Philadelphia and New York.

Aviator Max Miller on September 19 flew to Clarion Pa., to chart a more favorable route across the mountains in Pennsylvania than is found on the air line from Belmont to Cleveland.

U. S.-Spain Aero Mail Service Is Proposed

Madrid, Spain.—Captain Herrera, chief of the Spanish military air force, has had a number of interviews with King Alfonso on the subject of an aerial postal and passenger service between Spain and the United States. The scheme also has been discussed at cabinet meetings, and it is said that a leading shipping company is willing to finance it.

Will Relay New Aero Mail

New York.—The feasibility of the government's plan to transport mail by aeroplane and make final delivery of letters, between New York and Chicago within a maximum time of 10 hours, has been demonstrated, in the opinion of postal officials and officers of the Aero Club of America. This opinion was expressed after Max Miller, arriving here from Chicago by way of Cleveland and Lock Haven, completed the first round trip aero post flight between this city and Chicago.

On his journey to Chicago last week Miller, battling against adverse weather conditions at times, made the flight in an elapsed flying time of about nine hours. On his return journey, begun in Chicago, Miller consumed eight hours and 42 minutes.

Under the government's plans for a regular aero post between New York and Chicago, beginning October 1, mail will be carried in relays, three aviators carrying the mail instead of one.

Miss Stinson Again Flies Mail

Miss Katherine Stinson, who made her first trip as a member of the air mail staff on September 26, flying from Washington to Belmont Park, was ready for her second flight on September 27, and was favored with pleasant though windy weather. She got away from the Belmont Park station at 12:12 P. M. with pouches containing 150 pounds of mail, and Pilot Maurice Newton flew another plane carrying an equal amount, both starting about the same time and reaching Philadelphia at 1:22. From there they went on, after a short stop, to Washington.

Pilot Robert Shank brought in the northbound mail, making the trip from Philadelphia to Belmont Park in fifty minutes. The large volume of mail carried in the last two days is due in part to the fact that boxes with the aero mail service signs have been installed in the hotel lobbies from which collections by motorcycle are made just before the time for the dispatch of the messages to the aero mail stations.

Do You Use the Aerial Mail Service Regularly for Your Urgent Correspondence With Philadelphia and Washington? It May Interest You to Know the Following Facts

The Aerial Mail Service operates with clock-like regularity between New York and Washington.

The aeroplane leaves New York every week day without fail at 12 o'clock noon and arrives at the Philadelphia field at 1 p.m. and at the Washington field on or before 3 p.m.

Northbound, the aeroplane mail leaves Washington at 11.30 a.m. every week day without fail, arrives at Philadelphia at 1.10 p.m., and lands at the New York terminus of the route on or before 2.30 p.m.

During the month of August every foot of the route was flown without a miss and without a single serious delay. The mail from Washington to New York was late as much as one hour only once during the month, whereas the fixed schedule for arrival in New York was beaten 14 times. On August 21st the mail plane landed at 1.58 p.m. with the mail that left Washington at 11.30 a.m.

The best time from New York to Washington, including the mail stop at Philadelphia, was 2 hours and 30 minutes, and the best time from Washington to New York, including the Philadelphia stop, was 2 hours and 28 minutes.

Compare this for speed and regularity with the fastest train service between New York and Washington, which is approximately 5 hours, and about 5 hours and 30 minutes as an average for all the other fast through trains.

Compare this record with the time it takes for the transmission and delivery of the average commercial telegram. Neither train nor telegram are more regular and more certain in their delivery performances than is the aerial in any kind of weather as it is now operated by the Post Office Department.

An aeroplane letter mailed from New York is delivered to the addressee in Washington *before close of business the same day.*

Aeroplane mail receives special treatment from the time it is mailed until it is placed in the hands of the addressee.

The rate of postage is 16 cents for the first ounce, including Special Delivery Service, and 6 cents for each additional ounce.

The Postmaster can advise you as to the latest time in the forenoon that aeroplane mail may be deposited at the various stations for dispatch that same day.

OTTO PRAEGER,
Second Assistant Postmaster General

September 7, 1918

Motorcycle Schedule for Collecting Aeroplane Mail—Stations, Business District and Important Hotels, New York City

Station	*Location*	*Time of Collection*
P.	Custom House Building	10.15 a. m.
Wall Street	165 Pearl Street, corner Pine Street	10.23 a. m.
Hudson Term'l	30 Church Street	10.30 a. m.
City Hall	Broadway and Park Row	10.35 a. m.
S.	Northwest cor. Howard and Lafayette Sts.	10.40 a. m.
D.	Southwest cor. Fourth Ave. and 13th St.	10.50 a. m.
Madison Sq.	310-316 Fourth Ave., corner 23rd Street	11.00 a. m.
General P. O.	Eighth Ave., 31st to 33d Streets	11.15 a. m.

Hotel	*Location*	*Time of Collection*
Astor	Broadway, 45th to 46th Streets	10.30 a. m.
Knickerbocker	Broadway and 42d Street	10.33 a. m.
Manhattan	Madison Ave., 42d to 43d Streets	10.37 a. m.
Ritz-Carlton	Madison Ave., 45th to 46th Streets	10.40 a. m.
Biltmore	Madison Ave., 43d to 44th Streets	10.45 a. m.
Belmont	Park Ave., 41st to 42d Streets	10.50 a. m.
Vanderbilt	Park Ave., 33d to 34th Streets	10.55 a. m.
Waldorf	Fifth Ave., 33d to 34th Streets	11.00 a. m.
McAlpin	Broadway, 33d to 34th Streets	11.05 a. m.

NOTE—Mail deposited at any one of the above points up to ten minutes before last collection is made will be dispatched same day. Mail deposited after last collection will go forward via first train and be given special-delivery service unless instructions are given to hold same until following day for dispatch via aeroplane.



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F. C., C. F. A.

So far as the naval balloons were concerned they were housed in special balloon ships, which had a hold fitted up for the reception of the gas bags. On land it was another matter. It was almost a universal accepted theory that balloons would be houses in wooden or canvas hangars, the same as aeroplanes are at the present time. Active service and the advent of the aeroplane, however, made it evident that some new means of housing a balloon was advisable. The hangars were very easily spotted from the air and owing to their gaseous occupant were particularly vulnerable to enemy artillery fire and later to enemy incendiary bombs. Besides hangars were rather a nuisance. They were unwieldy and hard to transport. Unlike an aeroplane, which can reach the battle front in a very few minutes from its aerodromes away behind the lines, a balloon must be fairly close to the place it is going to do its work. To walk a balloon overland requires the efforts of the whole crew and a very tedious job it is. That procedure also requires an absence of overhead wires, a state of things which is very seldom the case near the front in France. In windy weather even the combined efforts of the whole crew would probably not be sufficient to take the balloon any distance safely. So events proved that a balloon must be bedded down fairly near to the winch position. As the erection of hangars so close to the enemy was impracticable, a bed on the ground was devised. Some experiments along that line had been carried out in England before the war, and these formed the basis of new experiments on active service

Several things are essential in the contructions of a good balloon bed. Probably the most important is protection. This point subdivides itself into two parts, first protection from the weather and second from the inquisitive eyes of wandering Boche airmen and ground observers. The latter are usually not very hard to circumvent, that is, given any decent kind of country. It is surprising just how much protection even a very small rise in the ground will give. So long as the ground line of where the balloon rests on the ground is not visible to the enemy it is very difficult for him to notice the balloon at more than five thousand yards. The airman is not so easy to fool. Owing to its regular more or less cylindrical shape it is unmistakable from the air. Camouflage well applied, is distinctly effective. Not the wierd color combinations which one sees so much of in this country but a quiet breaking up of the regular lines with color and a harmony with the surroundings. I remember on one occasion I was beautifully fooled and incidentally, unwittingly, caused quite a flutter in the company. While we were operating a balloon on the Arras sector just behind the one-time village of Souchez, the section on our right, for some reason or other, I forget what, got a new balloon. Instead of being a dark green as most of the balloons are colored, it was a very irregular grey. Quite mottled in fact. As the fortune of war had it, their suroundings were almost the same color, to wit, an old shell torn wood. I happened to be in the air one day when a message came through asking if Number —was in the air. I cast a glance over my shoulder and failed to see the sausage up. For no particular reason I glanced at the ground to see the balloon on its bed. I did not know they had received a new balloon and I didn't see it lying there. I reported that Number — was not only not in the air but that the balloon was not visible on the ground either and that probably it had blown off its bed during the night. Some excitement ensued on the ground. It was only after looking very carefully with high-powered binoculars that I was able to discern their sausage on its bed. It was the best example of camouflage I have ever seen. Just here it might be said that balloons when exposed to the wind, the rain and the sun, will fade out whatever color they may have. At the time referred to above, my section was using an old French balloon which whatever color it had been to begin with, was at that time almost pure white. The only time it would have been protected naturally would be the middle of winter. A place in a thin wood, or between several rows of trees, other things being equal, will generally make very good protection both from the weather and the enemy.



The observation balloon in the navy. These balloons, which ride 3000 feet or more above the surface of the ocean, are sometimes flown from a destroyer though more often they are flown from a regular balloon ship, which has special facilities for handling them. They are used for spotting submarines and are sometimes used in a trans-Atlantic convoy. They are used for coast defence observation and were designed for observation of fire from battleships at very long ranges. Their vulnerability to aeroplane attack was against them though

THE INCREASING OF POWER OUTPUT*

Including Reference to a Six-Stroke Engine

By PROF. EMIL SCHIMANEK

THE power output of an internal combustion engine is evidently improved if the amount of fuel consumed per unit of capacity can be increased, and the more effectively the heat capacity of the fuel is utilized the better will be results.

The quantity of fuel which can be consumed is evidently in direct proportion to the charge of air in the working cylinder, other factors remaining unaffected, and it is therefore possible to increase the power output by increasing the air charge and by improving the thermal efficiency.

To increase power output then, effort in the following directions may be made:

1. To increase thermal efficiency.
2. To increase the number of working strokes per unit of time—
   - *a.* By increasing the revolutions per minute.
   - *b.* By reducing the number of idle strokes; employing the two-stroke cycle instead of the four-stroke.
3. To increase the air charge in the working cylinders, *i. e.,* consuming a greater quantity of air for a given number of strokes.

1. The overall thermal efficiency can only be increased (assuming the mechanical and indicated efficiency to remain unaltered) by increasing the expansion ratio after the combustion of the gases. If we consider similar cycles—*i. e.,* approximately constant volume or constant pressure cycles—in which the volume at the end of expansion is equal to the volume at the beginning of the compression, then the increase in expansion ratio is equivalent to an increase in compression ratio.

Theoretical considerations and practical results have shown that, after a certain limit is reached, the advantage of further increasing the compression ratio is very small. For instance, a constant pressure cycle engine working with a compression of about 38 to 40 atm. could scarcely be improved by increasing the compression. We can scarcely expect a further increase in power output from this direction therefore.

2a. The increase in the number of working strokes per unit of time by increasing the number of revolutions per minute is very effective in augmenting the power output, and is, of course, very general.

2b. Reducing the number of idle strokes has been effected successfully in double-acting engines, also in employment of the two-stroke cycle instead of the four-stroke. With the two-stroke engine, one stroke is required for the expansion, while the remaining stroke may be used either for the exhaust or for the compression. As the compression is essential from a thermal point of view, and as this compression can scarcely be performed elsewhere than in the cylinder itself without entailing considerable losses, it is the usual practice with two-stroke engines to perform the compression during the other stroke. The scavenging and charging of the working cylinder with fresh air is performed during a short portion of the stroke near the dead centre. This requires, besides the working cylinder, a pumping cylinder, taking air in and transferring it to the working cylinder.

During the transfer period the working cylinder is scavenged with the help of the new air charge. Theoretically it would be sufficient to make the cylinder volume of the pump equal to the volume of the working cylinder. As, however, it is impossible to prevent a certain amount of air escaping with the exhaust gases during the scavenging period, and so being lost for combustion, it is the usual practice to make the volume of the pumping cylinder at least 30 per cent larger.

In order to establish a comparison between the four and the two-stroke engines with regard to the necessary cylinder volume per unit of power, we have to add for the two-stroke engine the volume of the pumping cylinder, neglecting

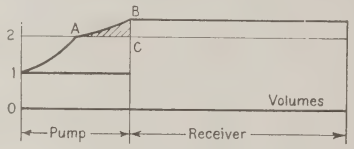


Fig. 1.
Diagram of pump.

for the moment designs employing the crank case as the pump.

Assuming the two-stroke to give twice the power of the four-stroke engine, we obtain for the former, for the same power output, the proportion

$$\frac{\text{Cylinder capacity}}{\text{Power output}} = a = \frac{2.3}{2} = 1.15$$

of that of the four-stroke, *i. e.,* 15 per cent larger. The use of double-acting pumps alters the proportion to

$$a = \frac{1.65}{2} = 0.825.$$

Assuming the two-stroke to give only 1.8 times the power of the four-stroke, the proportion will be

$$a = \frac{1.65}{1.8} = 0.917.$$

The proportions represented by *a,* which will be calculated in all the following comparisons, show the proportion of the total volume of the cylinders of the engines to be discussed to the cylinder volume of the ordinary four-stroke engine for equal power output.

It will be noted that the proportions given in all cases hold good only for the cylinder volume, and should not be considered in relation to the weight of the engine. It is evident that for the same cylinder volume the pumps will be lighter than the working cylinder, including piston and crankshaft, on account of the smaller pressures for the pump.

3. The power increase due to the increase of the air charge in the cylinder of a given volume can be achieved—

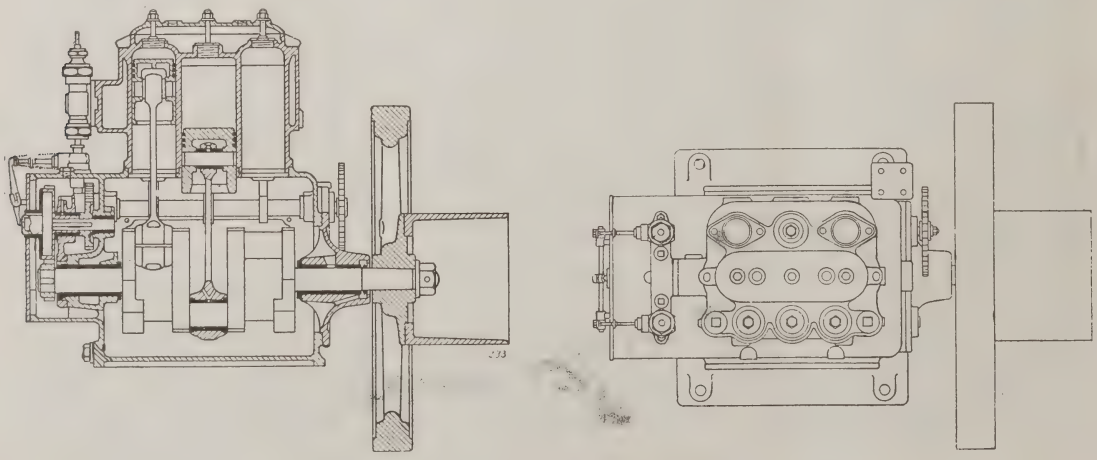
- *a.* By a decrease of the air temperature.
- *b.* By reducing the exhaust residue in the combustion chamber and replacing the corresponding volume by fresh air.
- *c.* By increasing the air pressure before compression.

As examples of 3*a* we may mention the difference of power output between air-cooled and water-cooled engines, also the cooling of the air for two-stroke engines during the transfer period from the pump to the working cylinder, as proposed by Prof. Junkers. The power output at this lower temperature is also increased on account of the better thermal efficiency. The increment is due to the fact that the specific heat of the gases increases with the temperature. This increase is evidently the smaller the larger the air charge, which is consequently less contaminated by the remaining exhaust gases.

The power increase which can be obtained by cooling the air before the compression is limited by the temperature of the cooling water. By calculating the necessary cylinder volumes of the working cylinders for the same power output, no account is taken of the various air temperatures, because the proportions vary greatly for various fuels, and mixtures of fuel and air, due to the specific heats. Neglecting this variation in thermal efficiency, and assuming that the specific heats and weights of the air and exhaust residue are the same, we shall need for equal power output an increase of cylinder volume almost proportional to the increase of absolute temperature of the charge.

The method set forth in 3*b* has been employed by the Premier Gas Engine Co. for their four-stroke scavenging engines. In these the exhaust residue is expelled from the combustion chamber with compressed air. Also the Hellmann four-stroke engine with complete scavenging may be mentioned.

With the Premier engine the air pump delivers the total air charge, while in the Hellmann engine the pump supplies only the necessary



Figs. 2 and 3.
Four-stroke engine with power increase.

* Translated from an article published in *Zeitschrift des Vereines Deutscher Ingenieure.*

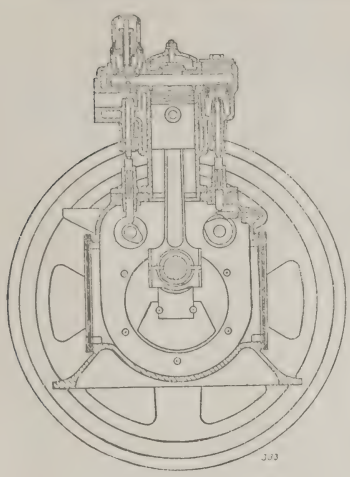


Fig. 4.

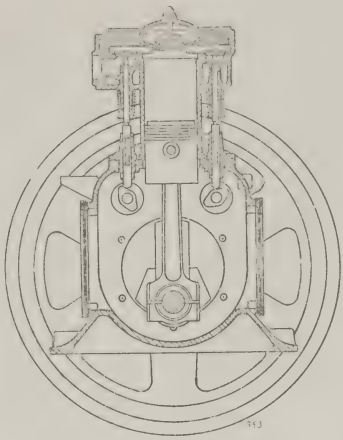


Fig. 5.

quantity of air to scavenge and charge the compression space. The total volume of the working and pumping cylinder is for both machines evidently larger than for the ordinary four-stroke.

To the same group of engines belong also the six-stroke engines, in which two further strokes are added to the normal four strokes, during which the pistons draw in air only, expelling it again through the exhaust valve.

In considering this cycle of operations we must take into account the fact that in the scavenging of the cylinder during the fifth and sixth strokes a cooler charge will result, which increases the thermal efficiency; also the compression space is charged with fresh air, and we can therefore expect a greater economy. Because more fuel has to be consumed during one cycle the thermal efficiency will be adversely affected, and on account of the two additional strokes the mechanical efficiency is not so good.

A calculation could only be made by adopting several assumptions; therefore we will dispense with this, and merely point out that all the methods of operation under 3b are only employed with engines having a large compression space. With high-compression engines (Diesel engines) this method is of no practical value.

In method 3c—that of charging the working cylinder with air—higher pressure can be effected in the simplest manner with two-stroke engines by increasing the air pumping cylinder. If we assume, as before that the air loss during the scavenging amounts to 30%, and if we make the pumping cylinder 2.3 times as large as the working cylinder, and, furthermore, assume isothermal compression and no throttling losses, we obtain a pressure of 2 atm. in the working cylinder after the transfer. Twice the amount of air is consumed, and we may expect, therefore, twice the power output, other conditions remaining unaltered. Evidently the compression pressure will be twice as high as before. The air pump may either deliver the air in two portions—one portion practically at atmospheric pressure for scavenging and charging the cylinder, and the other portion at higher pressure in order to raise the pressure in the cylinder. In the case of the Junkers engine the exhaust is throttled to such an extent that the lowest pressure in the working cylinder corresponds with the pressure of the charging air. If the exhaust is throttled down to 2 atm. absolute the theoretical power output is doubled.

An example of dividing the air portions into two portions is found in the single-acting two-stroke engine of Sulzer Bros., of Winterthur. In this engine the cylinder is scavenged with an open exhaust, and, after closing the exhaust ports, air at higher pressure is admitted.

With regard to the thermal efficiency and power increase, the method of the Junkers is not so good: First, because the whole amount of air has to be compressed to the high pressure, and, secondly, because some exhaust gases are likely to remain in the cylinder. The position of the inlet and exhaust ports at opposite ends of the cylinder in the Junkers engine has, however, some tendency to diminish the last-named detrimental effect.

The advantage of this two-stroke engine over the four-stroke, with regard to the necessary cylinder volume, is the more marked the higher the charging pressure. If, for instance, we charge with air at 1.5 atm., and assuming isothermal compression, no throttling losses, and double power output as compared with the four-stroke, also double-acting pump, we then arrive at a cylinder volume of working and pumping cylinder of $1 + \frac{1.8}{2} = 1.9$ times as great, while the power output is three times as great. The proportion of the necessary volume to that of the four-stroke engine for the same output is

$$a = \frac{1.9}{3} = 0.63.$$

If the charging pressure is 2 atm., the proportion works out at

$$a = \frac{1 + \frac{2.3}{2}}{4} = 0.504.$$

It is also possible to increase the power output of the four-stroke engine by charging the cylinder with compressed air. The engine takes in its charge from a receiver filled with compressed air, the supply being maintained by means of a pump. The necessary total cylinder volume for a given power output is dependent on the charging pressure, or, in other words, on the desired power increase. With a charging pressure of, say, 2 atm. the power output is double that of the ordinary four-stroke engine. If the pump, which is delivering every alternate stroke, is single-acting, it will require the same volume as the working cylinder, and if double-acting, only half this volume. The volume proportions for the same power output are: In the first case $a = 1$, and in the second case $a = 0.75$. With a charging pressure of 1.5 atm., $a = 1.166$ and 0.913 respectively.

It is also possible, however, to supply by the pump only one portion of the total charge, while the other portion is drawn in by the working cylinder at atmospheric pressure.

The cycle of operation of such an engine is as follows: The piston at the first stroke draws in air from outside. At the end of the suction stroke, after the inlet valve is closed, the cylinder is brought into communication with a receiver containing compressed air supplied by a pump. This air is transferred into the working cylinder and raises the pressure. Then follow the compression, expansion, and exhaust strokes as usual.

If, for instance, the pump supplies the receiver with exactly the same quantity of air as the working cylinder draws in from outside, then we have, after the transfer, *i.e.*, before the compression, a pressure of 2 atm. in the cylinder, assuming isothermal compression in the pump and transfer without losses at the dead centre. The power output will be twice as large as for the ordinary four-stroke. The total volume of working and pumping cylinder, with a single-acting pump, will be $1 + 0.5 = 1.5$, and the proportion $a = \frac{1.5}{2} = 0.75$, on account of the double power output. With a double-acting pump we have

$$a = \frac{1 + 0.25}{2} = 0.62.$$

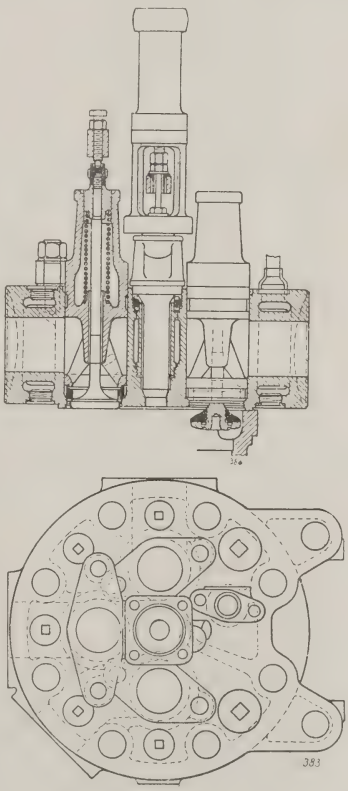
Evidently this proportion is more favorable than that for the two-stroke engine without power increase, as the pump has also to supply the extra amount of air lost during the scavenging period. The advantages over the two-stroke are, therefore, no loss of air and a better exhaust. The disadvantage is the higher pressures in the working cylinder. In the above example the pressures are twice as high as in the two-stroke without power increase.

The thermal efficiency of this engine is not so good as that of the ordinary four-stroke. This will be the more pronounced the smaller the receiver is for the compressed air. This is due to the fact that the air has to be transferred from the receiver at higher pressure in the cylinder at lower pressure, neglecting even the losses on account of the acceleration and throttling of the air.

This loss can be approximately illustrated in the pump diagram (for isothermal compression). The area ABC (fig. 1) illustrates the loss, which evidently increases with the receiver pressure. With an indicated mean effective pressure of 10 atm., and a receiver volume equal to twice the volume of the pumping cylinder, this loss amounts to 1.15% of the indicated power of the working cylinder.

Figs. 2 to 5 illustrate an engine working on the above principle. The central cylinder is the pumping cylinder, while the two outer cylinders are the working cylinders. The valves are disposed on both sides of the cylinder. The transfer valve is in connection with a ring space by means of several holes, whereby the fuel is atomised as the air under pressure is admitted. The pistons of the fuel pumps are operated upwards by a cam on the camshafts, while a spring controls the return stroke. A centrifugal governor (not shown) is mounted in the gear, which governs the stroke of the fuel pump's pistons by interposing a wedge. The experiments with this engine were not completed at the time these notes were prepared, but the preliminary tests confirmed the theoretical conclusions regarding the power output.

It is also possible to increase the power output without the addition of a special air pump



Figs. 7 and 8.
New cylinder head by Schimanek, with transfer valve removed.

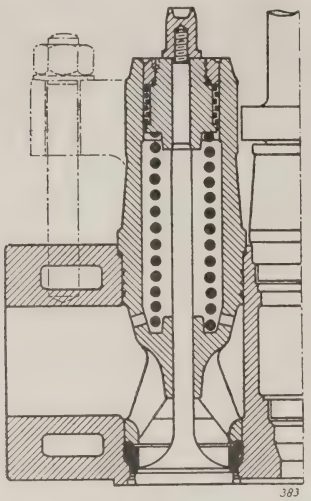


Fig. 9.
Transfer valve with balancing piston.

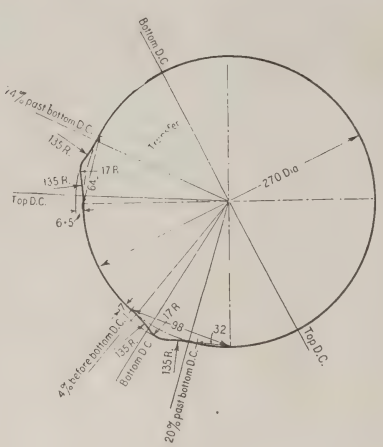


Fig. 10.
Cam for transfer valve.

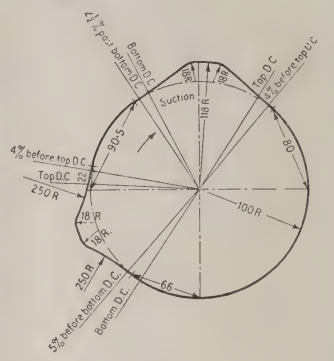


Fig. 11.
Cam for suction valve.

by employing more than four strokes, namely, by arranging several suction strokes before each compression and expansion stroke. The air taken in before the last suction stroke is pumped into a receiver and stored there until at the end of the last suction stroke—*i.e.*, before the compression stroke—it is transferred back into the cylinder to supplement the charge. The total charge is therefore accumulated during the successive suction strokes. The six-stroke engine (see fig. 6) may serve as an example. The six strokes are—

First stroke: Suction of air from outside (line A—B).

Second stroke: Compressing the air into the receiver (line B—C).

Third stroke: Suction of air from outside (line C—D).

Between the third and fourth stroke: Transfer of the air from the receiver into the cylinder, increasing the pressure to about 2 atm. (line D—E).

Fourth stroke: Compression of the charge (line E—F).

Fifth stroke: Combustion and expansion (line F—G).

Sixth stroke: Exhaust (line G—H).

By this cycle of operations we consume during six strokes twice as much air as during the four strokes of the four-stroke engine. For the same number of revolutions, therefore, the power output of the six-stroke is $\frac{2 \times 4}{6} = 1.33$ times that of the four-stroke. For the same cylinder capacity we obtain, therefore (without transfer losses), almost 33% more power.

In Table I. are tabulated the necessary total volumes of working and pumping cylinders for the theoretical power output of the previously discussed cycle of operation.

An eight-stroke engine would have the following cycle of operations:

First stroke: Suction of air from outside.

Second stroke: Compression of the air into a receiver.

Third stroke: Suction of air from outside.

Fourth stroke: Compression into the receiver.

Fifth stroke: Suction of air from outside.

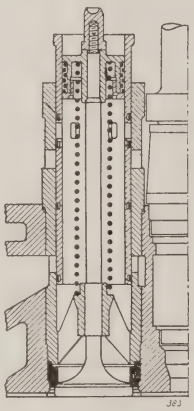


Fig. 12.
Combined suction and transfer valve with sleeve valve distributer.

Between the fifth and sixth stroke the air stored in the receiver is transferred back into the cylinder, in which the pressure will rise to about 3 atm. absolute; then follows the

Sixth stroke: Compression.

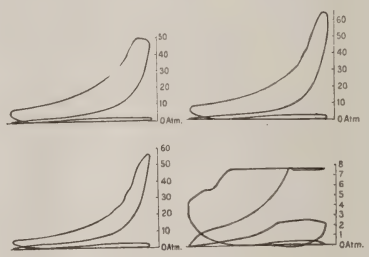
Seventh stroke: Combustion and expansion.

Eighth stroke: Exhaust.

The power output would be about 50% larger than that of the four-stroke.

In practice the six-stroke engine offers considerable promise. First of all, it is advisable to study the probable influences which may effect the 33% increase in power output as previously estimated.

It was assumed that during one cycle the six-stroke consumes twice as much air as the four-stroke on account of the two suction strokes



Figs. 15, 16, 17, and 18
Compression of 45.3 atm. Compression of 54.5 atm. Output 46.2 h.p. Rev. per min. 207. Compression of 54.5 atm. Weak spring diagram.

preceding the combustion. In fact, there exist only during the first suction strokes the same conditions as in the case of the four-stroke. At the beginning of the second suction stroke, the combustion chamber of the cylinder is filled with air at receiver pressure, and the volumetric efficiency is influenced by the expansion of this air to atmospheric pressure. During the second and the following (with eight or more strokes) suction strokes the volumetric efficiency is only then high if the combustion chamber is not too large. The use of this principle is therefore restricted to such engines as have a high compression—*i.e.*, constant pressure cycle engines. If the volume of the receiver is four times that

TABLE I.

Cycle of Operations.		Cylinder Volumes.					Theoretical Output.	Proportions of the Total Cylinder Volumes for Equal Theoretical Output.	
		Working Cylinder.	Pumping Cylinder.		Both Cylinders.				
			Single Acting. (*a.*)	Double Acting. (*b.*)	(*a.*)	(*b.*)		(*a.*)	(*b.*)
Four-stroke	Ordinary	1	0	0	1	1	1	1	1
	The total amount of air is supplied by the pump. Charge at 1.5 atm.	1	0.75	0.375	1.75	1.375	1.15	1.16	0.913
	" " 2 "	1	1	0.5	2	1.50	2	1	0.75
	The extra amount of air is supplied by the pump. " " 1.5 "	1	0.25	0.125	1.25	1.125	1.5	0.835	0.75
	" " 2 "	1	0.5	0.25	1.5	1.25	2	0.75	0.625
Two-stroke	Ordinary	1	1.3	0.65	2.3	1.65	2	1.15	0.825
	Power increase of 50%	1	1.8	0.9	2.8	1.9	3	0.93	0.63
	" 100%	1	2.3	1.15	3.3	2.15	4	0.825	0.504
Six-stroke		1	0	0	1	1	1.33	0.75	0.75

of the working cylinder, and if the compression space is 8% of the cubic capacity of the cylinder, we shall have about 92% of the cylinder volume filled with fresh air at the end of the second suction stroke. During the first suction we shall also have a little loss on account of the exhaust residue expanding first. This loss of air charge is insignificant with the six and four-stroke and can be neglected. The charge of the six-stroke will therefore not be double that of the four-stroke, but only 1.92 times as great. With the same compression space, the pressures during the compression and expansion will be 1.92 times as great as those of the four-sroke. As mentioned before, this increase in pressures exists with all the cycles working with an increased air charge. However, with the six-stroke these pressures occur only during each sixth stroke.

Professor Junkers, in his article in *Der Oelmotor*, gives some valuable information on the admissible pressure increase. The article shows clearly the possibility of working with high pressures without any practical disadvantages.

With the six-stroke, however, we have to consider the following: As a rule the necessary dimensioning of an engine is governed by the highest pressures on account of the material stresses. With constant pressure cycle engines using compressed air for starting, this pressure is not the compression pressure before the combustion, but the pressuse resulting at the first combustion in the cylinder when starting. Normally this pressure is not higher than 60 atm. With the six-stroke any desired compression can be obtained during the starting period. Before the starting operation the receiver is at atmospheric pressure, and during the starting this pressure increases according to the quantity of air stored gradually, until after several revolutions equilibrium exists between the pressures, depending on the size of the receiver. However, by opening a cock in the receiver any desired pressure may be maintained in the receiver during the starting period. This controls the pressure at the beginning and the end of the compression stroke, which can be regulated as desired, and there need be no higher pressures during the starting period, therefore, than is the case with the four-stroke.

The ignition of the fuel can be assumed to be just as certain as with the four-stroke, because during the starting period only a negligible quantity of heat is carried away through the receiver wall on account of the relatively low temperature of the stored air and the small heat conductivity of the latter, also the temperature loss is made good again through the increase in temperature due to the throttling effect during the transfer. The maximum temperatures of the compression cannot therefore materially differ from those of the four-stroke with the same pressures.

The maximum pressures can be limited to 60 atm., and the sizes and strength of parts can be left the same as for the four-stroke.

If in spite of this we have to limit the compression pressure to 50 atm. in the six-stroke, we have to increase the compression space accordingly, thus somewhat reducing the thermal efficiency and also the power output. If we operate the four-stroke with a compression pressure of 35 atm. and the six-stroke with only 50 atm., then the proportion of thermal efficiencies of constant pressure cycles at the highest outputs is in the proportion of about 109 to 100, considering the variation of the specific heat.

The effective power output is influenced not only by the thermal efficiency of the cycle, but also by the heat losses to the cooling water and mechanical efficiency, and we may now discuss what effect the six-stroke cycle has on these.

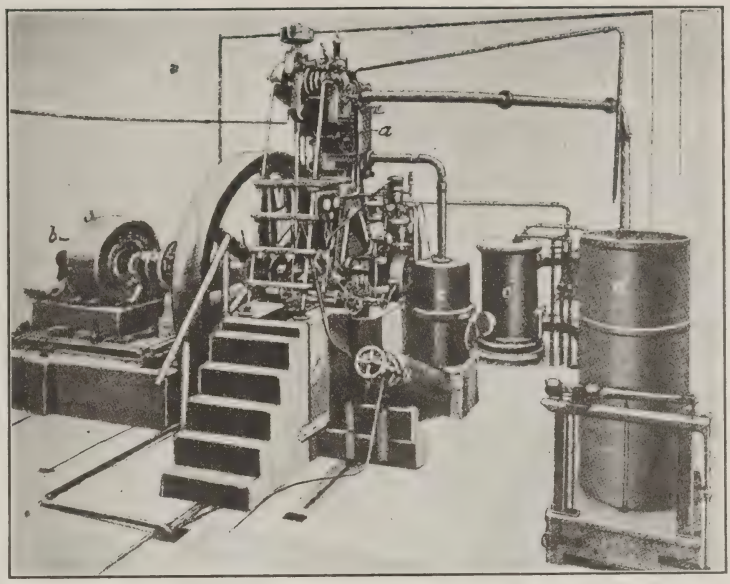
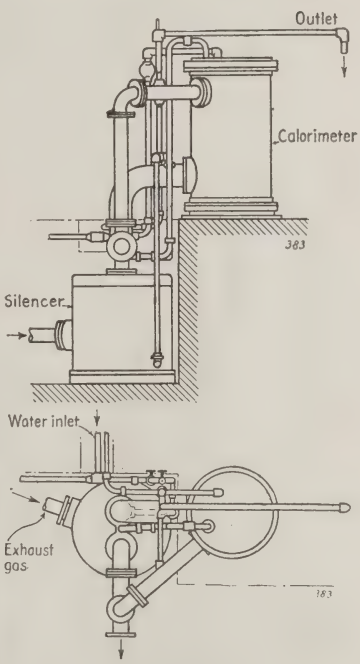


Fig. 13.—See description of Fig. 14

It is known with the four-stroke that the water cooling has no effect on the heat utilisation for the power output during the suction and exhaust strokes, and only a small effect during the compression stroke. Only during the combustion and expansion has the heat loss of the charge a detrimental effect on the heat utilisation. For the six-stroke engine there are five strokes during which the cooling water has little or no detrimental effect. If, therefore, the temperatures during the combustion and expansion do not materially exceed those of the four-stroke, which can easily be assured by cooling the receiver, then the heat loss to the cooling water for the same number of revolutions for the six-stroke is smaller than for the four-stroke. The resulting gain in power can only be estimated. Using the method of E. Meyer, this gain works out, roughly, from 4% to 5% of the indicated power; 4% has been adopted for the further calculations.

The mechanical efficiency of the six-stroke engine is bound to be better than that of the four-stroke engine. The friction losses are only dependent on the pressure—*i.e.*, on the load. The greater power output of the six-stroke therefore assures a better mechanical efficiency. Based on results from Diesel engines, this gain may be estimated at 5% to 6% of indicated power. It is assumed, however, that this gain is counterbalanced by the losses of transfer of air into the receiver and back into the cylinder.

The effective power output of the six-stroke is therefore, for the same dimensions and same compression space,



Figs. 19 and 20.
Water-cooled silencer with calorimeter.

$$1.33 \times \frac{1.92}{2} \times 1.04 = 1.33$$

that of the four-stroke. Limiting, however, the compression pressure to 50 atm., the power output on account of the above mentioned influences is

$$\frac{1.33}{1.09} = 1.22$$

that of the four-stroke engine.

In order to determine the power output and heat balance of the six-stroke engine, Ganz and Co., of Budapest, have fitted a four-stroke Diesel

(*Continued on page* 193)

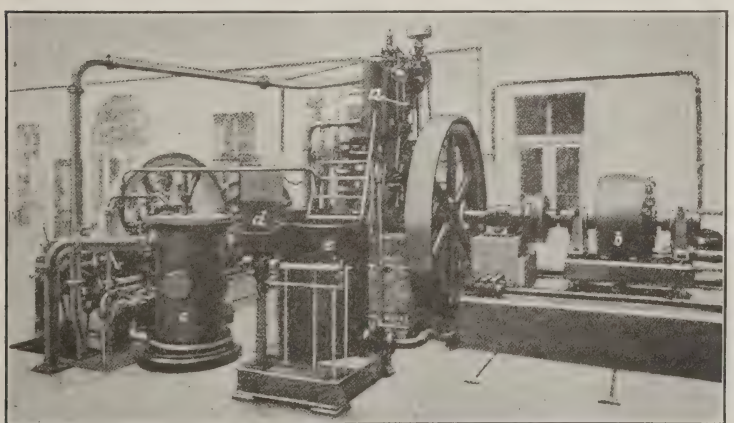


Fig. 14.—(a) Engine. (b) Dynamo. (c) Calorimeter for exhaust gases. (d) Tank for measuring the cylinder cooling water. (e) Tank for measuring the cooling water of the exhaust gas calorimeter

THIRD ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE ON AERONAUTICS

(*Continued from page* 139)

Meteorology and Aeronautics

IN the field of meteorology, the committee recommended to the President an appropriation for the extension of the aerological work of the United States Weather Bureau, and in accordance with which an appropriation of $100,000 was made by Congress for this work, with special reference to the securing of more comprehensive observations on the air in aid of aviation. The committee also acted in cooperation with the United States Weather Bureau in placing meteorological exhibits at the First Pan American Aeronautic Exposition.

In August, 1917, the Advisory Committee recommended that there be organized under the Chief Signal Officer of the Army, as a war measure, a military aerological service with necessary stations and equipment, both in the United States and abroad, and that this service be organized in full cooperation with the Weather Bureau and with care to avoid duplication.

A special report on meteorology and aeronautics has also been prepared and issued as Technical Report No. 13.

Board of War Inventions in Aeronautics

Soon after the declaration of hostilities with Germany the Chief Signal Officer of the Army called to the attention of the committee the large amount of material which was coming before the War Department, comprising inventions and suggestions relating to aeronautics in warfare, and asked assistance in examining and disposing of such material. Accordingly, this committee, through an appropriate subcommittee appointed for the purpose, has acted as a board of inventions for the Government in matters relating to aeronautics, and since the outbreak of hostilities between the United States and Germany it has weekly examined hundreds of suggestions and inventions pertaining to this subject and referred to it by the War and Navy Departments, in addition to the suggestions and inventions which come direct to the committee. This work has required a large amount of time and careful study and has called for considerable increase in the technical and clerical staffs of the committee in order to care for the very large amount of examinations, study, and correspondence with inventors regarding these matters. Several suggestions of value have been received and brought promptly to the attention of the particular Government office most directly interested.

Definition of Technical Terms

During the year the committee has given further attention to the subject of the definition and standardization of technical terms used in aeronautics, and has prepared a further edition of its bulletin on the subject of nomenclature (Technical Report No. 15).

Metric System for Drawings and Calculations

On recommendation of the Advisory Committee, in December, 1916, the War, Treasury, Interior, and Commerce Departments adopted the metric system of weights and measures for all drawings and calculations on aeronautical matters, for use with the accompanying English equivalents. Due to the exigencies of war activities, however, the metric system has not been used generally by the War Department.

Aerial Mail Routes

In December, 1916, the subject of cooperation with the Post Office Department in the establishment of aerial mail routes was considered, and the same matter in one form or another has been considered from time to time since that date. Recently the Second Assistant Postmaster General has expressed a desire to develop such routes in a trial way and so far as military requirements may permit furnishing the needed equipment and personnel. The committee is prepared to advise with and aid the Post Office Department in the furtherance of these aims.

Civil Aerial Transport

In the latter part of 1917 the general subject of civil aerial transport was brought to the attention of the committee and a special subcommittee was appointed to take under consideration the various phases of civil and commercial uses of aeronautics, with special reference to the conditions which may be expected to develop at the close of the war.

Landing Field for Transient Aviators

In connection with the accommodation of transient aviators in Washington, the committee cooperated with the War Department in the selection of a tract of land on the Eastern Branch of the Potomac River and southeast of the Washington Navy Yard.

Productive Capacity of Aeronautic Industry—Inspection Trips

During November, 1917, members of the Advisory Committee in two different groups made trips of inspection to the three principal centers of aeroplane production, namely, Dayton, Ohio; Detroit, Mich.; and Buffalo, N. Y.

The purpose of these trips was to place the committee in immediate contact with the conditions in the industrial field and give them an opportunity of forming a personal, first hand judgment regarding the productive capacity for aeroplanes and for aeronautic engines as provided by the facilities developed at that date, and as contemplated in plans for further development.

The members of the committee have been very favorably impressed with the serious energy and purpose with which the manufacturers are approaching the problem of the quantity production of aircraft and aircraft engines, and with the productive capacity which is now rapidly approaching the point of effective service. Counting on a similar spirit and purpose throughout the field of aircraft industry, there seems every reason to anticipate productive capacity adequate to meet the needs of the Government.

Technical Reports

The first annual report of the committee contained technical reports Nos. 1 to 7, and the second annual report Nos. 8 to 12. With this, the third annual report, the committee submits technical reports Nos. 13 to 23, as follows:

Report No. 13, entitled "Meteorology and Aeronautics" was prepared by Prof. William R. Blair, in charge of aerological investigations, United States Weather Bureau, and submitted through the subcommittee on the relation of the atmosphere to aeronautics. This report discusses problems and general phenomena of the atmosphere. On request of the Signal Corps, it has been printed as a separate document by the committee for widespread distribution, as it contains information of special value to all aviators and aeronauts.

Report No. 14, entitled "Experimental Research on Air Propellers," was prepared and submitted by Dr. William F. Durand, chairman of the National Advisory Committee for Aeronautics. A brief description of this report is contained under "General problems and activities," paragraph E. It has been printed by the committee as a separate document for immediate distribution in order to supply much-needed information at the earliest moment to those who are interested in the design of air propellers.

Report No. 15, entitled "Nomenclature for Aeronautics," was prepared and submitted by the subcommittee on nomenclature for aeronautics, of which Dr. Joseph S. Ames is chairman. It has been printed by the committee as a separate pamphlet.

Report No. 16, entitled "The Stretching of the Fabric and Deformation of the Hull in Full Balloons," is a translation from the German, by Prof. Karl K. Darrow, of the University of Chicago.

Report No. 17, entitled "An Investigation of the Elements which Contribute to Statical and Dynamical Stability and of the Effect of Variation in those Elements," was prepared by Prof. Alexander Klemin, of the Massachusetts Institute of Technology, under contract entered into by the committee with Prof. C. H. Peabody, of the same institution.

Report No. 18, entitled "Aerofoils and Aerofoil Structural Combinations," is a graduating thesis prepared at the Massachusetts Institute of Technology by Maj. H. S. Martin, S. C., and Maj. E. S. Gorrell, S. C., and has been included in the present report by the committee on account of the importance of the information which it contains.

Report No. 19, entitled "Periodic Stresses in Gyroscopic Bodies with Application to Air Screws," was prepared and submitted by Dr. A. F. Zahm of the Washington Navy Yard.

Report No. 20, entitled "Aerodynamic Coefficients and Transformation Tables," was prepared by the committee under direction of Dr. Joseph S. Adams, member.

Report No. 21, entitled "Theory of an Airplane Encountering Gusts, II," was presented as a paper before the American Philosophical Society by Prof. E. B. Wilson, of the Massachusetts Institute of Technology, being a continuation of a report on the same subject printed in the first annual report of the committee. For this reason and in order to complete the treatment of the subject in the records of the committee this paper is included in the present report.

Report No. 22, entitled "Fabrics for Aeronautic Construction," was prepared by Mr. E. D. Walen, of the United States Bureau of Standards, and submitted through the subcommittee on standardization and investigation of materials. This report consists of two parts, the first dealing with cotton fabrics intended for the covering of aeroplane wings and the second with balloon fabrics.

Report No. 23, entitled "Aeronautic Power-Plant Investigations," was prepared by Dr. H. C. Dickinson, of the United States Bureau of Standards, and submitted through the subcommittee on power plants. This report consists of three parts. The first, entitled "Performance of Aeronautic Engines at High Altitudes," gives a description of the construction and equipment of a special testing laboratory intended to furnish, under control, the operating conditions of an aeronautic engine at high altitudes and under any desired conditions of air density, temperature, and humidity. Part 2, entitled "Radiator Design," gives a description of special apparatus designed and constructed for the investigation of different types of radiator sections and with a view to the development of the better knowledge of the interrelation among the various factors entering into radiator performance. Part



The French "Corps d'Armée" Letard biplane equipped with two Hispano-Suiza motors

3, entitled "Spark Plugs," gives a description of a series of tests on different types and forms of spark plugs and of measurements intended to indicate the relation between the various factors affecting performance of the same.

General Problems and Activities

The general problems enumerated in the preceding annual reports of the committee constituted the program of work during the past year. Progress has been made in the scientific study and solution of these problems which are considered of immediate importance, and they will be attacked on a larger scale by the committee with the increased facilities which will be available on completion of the committee's research laboratory at Langley Field.

A. *Stability as determined by mathematical investigations.*—The literature on this subject has been augmented by a report (No. 21) entitled "Theory of an Airplane Encountering Gusts, II," prepared by Prof. E. B. Wilson, of the Massachusetts Institute of Technology, in continuation of his report on the same subject contained in the first annual report of this committee.

Report No. 17, entitled "An Investigation of the Elements which Contribute to Statical and Dynamical Stability and of the Effects of Variation in Those Elements," contains valuable information from the standpoint of inherent stability, and also gives data on static longitudinal balance heretofore unavailable to the designing engineer.

B. *Air-speed meters.*—The complete air-speed meter involves an indicating instrument and a head for the production of pressure difference, which may be either a Pitot or Venturi tube or a combination of the two. The French use almost entirely the Venturi-Pitot; the English, the Pitot with accompanying static tube. With a view to diminishing the danger of clogging the tube with water, Dr. A. F. Zahm, of the Washington Navy Yard, has inverted the mount on the Venturi-Pitot combination so that draining is more certain, and also used a larger cross-section of throat and connecting tubes than has been common abroad. This tube gives a difference of pressure almost exactly proportional to the square of the speed, and though considerably heavier than the English Pitot tube, it permits of the use of a more rugged indicating instrument. The recently improved Foxboro indicating instrument is considerably reduced in size and behaves very well under the trying conditions of vibration experienced on an aeroplane, but the scale is very far from uniform. The production of a uniform scale is the next improvement to be desired, and development is being pushed with several types. Maj. C. E. Mendenhall, a member of the subcommittee on instruments, has in hand a large number of problems.

C. *Wing sections.*—Several aerofoil sections designed by officers of the Signal Corps and tested in the Massachusetts Institute of Technology wind tunnel give promising results. A description of these aerofoils and the data obtained from the tests are embodied in Report No. 18.

D. *Engines.*—The most notable development in aeronautic engines in America during the past year has been the Liberty engine designed under the direction of the Aircraft Production Board and embodying the best American ideas in combination with information from Europe regarding the best foreign designs, and made available during the early summer of 1917.

D-1. The manufacture of the Hispano-Suiza engine has been successfully developed in the United States during the past year, and certain other engines of foreign design have been likewise modified with reference to economical quantity production by American manufacturers.

D-2. An experimental study of the fundamental principles of radiator design, with particular reference to the effect of air velocity and density on the cooling capacity of various possible types of cellular construction, was undertaken in May, 1917. For the purposes of this investigation, a comprehensible experimental plant has been constructed at the Bureau of Standards and specimen radiators have been obtained from most of the manufacturers of automobile as well as aeronautic radiators. This group of specimens includes not only a wide variety of types of construction, but several series of specimens differing in one respect only, as for instance, cell length. Measurements are being made for this group of specimens of the cooling capacity, head resistance, weight, water capacity, resistance to water flow, air cell dimensions, etc.

D-3. During the present year suitable testing equipment has been installed at the Bureau of Standards for the carrying on of an extended experimental program on aircraft engine performance with special reference to high altitude conditions. The "altitude" laboratory planned for these investigations comprises the following equipment:

A reinforced concrete chamber, in which engines may be run at reduced pressures of below one-half atmosphere; a 300 horsepower dynamometer for absorbing and measuring the power output; an enhaust blower of sufficient capacity to carry off the exhaust from the engines under test and to maintain the reduced pressure in the test chamber; a refrigeration plant for cooling the intake air and the air circulation in the chamber; fans for producing circulation in the test chamber; and equipment for measuring all quantities necessary for a complete record of engine performance.

One of the Liberty engines (eight cylinder) now in place in the test chamber is being studied for the effects of altitude and fuel changes. Following this it is expected that the twelve cylinder model will be studied, then other engines, particularly those especially designed for high altitude flying, will be taken up.

D-4. The study of performance and causes of failure of spark plugs has developed a large number of parallel investigations. The causes of failure are numerous, including mechanical (accidental) breakage, cracking due to thermal expansion, gas leakage under compression, fouling with soot, or carbon deposit, and "cut-out" or short circuiting as the insulator becomes conducting at high temperatures.

The latter, while perhaps not the most common cause of failure, offered the most promise of valuable results from a laboratory investigation, hence the greater share of time has been devoted to it. Satisfactory laboratory methods have been developed for measuring and specifying the relative merits of different types of spark plugs as regards "cut-out."

Reasonably satisfactory methods for testing for gas leakage and liability to breakage from sudden heating have been developed.

Specifications for acceptance tests of spark plugs have been prepared in cooperation with the inspection section of the Signal Corps, and tests under these specifications have been carried on at the Bureau of Standards, where the spark-plug investigation is in progress. These tests include not only laboratory tests, but endurance tests in an engine.

D-5. A method of measuring vapor pressures of gasolines has been developed and the necessary equipment nearly completed. This work is now being carried on at the University of Virginia by a member of the faculty who spent the summer at the Bureau of Standards perfecting the program and building the experimental apparatus.

Work on the latent heats of fuels has only recently been undertaken at the Harvard laboratory, where space and shop facilities are available. Trial apparatus for this work is under construction, but the final design of experimental esuipment has not yet been perfected.

E. *Propellers.*—During the year an investigation has been carried out on model propellers, the results of which are given in Report No. 14. A series of model propellers selected for this investigation have been taken with a view of regular distribution among the various properties and characteristics, such as pitch, form of blade, blade width, form of blade section, etc. These tests are intended to form a basis for comparison with experiments carried on in other laboratories, and also with the system of theoretical design now in common use and first enunciated by Drzewiecki. They are also intended to serve as a basis of comparison with coefficients of the performance of full-scale propellers in order to provide much-needed information regarding the relation between model and full-scale experiments. It is a part of the program held in view to test a certain number of full-sized propellers representing a distributed selection of the model forms. The results of such tests will then serve to connect directly the model tests on the corresponding forms with full-sized tests, and, presumably, by extension the coefficients thus developed may be used for the entire series of model experiments.

A further contract has been made with Dr. W. F. Durand, to be carried out at the aerodynamic laboratory at the Leland Stanford, Jr., University, covering a large number of further investigations in the field of air-propeller performance.

F. *Form of aeroplane.*—During the year there has been carried on at the Massachusetts Institute of Technology on behalf of the committee an investigation on this subject by Prof. Alexander Kelmin, the results of which are published in Report No. 17.

A large amount of experience with full-sized machines in Europe, especially under war conditions, has contributed greatly to a better understanding of this important problem, and in particular much available information has been acquired regarding the factors involved in inherent stability.

G. *Radiotelegraphy.*—During the year the committee has carried on active work on the subject of radiotelegraphy in cooperation with various other agencies engaged in the study of this problem. The best form of generator for use on airplanes has been given careful study, and it has been developed (*a*) that 500 cycle alternating current generators, giving 1,000 sparks per second, and of an output of 500 watts can be and have been made, which will satisfy all the requirements of the Army and Navy which were imposed; (*b*) a vacuum tube oscillator for telephonic communications between aeroplanes has been developed, giving satisfactory results.

The porblem of receiving wireless signals has also been investigated and it has been established that a very efficient receiving set employing the sound method is practicable. The question of detecting and locating hostile aeroplanes or airships before they are seen, or heard by the unaided ear, has also been investigated, but without thus far fully satisfactory results.

H. *Bibliography of aeronautics.*—A bibliography of aeronautics was published by the Smithsonian Institution in 1909. The committee has well in hand the extension of this work up to January, 1917, and it will be published as soon as completed.

(To be continued.)

77 Planes Soar in Mineola Group

The greatest spectacle Mineola's aviation fields has ever witnessed was a formal inspection on the morning of September 27 by Major Gen. William L. Kenly, Director of Military Aeronautics, of "Group A" of the Reserve Wing.

Seventy-seven planes lined up in a row more than a quarter of a mile long, each pilot at attention, Gen. Kenly, in a blue De Haviland, driven by Col. C. K. Rhinehart, the Wing Commander, "taxied" up and down the long line on the ground and looked them over. There were four squadrons of eighteen machines each, and a few extra ones. Each squadron's machines were painted a distinctive color.

As he reached the end of the lines Gen. Kenly's machine took him aloft about 2,000 feet. Meanwhile all seventy-seven propellers were started whirling. Then, one after the other, the long line of "ships" took to the air. Each plane sought out its squadron mates of the same color, and then the whole fleet broke up into fighting formations of five planes to the unit, flying in V-shapes. They remained aloft about twenty minutes and then the show ended.

Travel by Aeroplane

London.—Six members of the party of American editors, who are visiting English war plants and the battle fronts as guests of the British Government, flew from England to France on September 26. They were Dr. Wheeler, of *Current Opinion;* Fred W. Kellogg, of the San Francisco *Call;* S. J. Duncan Clarke, of the Chicago *Post!* Ellery Sedgwick, of the *Atlantic Monthly;* Dr. Vanhise, president of Wisconsin University, and Charles Towne, of *McClure's Magazine.* The remainder of the party made the trip by boat.



Two Aero bombing type biplanes. (Official photo)

AEROPLANES OF THREE ALL



An American-made Caproni bombing biplane equipped with three Liberty motors



A squadron of the British Royal Air Force, with their machines, in France

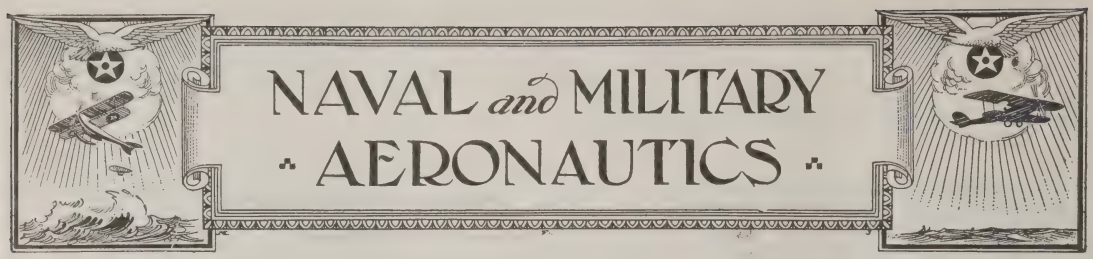
D NATIONS AND—GERMANY



In the interior of a German aircraft factory, showing the introduction of the motors into the fuselage. The photograph is one obtained from the British official sources



The machines of a French Spad squadron lined up on their aerodrome in France



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to Dayton, Ohio, Chief Prod. Eng. Dept., Dayton Savings & Trust Bldg.

Note 3—Report to Dayton, Ohio, Chief Technical Section.

Note 4—Report to Dayton, Ohio, District Mgr. Mutual Bldg.

Note 5—Report to Middletown, Conn., Gen. Supply Depot.

Note 6—Report to Middletown, Conn., Wesleyan University.

Note 7—Report to Army Balloon School, Arcadia, Cal.

Note 8—Report to Army Balloon School, Lee Hall, Va.

Note 9—Report to Balloon Detachment, Fort Munroe, Va.

Note 10—Report to Aircraft Production Depot, Buffalo, N. Y.

Note 11—Report to Aviation Repair Depot, Speedway, Indianapolis, Ind.

Note 12—Report to Capt. R. J. MacKenzie, Standard Aircraft Corp., Elizabeth, N. J.

Note 13—Report to Chemical Laboratory, Washington, D. C.

Note 14—Report to Approvals Officer, 1550 Woodward Ave., Detroit, Mich.

Note 15—Report to Students' Army Training Corps, Western Res. University, Cleveland, Ohio.

Note 16—Report to Students' Army Training Corps, Univ. of Va., Charlottesville, Va.

Note 17—Report to Students' Army Training Corps, Univ. of Minn., Minneapolis, Minn.

Note 18—Report to Students' Army Training Corps, New York University, New York, N. Y.

Note 19—Report to District Office, 480 Lexington Ave., New York, N. Y.

Note 20—Report to Balloon Detachment, West Point, Ky.

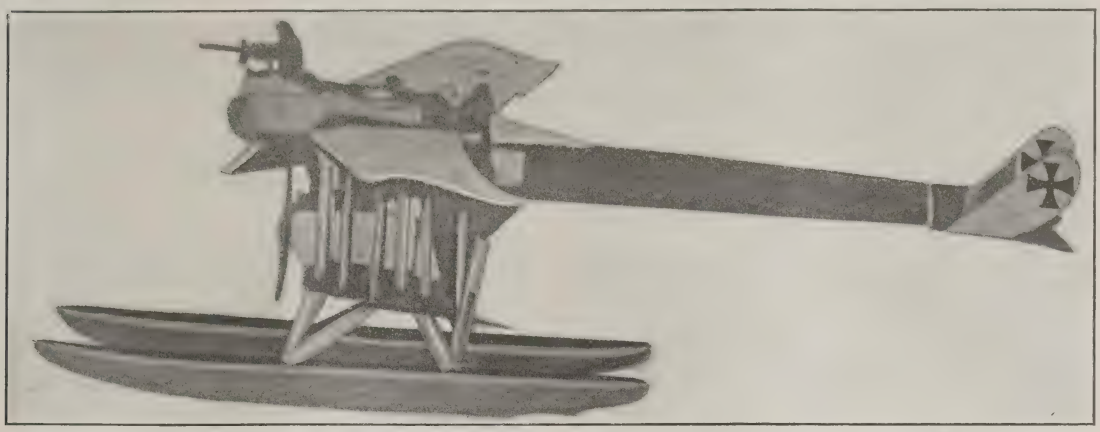
Special Orders Nos. 210-214 Inclusive

A

Alexander, James Franklin.....CPA; DAP
Alford, John Gordon.....SLA; EOT
Avery, Robert Pattison.....SLA; RSD
Atkins, James Fillmore.....SLA; KST
Alger, Edward Everett.....SLA; PFO
Ashcraft, Edward Raymond.....SLA; SMM
Adelsperger, Neal Dow.....SLA; TFT
Alpine, Arthur David.....SLA; EOT
Atkins, Charles M., 3rd.....RSD
Addington, Edward P.....SMM
Arthur, Ira W.....PFO
Albright, Oliver.....GLC
Austin, Eugene H.....HHN
Alcorn, Kent Archibald.....SLA; AAD
Akers, Claude.....WFO
Abbott, Roy Wilks.....SLA; BST
Apple, Addison A.....WFO
Alexander, Marvis L.....BST
Armentrout, Dale M.....DMA
Armstrong, Russell B.....WFO
Ashe, Clarence F.....WFO
Anderson, Edwin F.....LHV
Allen, Carl B.....TFT
Ahearn, Clarence J.....TFT
Ashley, Thomas W.....WFO

B

Baum, Charles Edwin.....SLA; CRI
Baker, John F.....DMA
Bell, Ned C.....WFO
Bower, Claire A.....SLA; KST
Bumstead, John H.....WFO
Boyce, Charles Ward.....SLA; APR
Berglund, Roscoe Lester.....SLA; UCB
Barnard, William T.....EOT
Bowen, Robert H.....EOT
Bennett, Robert K.....LHV
Bleser, Louis William.....SLA; CRI
Brooke, Leon C.....CWT
Bastian, Frederick Roth.....SLA; EOT
Burns, Kenneth.....SLA; ELA
Barrett, Alexander McC.....CPA; VBW
Brown, Nugent Ezekiel.....SLA; EOT
Berger, Carey Kingsbury.....SLA; BST
Buell, Arthur Campbell.....SLA; EOT
Burrows, Paul E.....EOT
Byerly, Frank, Jr.....EOT
Bramlette, Milton N.....EOT
Butler, Judson Rea.....SLA; EOT
Baer, George V.....FOB
Blaney, Lewis.....CPA
Brown, Charles Morris.....SLA; GLC
Bergan, Knute Washington.....SLA; GLC
Beekley, Archie Gordon.....SLA; KST
Boswell, Haden Edwards.....SLA; GLC
Boylston, Joseph Edward.....SLA; ELA
Bare, Leslie Thompson.....SLA; SMM
Baker, Quin K.....WFO
Best, Harvey George.....SLA; PMT
Barnett, Nelson D.....BST
Benson, Charles Berverley.....FLA; CUI
Benjamin, Walter E.....DMA
Barnes, Ralph Winslow.....SLA; RWT
Buehler, Fred Jacob.....SLA; GLC
Brigham, Marshall Henry.....SLA; UIU
Brown, Oscar.....CGC
Bean, Joseph H. H.....CGC
Baymiller, Clyde Chester.....SLA; CFT
Briscoe, Frank.....CPA; DAP

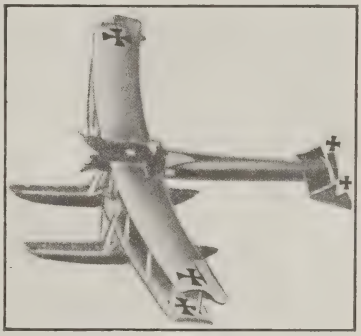


Was ist das? A German nightmare seaplane designed, apparently, to be offensive to the vision as well as the enemy. The tractor airscrew can be seen in the front of the small nacelle underneath the gunner's perch. The machine is believed to be called the "Ursinus," possibly because it was built by the motor firm of that name, and is said to have been designed by the Editor of "Flugsport"

Barnes, Earl D.....WFO
Butterworth, Benjamin F., Jr.....WFO
Bird, Emerson P.....TFT
Bowers, Eugene.....TFT
Brannum, Claude J.....TFT
Braymen, Kenneth C.....TFT
Boyle, Frank Joseph.....SLA; FOB
Bushman, Francis L.....WFO
Bonsal, Stephen, Jr.....REL; EOT
Battles, Winthrop H.....HHN
Bacon, Leonard.....SRC
Beeks, Herbert S.....SMM
Budd, Thomas G.....WFO
Buffington, James, Jr.....EOT
Baker, Robert H.....PFO
Borden, Frank Harris.....SLA; LDT
Brown, William T., Jr.....EOT
Blind, Charles Albert.....BFT
Beymer, Harold S.....WFO
Benton, Herbert E.....BST
Buckley, James W.....TFT
Burgess, Walter K.....GLC
Bennett, Thomas E.....WFO
Boggs, William G.....DMA
Bates, Lew A.....BST
Bartlett, Frank M.....CPA
Benvie, Frank W.....WFO
Butterfield, Arthur D.....MJA
Baird, Walter E.....CWT
Belknap, Clifford B.....EOT
Budd, Thomas G.....WFO
Broman, Victor.....EOT
Burnett, Hunter P.....DIK
Bidwell, Ira Monroe.....SLA; GLC
Blair, Elmer W.....CGC
Bleser, Louis W.....BFT
Butler, Lawrence O.....PFO
Burruss, George Henry.....SLA; RSD
Boggs, Paul R.....WFO
Burton, Frederick H.....CGC
Bell, Frank F.....CPA
Brones, Frank L.....WFO
Barnett, Nelson Dater.....SLA; KST
Bell, Charles F.....GLC
Butler, Morgan.....Note 2
Beverly, Efford Armona.....SLA; Note 13
Bartholomew, Robert.....Note 3

C

Chireleison, Frank.....WFO
Cunningham, John K.....DMA
Chidlaw, Carrol Hughes.....SLA; KST
Clark, Elmer Cutler.....SLA; RSD
Clements, Theron Alvord.....FLA; DAP
Carey, Francis James.....SLA; SMM
Clark, Howard Edward.....SLA; SMM
Cunningham, William Burt.....SLA; SMM
Chenoweth, Bertram W....APR; CUI; Note 1
Cleveland, Walter Eugene.....SLA; CRI
Colson, Joseph George.....SLA; GLC
Crawford, Ira Melton.....SLA; RSD
Cerruti, Frank Anthony.....FLA; DAP
Coleman, Andrew Hartwell.....SLA; ELA
Clark, Roy Ersel.....SLA; ELA
Courtney, Edward William.....SLA; ELA
Cerreta, Joseph Murray.....SLA; ELA
Culver, Rufus Burr.....SLA; KST
Cardoff, Earl Frederick.....SLA; KST
Curtis, Tobin S.....DMA
Carbery, Joseph E.....KST
Campbell, George Leroy.....SLA; RSD
Carey, Homer Frank.....SLA; PMT
Cushman, Stewart A.....EOT
Connolly, Maurice.....WFO
Cranford, Russell A.....FRF
Copenhaver, Edwin H., Jr.....CGC
Clark, John F.....DMA
Campbell, John Ray.....SLA; GLC
Clough, Oscar L.....KST
Cote, Charles L.....WFO
Clark, Harold M.....RSD
Chambers, Harold Cooke.....SLA; EOT
Clark, Carl Francis.....KST
Casey, Joseph Daniel.....SLA; SBI
Cleary, Ansel Rutherford.....SLA; GLC
Church, Warren George.....SLA; GLC
Coe, Alfred L.....FRF
Chittenden, Gerald.....UTA
Cox, Gilbert H.....SAG
Cook, Horace L.....WFO
Connell, J. Weed.....SAG
Carmody, Arthur R.....BST
Cleveland, Walter E.....WFO
Crooks, William R.....EOT
Caraway, Talmadge E.....GLC
Clark, George A.....TFT
Craig, Britt.....WFO
Craighead, Phillip B.....WFO
Clopeck, Frank.....EOT



The German Freak Seaplane viewed from another machine in the air

Coulter, Wilmer V.....WFO
Cross, Eugene H.....WFO
Cannon, Robert H.....EOT
Connell, David E.....WFO
Clarke, Frederick L.....EOT
Corkan, Dudley C.....TFT
Critz, Robert, Jr.....KST
Carr, Richard M.....GLC
Cleveland, Walter E.....WFO
Clark, William P.....BFT
Cruickshank, Bruce D.....EOT
Cocke, Dudley B.....PFO
Connelly, Robert M.....CWT
Crawford, Ira M.....GLC
Conzett, Charles Nott.....SLA; CJW
Coulter, Wilmer V.....WFO
Cross, John M.....CGC
Craighead, Philip B.....WFO
Carney, Herbert Stanton.....SLA; GLC
Caskey, Jack Pearson.....SLA; GLC

(*Continued on page* 185)



Another view of the quaint German seaplane which is faintly reminiscent of an experimental aeroplane built in the early days of the war, and called the "Sparrow"

FOREIGN NEWS

GREAT BRITAIN

On Sept. 8 the sky was overcast, and there were frequent rain storms with high wind. Our aeroplanes carried on their work for the artillery with difficulty, and also accomplished a number of reconnoissances and contact patrols. Five tons of bombs were dropped during the day.

There was no flying at night. The activity of the enemy's machines was very slight, but we brought down five and drove two down out of control. None of our machines are missing.

Owing to continued heavy rainstorms on Sept. 10, aerial observation was very difficult. In spite of a very high wind some work was accomplished during the fine intervals which occurred from time to time.

Several reconnoissances were carried out by our machines, and some photographs were taken. One of our aeroplanes failed to return.

An official statement issued September 14, describing the British aerial activities over the battle area, says:

On September 13 clouds and rain again greatly interfered with operations in the air. During the brighter interval a number of photographs were taken, and our machines made observations whenever possible for the artillery fire.

Contact patrol work had to be carried on at a very low altitude. One enemy machine was brought down in air fighting during the day and two were driven down out of control. At night two hostile night bombing machines were brought down.

Ten tons of bombs were dropped by us in the course of the twenty-four hours. All our machines employed during this period have returned.

In conjunction with the attack by the American First Army the following operations were carried out: On September 13, in addition to the bombing reported in the communique of September 13, nearly a ton of bombs were dropped on the railways at Arnaville and Metz-Sablons. Two enemy aircraft were shot down out of control.

On the night of September 13-14 attacks were carried out on the railway at Courcelles, but owing to the weather results were difficult to observe.

On September 14 the railway at Metz-Sablons and Ehrang and the Buhl aerodrome were attacked with good results. Three direct hits were obtained on the railway at Ehrang and one on a shed at the Buhl aerodrome. Nearly six and one-half tons of bombs were dropped during the day and night. One of our machines is missing.

The statement of September 15 says:

On the battle front, in addition to the bombing reported in yesterday's communique, the following bombing operations were carried out:

Two further attacks were made on Metz-Sablons in the late afternoon and many direct hits were obtained on the railway triangle, on the workshops, the gas works and the barracks. The Buhl aerodrome was also attacked with good results.

Heavy attacks were kept up throughout the night of September 14-15 on Metz-Sablons, Courcelles, Ehrange, Sarbrucken, Kaiserslautern and the aerodromes at Frescaty and Boulay. Many direct hits were obtained on the railway, especially at Metz-Sablons and Courcelles, and several fires were started at Metz, Kaiserslautern, the Saarbrucken station, and the Frescaty aerodrome. Three of our machines failed to return.

This morning the railway triangle at Metz-Sablons was again attacked and many direct hits were obtained. Enemy scouts were active. Bombs were also dropped on the Buhl aerodrome. Three of our machines are missing.

The Daimler Works at Stuttgart were also attacked with good results. During this raid twenty enemy aircraft were encountered and two were destroyed. Our machines all returned safely.

The total weight of bombs dropped during the twenty-four hours was more than twenty-seven tons.

On September 14 the enemy aircraft showed more activity on some parts of the British front than for several days past. In air fighting four hostile machines were destroyed. In addition, two enemy two-seaters were burned on the ground in the course of a successful attack carried out by our airmen from a very low height upon an aerodrome south of Lille. Four German balloons were shot down in flames. Two of our machines are missing.

A good deal of photography and artillery observation work was accomplished, together with a number of contact patrols.

Twenty-one German towns have been bombed by the British independent air force during the month of August. The objectives were railway stations, chemical and other factories and blast furnaces, and the towns included Frankfort, Mannheim, Metz-Sablons, Saarbruck, Thionville, three times each; Burbach, Coblenz, Cologne, Darmstadt, Karlsruhe, Luxembourg, Offenburg and Treves.

The total weight of bombs dropped in these raids was more than 100 tons.

During the last three months the independent air force has made 249 aerial raids over German territory. The extensive damage done has been confirmed by photographs in many cases. The German territory thus brought definitely into the war zone represents a belt in the Rhine Valley approximately 250 miles in length.

On September 15, with the improving weather, there was a marked increase of aerial activity. Enemy machines were encountered in large formations on the German side of the line and there were many combats.

Twenty-nine hostile aeroplanes were destroyed in the air fighting during the day and seven were driven down out of control. In addition, a large enemy night bombing machine was brought down after dark. Sixteen of our machines are missing, including two night flying aeroplanes.

Four enemy aerodromes were successfully attacked and heavily bombed, one by day and three by night. During the twenty-four hours thirty tons of bombs were dropped by us.

Our balloons took advantage of the clear atmosphere to send down many useful observations, and our aeroplanes engaged in reconnaissance, photography and observation for artillery fire carried out much valuable work.

On the battle front on the night of September 15-16 four hostile aerodromes were heavily and repeatedly attacked by our machines with excellent results. Four fires were started, three hostile machines on the ground were wrecked, two hangars were completely demolished and sveral more hangars received direct hits. A transport convoy was hit four times.

The railways at Metz-Sablons were again bombed and a fire started. The railway junctions at Mainz and the sidings at Karlsruhe were successfully attacked.

Very good results were observed on both targets, and at Karlsruhe, where three and a half tons of bombs were dropped, seventeen direct hits were obtained. During the night 350 bombs, totalling sixteen and a half tons in weight, were dropped.

All of our machines returned.

There was great aerial activity all along the British front September 16 and our machines were busily engaged in every department of their work. Photographic reconnaissances, both of forward and distant areas, were carried out with great completeness in spite of strong opposition, and the number of aerial photographs taken exceeds any previously recorded total for one day.

Nearly twenty-four tons of bombs were dropped by day, and fifteen tons the following night, on aerodromes used by the enemy's night flying aeroplanes and on railheads and dumps.

The fighting was intense all along the front throughout the day, combats taking place a considerable distance east of the lines. Forty-five hostile machines were brought down by our airmen. Of these, seven were brought down in one fight by one of our squadrons. Twenty other German machines were driven down out of control. In addition, one hostile aeroplane was shot down by our anti-aircraft guns. One hostile balloon was destroyed.

Sixteen of our machines are missing.

On the afternoon of September 16 our squadrons made two separate attacks on the aeroplane works and chemical factory at Mannheim with excellent results. The enemy attacked our machines over the objectives. Three of our machines are missing.

A German home defence aerodrome at Hagenau was attacked by a squadron and bursts were observed on and near the hangars. One hangar was seen in flames. All our machines returned.

Last night our machines attacked three hostile aerodromes with bombs and machine-gun fire. Good results were obtained.

The railways at Metz-Sablons and Treves were very heavily attacked and three fires were started at Metz-Sablons. Bombs were dropped all around the Treves station. The station at Frankfort was also heavily attacked and bombs were dropped with good effect.

Sixty tons of bombs have been dropped in the last three days.

The official report for September 18 says:

"During the last forty-eight hours Royal Air Force contingents working with the navy have dropped thirteen tons of bombs on the docks at Bruges and on the Maria Alter aerodrome. Eleven enemy machines and a kite balloon were destroyed, and seven machines driven down out of control. Four of our machines are missing.

"A formation of five enemy seaplanes approaching the east coast was met and engaged by two seaplanes and two aeroplanes. One German machine was destroyed, the others retiring eastward."

After their heavy losses on the previous day enemy aircraft were less active yesterday. The weather on the British front was fine, with a strong wind.

Our machines were at work all day carrying out reconnaissances and photography far behind the German lines; observing and reporting the effect of our artillery fire and bombing enemy aerodromes, ammunition dumps and other selected targets. Eleven hostile machines were destroyed and five others driven down out of control. Ten of our machines are missing.

At night we heavily bombed three German aerodromes, where squadrons working in the battle area are located. Three hostile night-bombing machines which came over our line were detected by our searchlight, attacked from the air, and brought down. One of our night-flying aeroplanes is missing. The total weight of bombs dropped by us during the twenty-four hours was twenty-nine and a half tons.

Field Marshall Haig gave out the following on September 19:

"Yesterday the enemy aircraft activity was slight. Four hostile planes were brought down and three others were driven down out of control. Four of our machines are missing.

"Our planes kept in touch with the advancing troops and assisted in the attack of bombing and with machine-gun fire, as well as by reporting many targets to the artillery. During the twenty-four hours sixteen tons of bombs were dropped."

ITALY

A squadron of bombing machines dropped several tons of bombs on the Navy Yard of Pola with very good results on September 20. Two enemy aeroplanes were brought down and three others forced to land out of control.

Major Gabriele D'Annunzio, at the head of the pilots who made the raid on Vienna, was presented by King Victor Emanuel, the High Decoration of "Officer of the Military Order Savoy." A dozen of the British pilots on the Italian front received the Italian silver medal for valor.

After the ceremony there was the largest review yet held of the Italian Flying Corps.

The aerial activity of September 22-24 was handicapped by the bad weather prevailing on the whole front; nevertheless, three enemy aeroplanes were brought down by our pursuit machines.

Major Gabriele D'Annunzio, starting from the Italian front on September 26, flew to Paris, crossing the Alps. It is understood that he will take charge of a very important project.

The official statement issued by the War Office on Sept. 20 says: "Our aviators bombed Pola."

GERMANY

The German official statement says:

"Lieut. Buechner achieved his thirtieth aerial victory.

"On Sept. 23rd Lieut. Rumey gained his forty-first aerial victory."

This statement says that seventy-nine persons were killed and 113 injured during the allied air raids.

The statement of Sept. 26th says:

"Seven aeroplanes were shot down out of enemy squadrons which attacked Frankfort-on-Main and Kaiserlautern."



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

(Construction of a 20-Foot Glider)

THE glider about to be described is for use in getting our first feeling of real flying. Of course the speed will not be as great as would be attained by a powered aeroplane, but it is much the same as the rolling chair used by infants in learning to walk. It leaves the ground but stays at a safe distance and moves so slowly that if an accident should occur, the striking impact would not be great and nothing other than a little shaking up would result.

To fly a glider, the operator can select one of two methods. One is to select some piece of ground a little higher than the surrounding country, face into the wind, run and cast off at the edge of the rise of ground, the glider will then carry you to a distance of about 200 or 300 feet, according to the skill of the operator.

The other method is to fasten ropes to the end of each wing and have it towed by a few men or a motorcycle. This method must not be attempted until the operator has practiced the other style, because there is danger of the motorcycle towing too fast with the result that the glider will shoot high in the air and the operator not knowing how to right it, it will come crashing to the ground with perhaps fatal results.

We will take up the operation of a glider fully in a later article.

The glider is made up mainly of spruce of different sizes and thicknesses, which can be purchased cut to the desired sizes at any lumber yard. Of course the finishing work can be easily done by the builder. I don't think it necessary to warn the reader to be more careful when constructing or assembling the different parts, then when building the small models, because we know that this machine is to carry the operator and must be made strong, as well as light as possible. The glider should not weigh more than eighty pounds.

The construction of the wings are somewhat similar to our double surfaced model wings. The main spars are made of spruce 2½" x 1½" and 25 feet 11 inches long. It will not be possible to get a piece of lumber of this length without knots or flaws, so it is necessary to piece it and wrap the joints as shown in the front view of the spar shown below the wings. If the builder is fortunate enough to secure lumber 13 feet long the glider can be made in two halves oarting the middle and joined by a fitting made of heavy gauge sheet iron as shown at the left of the cut.

If this method is employed, the center rib in the wing must be omitted and this part will remain uncovered when the glider is finished. Cross section of the front and rear spars are shown in figures to the right of the wings.

The ribs are made of two strips of spruce ½" x 3/16" and 5 feet 1½" square are glued and nailed between the ribs to hold the strips in shape and to reinforce them.

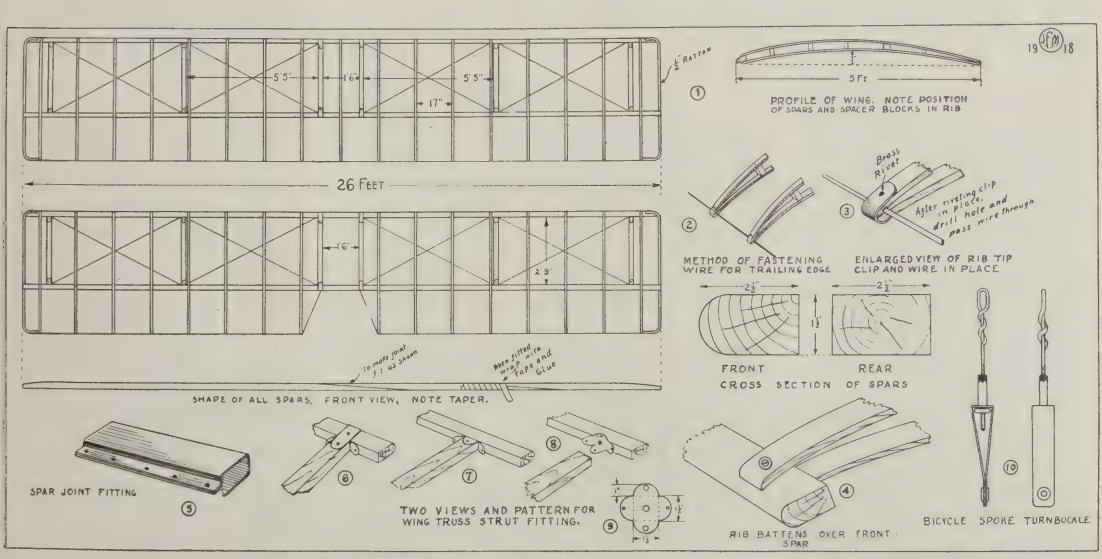
All ribs should be made before fastening to the spars. When making the ribs, a piece of lumber 2" thick should be cut to the shape of the bottom strip. This is done by drawing a line horizontally and then measuring a distance of 3" from this line. A curve should then be made starting and ending at each end of the line and reaching the height of 3". The lumber is then sawed along this curve, which leaves a mould to work on.

To make the ribs, lay one strip of wood on the mould with the convex side, nail and glue the blocks in place, then lay this part of the rib on the concave side and nail the other strip to the blocks. When all ribs are made, slide them on the rear spar to the proper places and fasten in place. The front spar is then fastened to the front edges of the ribs.

To strengthen the wing it must be reinforced by a sort of bridge truss arrangement. It is then necessary to put struts 1½" square between the spars to take the compression when the wires are tightened. The method of fastening the struts and a pattern for the strut fastening is shown in Figures 7, 8 and 9. The plate is fastened to the spars first, by a 1" wood screw, the top and bottom tongues are then bent out and the strut fastened in place by a 3/16" bolt. The other two tongues are left for fastening the truss wires in place. The truss wire is 16 gauge piano wire. (The strut shown in Fig. 6, is reinforced by another strap around the spars and fastened to the strut. This is done to the four struts in the center of the machine, because these members must take the full weight of the operator in flight.)

To tighten the wires, it is necessary to have some kind of an arrangement to take up the slack. This can be done by making turnbuckles from ordinary bicycle spokes and a strip of 16 gauge sheet metal. The turnbuckle is made as shown in Figure 10. When trussed properly the ends can be put in place. These are made of ⅛" round ratton fastened to the front spar, bent to a convenient curve, fastened to the rear spar and then fastened to the end rib after bending at right angles. When this is finished the trailing edge is fastened in place. This consists of piano wire running through each rib at the rear tip as shown in Figures 2 and 3.

(To be Continued)





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Intelligent Female (to balloon officer of observation sausage): I wonder you don't have a ladder or a fire escape or something of that sort, instead of just having that rope to climb up and down."

Aerodrome Proverbs

It's the last bump that breaks the chassis strut.
A switch off in time saves nine days in the repair shop.

Absent without Leave

Mess President: "Cook that dinner today on the new gasoline stove, Johnson."
Johnson: "Well, sir, I begun to, but it went out."
M. P.: Well, light it again."
Johnson: "Yes, sir, but it's not back yet. It went out through the roof."

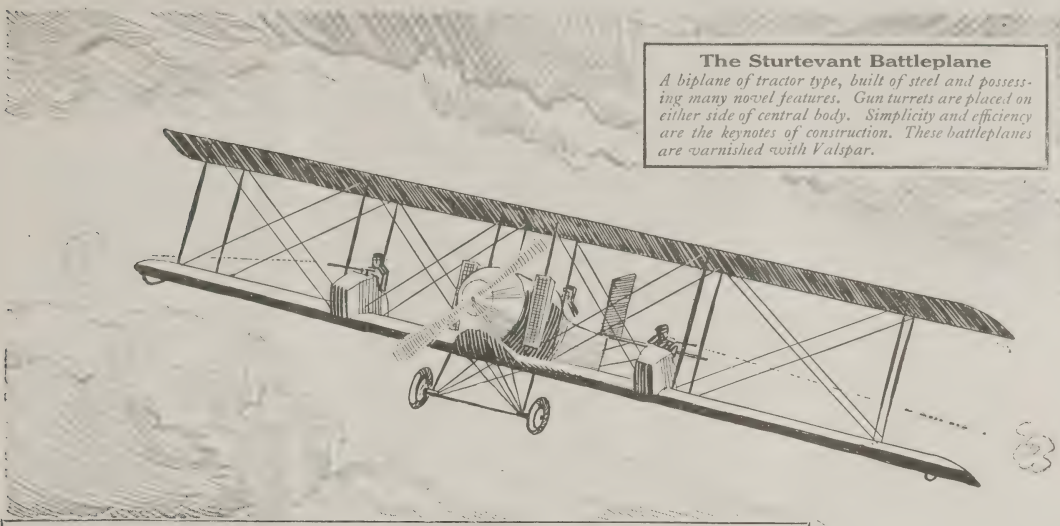


And, yea, it
Hath been said
By them of
Frequent times
That forgiveness,
Like garters,
Loose their snap
When they are
Stretched
Too far.
A mother-in-law's
Womanly dignity
Is a thing for
Angels and
Cadets to titter

Lazy Lines
By Lynn

Over in the
Vhrees of Life
* * *
The war was over
& as I kissed
Me wife good-bye
After doing 10
Hours nightshirt
Fatigue totin'
The twins back and
Fro I sorta felt
Like going on sick
Report me self,
But the ol' lady
Pestered me mighty
To see if her
Ration returns wus
In at the corner
Grocery and also
About gettin' a new
Issue of summer
Unions for the
The triplets.
* * *
I had a busy day
Of it and knocked off
Too late to reach
The shack for chow
So I figured I
Might as well make
A night of
It with some of the
Birds and other
Fowls.
* * *
When I got home the
Top Cutter-me
Mother-in-law gave
Me almighty hell
On three charges:
Missing evening
Retreat, being out
In town without
Pass and not
Answering "Heah"
At inspection.
She talked putty
Rough and gave
Me fo' days provost
& confined to
Quarters for a like
Period.
* * *
As reveille blew
I woke up in
A sweat—'twas only
A dream and
The Ramblings of an
Idle Brain, as
Sayeth the Poets
& Poetesses.
Thank Hannah! I was
In my upper bunk
In peaceful ol'
France with
Only the noise of
The cannon and
Other aviation field
Equipment to
Annoy me!

—*Exchange*



The Sturtevant Battleplane
A biplane of tractor type, built of steel and possessing many novel features. Gun turrets are placed on either side of central body. Simplicity and efficiency are the keynotes of construction. These battleplanes are varnished with Valspar.

Valspar protects battleplanes—

For many years Valspar has been the most famous varnish for yachts, ships and boats of all kinds.

Its tough elasticity, its resistance to water, sun, atmospheric and climatic changes, have been amply proved by these years of actual every-day testing in all weathers.

More recently it has been demonstrating these qualities in the still more strenuous air-service of the Allied governments. Today it is unquestionably the standard varnish for both airplanes and seaplanes. Its supremacy is definitely established in both arms of the service.

Because Valspar is a long-oil varnish, of exceptional durability and waterproofness, it protects wood, metal or fabric without checking, cracking, blistering or turning white. It is absolutely reliable under the most exacting conditions, where ordinary varnish would fail entirely.

To purchasing agents and superintendents of production, we will gladly send a copy of our new book, full of valuable information on airplane finishing. Our Airplane Department is also ready to afford any desired information or assistance on request.

VALENTINE & COMPANY, 456 Fourth Avenue, N. Y.

Largest Manufacturers of High-grade Varnishes in the World—ESTABLISHED 1832

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W. P. FULLER & CO., Agents for the Pacific Coast: San Francisco and Principal Pacific Coast Cities

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VALENTINE'S
VALSPAR
The Varnish That Won't Turn White

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AERONAUTICAL EQUIPMENT, INC.

ISRAEL LUDLOW, *President*

MILL AND MANUFACTURERS' AGENT

TELEPHONE 1344 RECTOR

EXPORT IMPORT

33 WEST 42d STREET NEW YORK, N. Y.

WE SPECIALIZE

3 ply, 5 ply, 9 ply and 15 ply, birch, mahogany, walnut and red gum waterproof veneers. Our products have officially passed Government test of boiling of twenty-four hours and baking twenty-four hours. Capacity 30,000 square feet daily. In an official Government report on sample three and five ply panels submitted by us for test, it was stated—

> **"Boiling tests and salt water soaking tests as follows were made on each specimen: Specimens were boiled for 8 hours, then baked for 24 hours at 100 deg. C.; specimens were soaked in salt water (4% salt by weight) at room temperature for 24 hours and then baked for 24 hours at 100 deg. C.**
>
> **"Results:—The glue held firmly in all tests. Neither the boiling nor the salt water soaking tests caused any indications of separations of the plies of the veneers tested."**
>
> **Dated, March 30th, 1918.**

Laminated wing beams of spruce. We have under contract a supply of aeroplane spruce and could undertake to manufacture 50 sets of 8 wing-beams daily. In an official Government report on a sample wing-beam section submitted by us for test, it was stated —

> **"Conclusion:—These beams carried a much greater transverse load than solid wood beams of the same material and section. The glue joints between web and flanges are stronger in shear than the web section, and the glue had fairly good waterproof qualities. These beams show the superiority of the laminated construction over the solid construction as to strength and great saving in material."**
>
> **Dated, March 11th, 1918.**

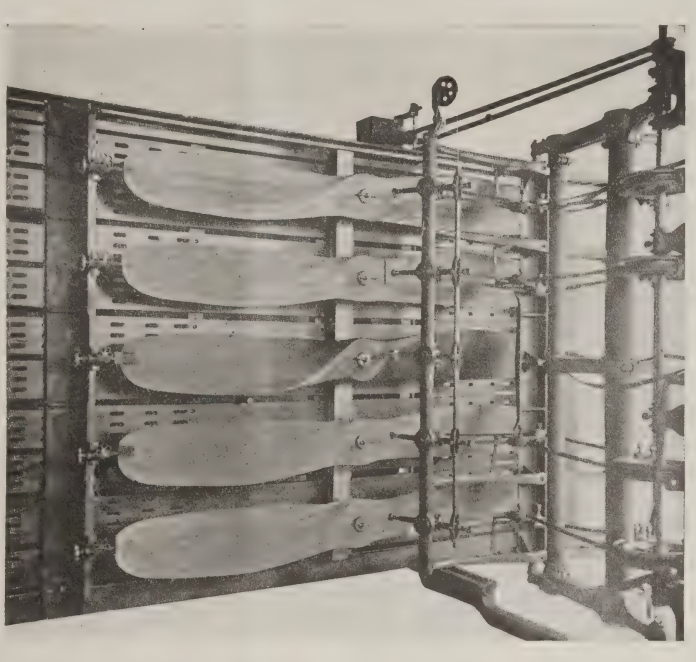
We offer single ply birch, maple, walnut, mahogany and red gum in sizes cut to order.

SHIPPER IN CAR LOTS OF

Spruce, Ash, Oak, Birch, Cherry and other manufactured aeroplane lumber.

IMPORTER OF CLAUDEL CARBURETORS

The Curtis Dreadnaught Propeller Cutting Machine, Model 55



THIS machine cuts four blades at a time, and cuts closer and more accurate than any other machine in the market.

It finishes the hub the same as all other parts of the blade.

It cuts with the grain of the wood.

It does not require a metal model; just a regular stock blade is sufficient.

It does not bump over the pattern.

It is manually operated, which gives it the advantage of the human touch required on accurate work.

The hand work required after this machine is from 3½ to 4½ hours on each blade.

It leaves just enough wood for cleaning up.

Curtis Machine Corp.
Jamestown, N. Y.

(*Continued from page 179*)

Chiles, Chester A.....CWT
Cate, Theodore W.....BST
Chisolm, Henry.....EOT

D

Duchac, Carl Oliver.....SLA; LDT
Dulin, Garrettson.....SLA; MAC
Duffus, William Clare.....SLA; DAP
de Gozzaldi, Richard Silvie.....SLA; LDT
Day, Olin Lincoln.....SLA; RSD
Doane, John Haynie.....SLA; LDT
Dreyer, Walter.....FLA; UCB
Durar, George H.....EOT
Dunn, Thomas F.....SMM
Dunn, Stanley M.....PFO
Duke, Daniel F.....TFT
Denison, George K.....TFT
Denny, Hugh R.....FRF
Duvall, Easton William.....SLA; SMM
Dupre, Naason K.....BST
Donaldson, Harold R.....BST
Davidson, Robert M.....TFT
Dean, Alexander.....SLA; CUT
Dickens, George R.....WFO
Dean, Thomas Jefferson, Jr.....SLA; EOT
Dinger, Jean T.....DMA
Denham, Louis Bradford.....SLA; EOT
DeLamatre, Harry Clayton.....SLA; CJW
DeLin, Martin.....EOT
Douthitt, Laidley Ellis.....SLA; KST
Dawson, John Charles.....SLA; KST
Davis, Homer H.....WFO
Davis, Frank Thomas.....SLA; FOB
Drake, George H.....EOT
Dahl, Newton Arnold.....SLA; ELA
Dougherty, Gordon W.....EOT
Downey, James F.....WFO
Dale, Russell C.....BFT
Dick, Guy H.....WFO
Day, Paul Lyon.....SLA; GLC
Davis, Harry Bascom, Jr.....SLA; RSD
De Vore, Ralph R.....CWT
Delaney, John J.....CGC
Dungan, Edmond D.....CGC
Dufield, Leroy B.....TFT
Dimmick, Harold E.....GLC
Davis, Harris E.....WFO
Davis, Guy H.....EOT
Duffield, John.....SLA; KST
Dugliss, Malcolm.....EOT
Doyle, Frank Butler.....SLA; EOT
Downey, James F.....WFO
Dobson, Matt H.....CGC
Doherty, George D.....GLC
Davidson, William G.....BST
Davis, Leland W.....EOT

E

Emmons, Claude Edward.....FLA; DMA
Eldredge, Windsor.....SLA; CGC
Ernst, Norman C.....WFO
Eickenberg, Philip.....SLA; DAF (2)
Evans, Dean Peoples.....SLA; TFT
Ewell, Thomas J.....TFT
Erney, Frederick G.....CWT
Eaton, Charles F.....ASM
Evans, Floyd W.....TFT
Evans, George Elwood.....SLA; RSD
English, Frank J.....WFO
Earl, Kenneth A.....WFO
Emmons, Bernard W.....DMA
Elliott, Lawrence M.....UIU
Evleth, Raymond Earle.....SLA; LDT
Evans, Christopher C.....GLC
Everett, Roberts.....EOT
Elliott, Clyde Robert.....SLA; ELA
Ettenger, Edwin L.....LHV
Earl, Kenneth A.....WFO
Emig, Howard Abraham.....FLA
Ely, Newell D.....BST
Ewan, Charles V.....BFT
Ehlers, George W.....WFO
Eldridge, Earl W.....CGC

F

Fulke, Frank L.....GLC
Frith, Edwin H.....KST
Flather, William James, Jr.....FLA
Fenwick, Herbert F.....EOT
Foss, Alden S.....EOT
Friedlander, Harold H.....EOT
Fechet, James E....DMA; KST; WDM; Note 1
French, Leigh H.....DAP
Faucher, Joseph Augustine.....SLA; KST
Frank, Walter H.....JMA
Frees, Arthur Lee.....FLA; BST
Frew, Ralph Charters.....SLA; SMM
Freydig, Paul E.....RSD
Ferguson, Earl Leo.....SLA; TFT
Fitzpatrick, Francis E.....CGC
Farrell, John B.....TFT
Flinn, Earle F.....TFT
Forrest, Robert P.....WFO
Fleet, Reuben H.....WFO
Fillot, Alexander M.....CGC
Farley, Bernard Francis.....SLA; KST
French, Seth T.....CWT
Frothingham, Newton S.....HHN
Farris, William C.....BST
Fay, Wallace M.....TFT
Fisher, Robert L.....WFO
Finsterwald, Verne Harrison.....SLA; LDT
Forward, DeWitt Arthur.....SLA; CRI
Forsyth, Ralph Ernest.....SLA; ELA
Freear, Hiriam Lamar.....SLA; ELA
Foster, William C.....SMM
French, Donald A.....EOT
Frelinghuysen, Frederick T.....FLA

G

Goodenough, Lewis Eldridge.....SLA; ELA
Gregory, Joseph Van Clief.....SLA; LDT
Gifford, John.....SLA; KST
Gardner, Thomas Adrian.....SLA; KST
George, George B.....KST
Garrett, John W.....SMM
Gardener, Allen Wynand.....FLA; VBW
Guillaudeu, Dudley.....REL; DMA
Gilson, Fred Edward.....SLA; KST
Greene, Oscar Kendrick.....SLA; UTA
Guilford, Edward Higley.....FLA; DMA
Green, Leroy Seeman.....SLA; PFO
Green, Gerald R.....WFO
Guenther, Karl D.....BST
Gasaway, Kenneth.....WFO
Graham, Charles, Jr.....TFT
Garwood, Sterling M.....CGC
Goodwin, Grover.....CGC
Greer, Jack.....CGC
Glover, James E.....TFT
Guppy, George.....SAG
Grafa, Clare.....CWT
Grethen, John P.....WFO
Gallagher, Robert T.....WFO
Goddard, George W.....LHV
Gillespie, Franklin S.....CGC
Grieb, Clarke.....FLA
Garman, Ray Lin.....SLA; GLC
Goss, Edgar K.....BST
Gardner, James E.....EOT

H

Hopkins, Julian B.....HHN
Hagan, Thomas Henry.....SLA; EOT
Hewes, Harry Philips.....FLA; DAP
Hart, Howard M.....FRF
Heptig, William August.....SLA; LDT
Hunter, John Ackley.....SLA; PMT
Hamilton, Jack.....CPA; VBW
Harper, Floyd Kenneth.....SLA; SAG
Holmes, Wayne M.....WFO
Holbrook, Sidney Walace.....SLA; LDT
Harvey, Robert B.....TFT
Hogue, Mark C.....TFT
Hintz, John Emil.....CPA; VBW
Howell, James Clancy.....SLA; EOT
High, Lennie Leroy.....SLA; LDT
Handy, John C.....PFO
Henry, Robert Lee.....SLA; SAG
Hathaway, Mortimer Delano.....SLA; AAD
Harold, Eugene L.....WFO
Howard, John C.....WFO
Hanlon, William J.....TFT
Henderson, Elmer J.....TFT
Hillhouse, John G.....TFT
Herrink, Louis Shepard.....SLA; SMM

Hosack, Carl Irving....SLA; SMM
Hasford, Carl Boyce....SLA; SMM
Hudkins, Edgar Fernando....SLA; SMM
Hopkins, Andrew Simpson....SLA; EOT
Harding, William K., Jr....CWT
Hastings, Edward R., Jr....CWT
Haworth, George W....CWT
Holborn, Clarence E....CWT
House, Edwin J....RTR
Harvey, William, Jr....CPA
Hamer, Bert L....WFO
Hooker, Roger Wolcott....SLA; TMA
Hezlett, Edward Harold....SLA; TFT
Harley, Wilbur H....TFT
Hart, Elwood Neal....OSU
Harrington, Henry G....LHV
Hockett, Rowland R....LHV
Hill, Thomas Russell....SLA; CUI
Hanisch, Arthur Oscar....SLA; PMT
Harvey, Harold W....WFO
Huntley, James W....CGC
Hibben, Robert C....CGC
Higgins, Walter Jefferson....SLA; EOT
Hall, Theodore E....BST
Hopkins, Thomas, Jr....WFO
Hall, Norman S....TFT
Holden, Harlan W....HHN
Hayes, Martin J....BST
Hayes, Benjamin H....TFT
Hutterly, Andrew J....LHV
Horton, Elwood....EOT
Hahn, Emanual....BST
Hamer, Edward B....BST
Helstrom, Roy L....DMA
Hunter, Harold McKnight....SLA; TMA
Houghton, Frank C....EOT
Horine, Merrill C....SAG
Hickman, Horace M....DAF
Harris, Dale A....WFO
Hawley, Walter J....EOT
Hart, Joseph L....WFO
Hamlin, Charles E....WFO
Hill, Maurice B....WFO
Henn, John E....WFO
Harris, Dale A....WFO
Halloran, Earl T....TFT
Heyden, Arthur L....TFT
Hall, Howard A....EOT
Harrell, Benjamin F....WFO
Haldeman, George W....WFO
Hooker, Roger W....BST
Horsley, Robert S....WFO
Harvey, Harold M....SMM
Haseltine, Emery....WFO
Horst, John R....WFO
Hyden, Victor M....GLC
Hauck, Cornelius J....EOT
Haigh, Devereux Smith....SLA; GLC
Hanrahan, John Joseph....SLA; GLC
Howeth, Woodfin G....BST
Haight, Samuel....GLC
Hubbell, Harry L....BST
Hulbert, Lucius Gaylord....SLA; TFT
Hoyt, William King....SLA; KST
Hartt, Obder R....CWT
Herr, Harry S....SLA; TFT
Huston, Sylvester....CGC
Haseltine, Emery....WFO

I

Illges, Abraham....LHV
Ivy, Fountain Turbiville....SLA; BST
Ives, Howard Caler....SLA; SMM
Israel, Gerald H....EOT
Irwin, John R....GLC
Ihrig, Howard K....LHV

J

Johnson, Olin Samuel....SLA; TFT
Jenkins, Ned W....TFT
Jones, Vivian M....TFT
Johnson, Emil Raymond....SLA; LHV
Johnson, Charles C....HHN
Jones, James Elliott....SLA; SAG
Jenison, Austin....SLA; AAD
Jones, Edward Paul....SLA; ELA
Jaynes, John B....LHV
Jacobus, Charles R....FLA
Jarratt, Charles R....PWM
Jones, Charles E., Jr....TFT
Johnson, Joe D....PFO
Johnston, Joseph T....WFO
Johnson, Paul O....BST
Jackson, Roger W....WFO
Jones, Kenneth H....BST
Jackson, John W....EOT
Johnson, Raymond C....CGC
Johnson, Frederick Andrew....SLA; SAG
James, Edward D....WFO

K

Kilgore, Edward W....CAF
Kouns, Lewis Albert....SLA; RSD
Kitchen, Benjamin F....WFO
Kilcline, William Francis....SLA; EOT
Kinnard, Albert William....SLA; SAG
Kelly, Gerald Vincent....SLA; SAG
Karigan, Stephen E....ALF
Kann, Emil A....SLA; DIK
Klotz, Harry John....SLA; UIU
Kittinger, Charles Chase....SLA; RWT
Kratky, Alfred Henry....SLA; TFT
Kearney, John J....TFT
Killorin, George W., Jr....TFT
Kline, Lawrence Joseph....SLA; EOT
Kintzing, Edward O....LHV
Krause, James W....LHV; DAF; Note 1
Kennedy, Robert E....BST
Kerr, William L....EOT
Kalis, Samuel A....PWM
Knight, Hebert G....UTA
Keck, Ray Marvin....FLA; UTA
Kelleher, Melvin B....HHN
Knopf, Lafayette....FLA; RWT
Keck, John H....CGC
Keith, Edward....CGC
Kraeckmann, Walter L....EOT
Kern, Ralph Donald....SLA; EOT
Koch, John Frederic....SLA; TFT
Kennedy, James E....CGC
Kirkpatrick, Everett L....LHV
Keightley, George M....GLC
King, Gloise A....CGC
Kinnard, Albert W....WFO
Kendrick, Aaron T....DIK
Knott, James E., Jr....EOT
Kirby, Grady....CGC
Kelly, Roland D....EOT
Krieger, Robert Jacob....SLA; TFT

L

Lyon, William Lewis....SLA; KST
Laycock, Joseph Greenwood....SLA; CJW
Long, Leonard F....DAF
Lalley, Walter R....WFO
LaPrade, Ernest M....DMA
Leeman, Franklin N....UCB
Lane, David Warren....SLA; EOT
Lyon, Edwin B., Jr....CAF
Loud, Lingard....SLA; ELA
Lestrade, Harold J....FRF
Lea, William Montgomery....SLA; ELA
Lemah, Edward Austin....SLA; RWT
Leenhouts, William John....SLA; PWM
Lloyd, William Folwell....DAP
Lawlor, William Charles....SLA; WDM
Lee, George F....DMA
Leonard, J. Cecil Leonard....DMA
Leonard, Leonard R....WFO
Lowell, Robert H. W....WFO
Leigh, Kenneth G....WFO
Law, Sidney F....CWT
Lovrien, Ned Royal....SLA; TFT
Longinotti, James L....CGC
Ladd, Arthur K....PFO
Latta, Franklin W....TFT
Lavene, Clayton C....EOT
Lee, John F., Jr....TFT
Loucks, Edwin Earle....SLA; EOT
Lloyd, Milton D....BFT

M

Mahr, Ralph Edward....SLA; KST
Moore, William Stewart....SLA; SAG
Meredith, Clive Burlingame....SLA
Miller, Ernest Ludwig....SLA; RSD
Mallers, John B....WFO
Muncie, Floyd H....WFO
Moore, Walter F....FRF
Morrissey, Edward James....SLA; SBI
Meng, Paul Henry....SLA; RSD
Main, James Birss....SLA; LDT
Munson, Charles Countcil....FLA; WDM
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Matthiessen, Frederick William....SLA; DAF
Mills, Thornton Anthony....MJA; VBW
Means, Gardiner G....EOT
Marrs, Aubrey R....EOT
Marlier, Raymond Murray....SLA; SAG
Martin, Leo C....HHN
Mitchell, Robert Lee....SLA; SAG
Miller, Walter....CAF
Moretti, Louis Ramon....SLA; RSD
Mills, Pittman Wall....SLA; BST
Marrs, Theodore C....TFT
Merrill, George R., Jr....CGC
Mills, Raymond T....CGC
Murray, Harry E....CGC
Moran, William K....WFO
Martin, William T....LHV
Moffatt, James....SLA; KST
Momeyer, Kenneth....DAP
Mayers, Howard Winfield....SLA; GLC
Mansfield, Edward Garrette....SLA; EOT
Manning, Robert....SLA; FOB
Mason, Hoelzle....SLA; GLC
Merriam, Robert Clizbe....SLA; RSD
Mayl, James Ellis....SLA; KST
Magovern, John Edward....SLA; EOT
Moore, Maurice H....LHV
Meyer, Frank W....WFO
Morse, Arnold Stetson....SLA; GLC
Mayfield, Mercer Brown....FLA
Martin, Dan Curtis....SLA; GLC
Mott, Louis C....EOT
Murray, Rudolph Charles....SLA; RSD
Mossbach, Robert E....EOT
Middleton, Ellis S....EOT
Murnen, George J....EOT
Monett, Howard B....BST
Marlier, Raymond M....WFO
Murphy, Fred M....CPA
Mooers, Clifford....PFO
Mitchell, Eliot W....TFT
Marr, Kenneth....MJA
Murphy, Harry J....WFO
Morgan, John Ross....SLA; ELA
Miller, Arthur John....SLA; ELA
Mullen, Michael C....WFO
Miller, William A. C....MJA
Mills, Pittman W....WFO
Marks, Allan D....WFO
Moore, Joseph J....EOT
Miller, Royal M....CGC
Miller, Colin U....CWT
Moran, John A....TFT
Murphy, Harry J....WFO
Moraga, Eugene Winslow....SLA; LDT
McDonald, Alexander Dee....FLA; VBW
MacDonald, John A....SBI
McKeena, Raymond Francis....SLA; TMA
McLeod, Jennings D....DMA
McKinstry, Augustus T....WFO
McCormack, Robert DeHuff....SLA; RSD
McLafferty, George Hoagland....SLA; FOB
McLaughlin, Edward Joseph, Jr....SLA; SAG
McKnight, James A....LHV
McKee, George Paul....SLA; TFT
MacKay, Charles H....TFT
McRae, John....WFO
McArthur, Emmett K....Note 7
McCoy, John F....Note 3
McCully, Coleman C....GLC
McAneney, Earl R....PWM
McChesney, Frank William....CPA
McFetridge, John F....TMA
McDaniel, Marshall Alexander....SLA; EOT
McCormick, Alexander Little....SLA; GLC
McMahon, Michael J....Note 3
McDow, Cleo B....WFO
McGrath, John W....LHV
McCluer, Darius H....TFT
McCaddan, Glen J....CWT
McBane, Frederick W....EOT
McElhinny, William D....CGC
McVey, Richard K....GLC
McKinney, Norman....BST

N

Niven, Stanley....SLA; LDT
Northrup, Layton Louis....SLA; CUI
Nevin, William Boyd....SLA; LDT
Nunenmacher, Francis W....TFT
Noel, Olen W....PWM
Nevin, William B....TFT
Norwood, John S....BST
Niday, Hugh D....SAG
Neal, Guy O....PWM
Noland, Raymond R....WFO

O

Ormsbee, Harry S....SMM
Ollis, Luke Sullivan....SLA; SAG
O'Donnell, William Marin....FLA
Overstreet, Thomas J....WFO
O'Brien, Bernard J....WFO
Owen, Robert John....SLA; EOT
O'Sullivan, Daniel J....WFO
Owen, Richard L....WFO
Ogden, James R....WFO

P

Perry, Warren Dunning....SLA; RWT
Preston, Lewis B....MJA
Pelich, Joseph R....BFT
Pentland, Henry Bishop....SLA; KST
Parmented, Harley H....SLA; MAC
Pierce, William....MIT
Purdy, Donald F....PFO
Payson, John B....WFO
Price, Kenneth Gill....FLA
Pratt, Daniel H....LHV
Packard, Vernon Wing....SLA; GLC
Perry, Norman Adams....SLA; WDM; Note 19
Note 1
Parkhust, Amos J....Note 9
Peabody, George H....Note 3
Pletther, Walter E....EOT
Park, David Eugene....SLA; UTA
Pickels, George Wellington, Jr....FLA; UIU
Pye, Harvey N....DMA; EOT; Note 1
Parsons, Clyde Henry....SLA; EOT
Phillips, Walter P....DIK
Pinney, Kyle J....GLC
Pinckney, Francis Morris....SLA; AAD
Poleman, Thomas T....BST
Peterson, David McK....MJA
Price, Edward F....EOT
Putnam, Charles Francis....SLA; CJW
Peacock, Albert Bryon....SLA; SAG
Phinney, Barton V....PFO
Porter, Phillip W....PFO
Paschall, Ancil Earle....SLA; LDT
Phelan, Joseph P....CWT

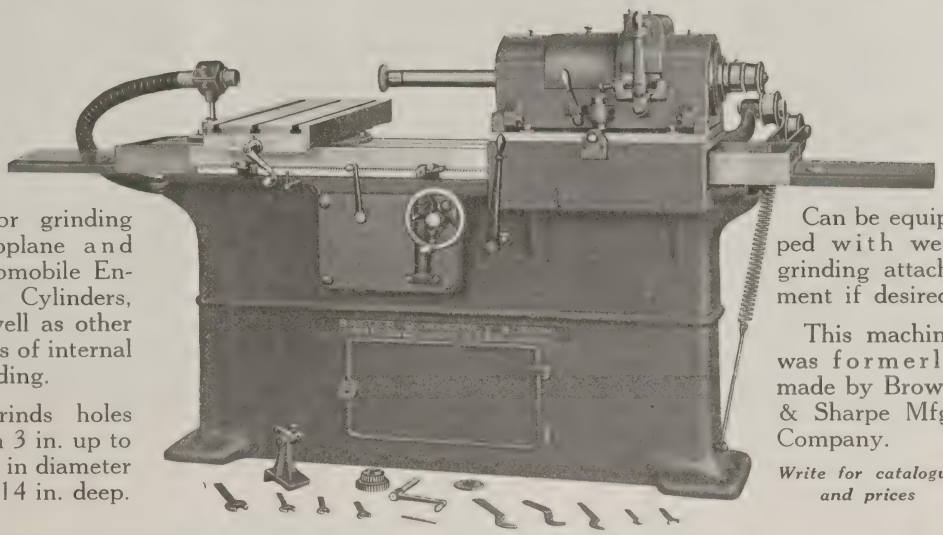
Q

Quirt, Harold William....SLA; EOT
Quirk, Joseph C....BST

R

Rountree, Leonidas Chestley....SLA; EOT
Richardson, Frederick S....SRC
Reid, Kenneth A....FRF
Robinson, Archibold Hamline....SLA; CUI
Roberts, Floyd Piercy....SLA; PFO
Real, Dennis Bernard....SLA; EOT
Runchey, John Edwin, Jr....SLA; SBI
Ryerson, Edward Larned....CPA; IMA
Regan, John A....EOT
Rubin, Myer Christella....SLA; RSD
Rhodes, Roy Stites....SLA; UCB
Randall, Rolph....SLA; UTA
Rowley, George I., Jr....DAP
Reese, Paul Jones....SLA; TMA
Reavis, Charles Frank....FLA; PMT
Ross, Malcolm H....LHV
Richards, Harrison H. C....GLC
Regan, Harold J....CWT
Ryerson, Edward L....MAC
Roberts, Kirk Madison....SLA; EOT
Roe, Joseph W....Note 2
Ruckstell, Glover E....Note 2

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Ramsey, Ambrose E.....Note 3
Read, Lemuel Wesley.....SLA; GLC
Royce, Gardner.....SLA; AAD
Ritter, Paul N.....FRF
Rodgers, Benjamin Gillespie.....SLA; EOT
Rogers, Harry S.....BST
Raube, Reinhold H.....WFO
Reinhardt, Henry A.....WFO

S

Stinson, Karl Willson.....SLA; OSU
Shriver, Herschel Lasure.....SLA; LDT
Sanguinet, Louis Conde.....SLA; CRI
Stephens, Arthur J.....DMA
Sonday, Frederick John.....SLA; EIA
Stonebraker, William Paul.....SLA; CRI
Smith, Ralph Waldo.....SLA; TFT
Smith, Clarence A.....SMM
Smith, William Arthur.....FLA; UTA
Smith, Raymond D.....LTA
Smith, Herbert Worcester.....SLA; LDT
Smith, Harold Carle.....SLA; LDT
Smith, Thomas.....SLA; KST
Sasnett, Bolling H.....BST
Skillman, William E.....BST
Saunders, Guy Durrel.....SLA; TMA
Sasnett, Bolling Hall.....SLA; TMA
Schmitt, Herbert Clarence.....SLA; RWT
Salter, Dwight William.....SLA; RWT
Stevenson, Francis L.....DAF
Stainton, Walter Hutchinson.....SLA; CUT
Southee, Earl Raymond.....SLA; CRI
Sanborn, Thor W.....CPA
Schaf, Joseph C.....PFO
Strickland, David Light.....SLA; CRI
Salmond, John.....SLA; RSD
Snow, George William.....SLA; BST
Stafford, Edward Emerson.....SLA; GIC
Stenson, Irving Carlton.....SLA; KST
Scherck, George.....WFO
Sullivan, Edwin.....CGC
Sanford, Frank W.....WFO
Schwartz, Edgar Louis.....SLA; GLC
Singletary, Harry Hunter.....SLA; EOT
Shaw, John S. C.....RSD
Suddard, Oliver.....SLA; GLC
Smith, William Wallace.....SLA; DAP
Simpson, John Aquinas.....SLA; TMA
Smoot, William B.....DIS
Seeley, Abe L.....TFT
Smith, Alexander D.....BST
Schultz, Raymond Howard.....SLA; SBI
Shannon, Harold E.....BST
Skidmore, Andrew A.....CGC
Smith, Henry Roy, Jr.....SLA; TMA
Saal, Raymond H.....WFO
Stubblefield, Blaine.....BST
Stauver, Frank L.....TFT
Slatterly, John W.....RSD
Stewart, Hal Wilson.....SLA; RSD
Snyder, Jonathan L.....SMM
Strickland, David L.....CWT
Shepherd, Ridgely G.....WFO
Shield, Lansing P.....EOT
Smits, Larry A.....EOT
Seiler, Frederick E.....Note 3
Snowden, Charles N.....Note 3
Smith, William H.....LHV
Silverman, Silas P.....WFO
Sullivan, Daniel Joseph.....SLA; RSD
Smith, James Roy.....GLC
Stone, James Austin.....FLA
Stephenson, George P.....DIK

T

Thomas, Gilbert Maxey.....FLA; UCB
Taylor, Otto F.....DAP
Thorp, Cary Dean.....SLA; BST
Thornton, Dudley Chipley.....VBW
Thompson, Gough Winn.....SLA; KST
Trowbridge, James O....DMA; HHN; Note 1
Tidrow, Robert E.....KST
Twitchell, Roger Thayer.....SLA; KST
Thorne, Henry S.....EOT
Thomas, Charles Edwin, Jr.....SLA; AAD
Thorne, William B.....WFO
Tresidder, Don.....EOT
Tyssowski, Joseph G.....DMA
Terry, George F.....EOT
Tebb, Gordon E.....TFT
Titus, Charles V.....LHV
Tanner, Edward E.....Note 4
TenBroeck, Thomas V.....REL; Note 18

V

Von Eiff, Herman A.....FRF
Van Arsdale, Maurice W.....HHN
Van Zandt, Malcolm.....PMT
Van Horsen, John M.....FLA
Voorhis, Clarence W.....WFO
Voshell, Howard.....SLA; SBI
Van Horsen, John M....DMA; Note 20; Note 1

W

Weaver, Arthur B.....PUP
Walker, Phelps White.....FLA; UTA
White, Robert Bruce.....SLA; AAD
Watson, Henry L.....DMA
Wahle, Carl B.....BST
Ward, Leslie Clayton.....FLA; VEW
Williams, Charles Baird.....FLA; UTA
Williams, Elliott Tuttle.....SLA; GLC
Williamson, Harlan A.....CWT
Wiedersum, Roy.....SLA; ELA
Wilmeth, Roscoe Hall.....SLA; UTA
Welty, James Alman.....SLA; ELA
Wilcox, Roy Franklin.....SLA; DAP
Waite, Allan G.....DMA
Weir, Matthews S.....PFO
White, William Joseph.....SLA; RSD
Whitehurst, Frank Pearce.....SLA; KST
Watson, Herbert Aborn.....FLA; DAP
Wilson, Leroy Alonzo.....FLA
Warfield, Gaither Postley.....SLA; ELA
Wyman, Everett L.....DMA
Willis, Ned T.....SLA; EOT
Warren, George Stanley.....SLA; GLC
Wright, Clifford A.....EOT
Windsor, Thomas H.....WFO
Wright, Earl L.....GLC
Waitemate, Louis F., Jr.....BST
Wilson, Benner M.....BST
Wilbur, Jerry F.....WFO
Woods, James A., Jr.....EOT
Woods, Robert J.....EOT
Wimer, Frank B.....EOT
Waterman, Herbert W.....EOT
Webb, Torrey H.....CAF
Wieport, George D.....BST
Wallace, George B.....PWM
Wellman, Arthur O.....WFO
Wilkinson, John S.....EOT
White, Julius A.....DMA
Wade, Andrew W.....PWM
Wine, Lyman A.....EOT
Wilson, Clarence C.....EOT
Wright, Robert D.....WFO
Ward, Charles P.....WFO
Woodbury, Phillip J.....WFO
Wirgman, Stewart L.....LHV
Williams, Isaac F.....CWT
White, Horace H.....WFO
Wells, Harold Raymond.....FLA
Ward, Allen B.....BST
Worth, Paul.....TFT
Woods, Kenyon.....SLA; KST
Wright, Elisha P. S., Jr.....WFO
White, Walter L.....REL; Note 15
Welch, Clarence H.....Note 7
Walker, William S.....Note 14
Weeks, Alvin B.....REL; Note 6
Winnie, Irvin K.....Note 10
Wilcox, Philip W.....Note 2
Warner, Frederick H., Jr.....REL; Note 18

Y

Yager, Frank R.....GLC
Yeazel, Lloyd Homer.....SLA; EOT; WDM
Note 1
Yount, Barton K.....BST

Z

Zimmer, Elmer Edward.....SLA; Note 12



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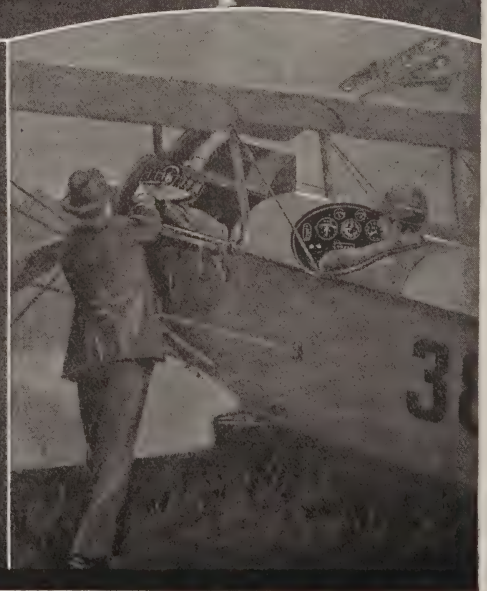
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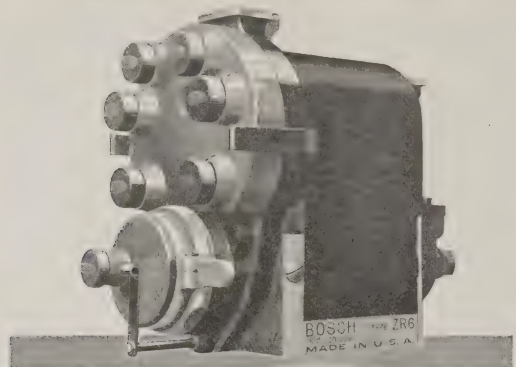
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(*Continued from page* 164)

and who is now in Paris, has volunteered to pay the expenses of establishing and maintaining a club in Paris for the Allied aviators during the period of the war, in the name of the Aero Club of America.

Mr. Beaumont was a resident of New York, before going to Paris in connection with Red Cross work. He is sixty-one years of age and a native of Dayton, Ohio.

Major Edmund Gros of the U. S. Air Service, who was one of the three founders of the Lafayette Flying Corps, and is a member of the Foreign Service Committee of the Aero Club of America, recently wrote to the Aero Club recommending the establishing of homes for tired aviators. His recommendation read, in part, as follows:

There is in my estimation, no way in which the Aero Club of America could render greater service to American aviators, and incidentally to the American Army, than by establishing one or more homes, where tired aviators could rest and find amusement and comfort.

The strain which active service brings to bear on the nervous system of a flying man is so great that few resist for very long without showing signs of breaking down.

The pilot himself feels this fatigue coming on, but as a rule will not give in until his symptoms become very marked. For instance in a case recently brought to my notice, one young fellow who had just been through several offensives, cried in a grocery store because the grocer told him he had no more sugar.

Examples are common where a pilot has been allowed to get in a state of extreme nerve exhaustion before leave was granted him.

It strikes me therefore, that there is a wonderful opportunity for the Aero Club to do good work, in a line which is not followed by other organizations.

Broken down pilots are first sent to a hospital where they are surrounded by illness and suffering. After this they are given a convalescent leave, and allowed to chose their place of rest. It is here that the difficulty begins. If they go to some country place, as likely as not, the food will be bad, the hotel expensive, and unless they meet friends, they will be bored.

If there was a home, run by fine broad-minded women, where there would be considerable liberty, gaiety and enjoyment, the aviator would quickly recover his morale and nervous equilibrium.

To obtain this, the life which he would lead here should be with considerable freedom of movement, Dances, Tennis, Swimming, etc., in a word, an active, home life.

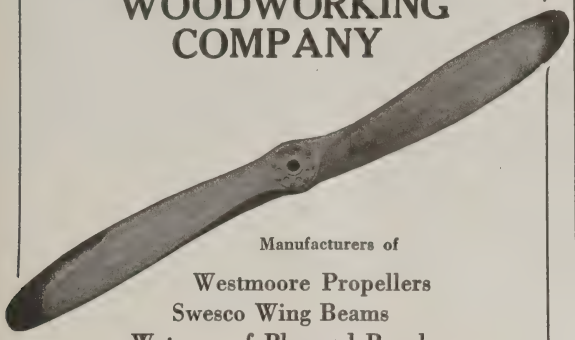
In the case of the aviator whom I mentioned above, I sent him to a small watering place on the West coast of France, where I knew there were young people full of fun and ready to have a good time.

This Aero Club aviator's home would be destined for a special class of men, those who after strenuous work at the front have manifested unmistakable signs of nervous breakdown, whose efficiency is momentarily lost, and who, to be restored to usefulness, require a certain kind of moral nursing.

In accomplishing this task, one would not only be doing a humane thing to the finest specimens of our manhood, but would also contribute directly to the fighting force of our army by quickly returning to a state of efficiency, men who are momentarily useless as combatants.

This recommendation received the unanimous approval of the Foreign Service Committee, the membership of which includes; Ambassador, Wm. G. Sharp, Honorary Chairman; L. G. Bennett, President of the American Chamber of Commerce in Paris; Chairman; Sidney B. Veit, Honorary Secretary; John Weare, Treasurer; Robert W. Bliss; Wm. S. Hogan; Dr. A. L. Hipwell; Major E. L. Gros; Major Wm. Thaw; and G. F. Campbell-Wood and the Aero Club of American acted on their approval.

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engine with a new cylinder head (figs. 7 and 8), and also with new cams, including a camshaft reduction of 1:3. In the head is mounted a new transfer valve similar to the suction valve, which establishes the communication between the cylinder and the receiver. In order to avoid excessive valve spring tensions, the valve is provided with a balancing piston (fig. 9) on which acts the pressure of the receiver. The transfer valve is actuated by a com (fig. 10) through a bell crank. Unfortunately, the position of the transfer valve on the opposite side of the camshaft necessitated an extraordinarily long and therefore heavy operating lever, the result being unfavorable inertia forces. The cam has two projections—the one opens the valve to transfer the air into the receiver, and the other to transfer it back into the cylinder. The double opening is also necessary with the suction valve, and accordingly this cam (fig. 11) has also two projections.

Fig. 12 shows a better solution of the problem. Suction and transfer valves are combined. The connection between the receiver and the outside air is governed by a concentric sleeve valve fitted above the mushroom valve in the cylinder head. This sleeve valve has only to assure air tightness against the receiver pressure (about 1.5 atm.) The mushroom valve is opened once only and remains open during the first four strokes. The sleeve valve establishes communication of the cylinder with the outside air and the receiver alternately. This design is in course of construction, and it is proposed to repeat the tests when completed.

During the tests the engine was coupled with a dynamo (figs. 13 and 14), the efficiency of which was previously determined accurately.

In all 100 tests have been carried out with different oils, at different loads, compressions, and different needle valves, while during small intervals (five to eight minutes) indicator diagrams (figs. 15 to 18) were taken with strong and weak springs. In order to determine the heat carried away by the cooling water, the amount of water and its temperatures at the inlet and outlet was measured.

The heat carried away by the exhaust gases was also measured. This was effected with a water-cooled silencer and calorimeter illustrated in figs. 19 and 20. The amount of water had been weighed separately, and the temperatures of the water registered at the inlet and outlet. The flow of water to the calorimeter was so regulated that the exhaust gases reached approximately the surrounding temperature.

Table II. gives the results of one series of the tests. During this particular series Galician crude petroleum was employed, the higher calorific value of which was 10,395 and the lower calorific value was 9,795 Th.U./kg. The consumption figures have been converted to the mean calorific value of 10,000 Th.U./kg.

The consumption was good at all loads. With such an overload as to bring the total output to about 47 h.p. the exhaust became somewhat impure. The load could be brought up to 53 h.p., however, with a smoking exhaust. This load can therefore be considered only permissible temporarily.

The simple plate diffuser was not adequately dimensioned to cope with the double amount of oil necessary for each charge. Experience in this direction was lacking to obviate the defect, and for this reason the fuel consumption was adversely affected. There is, however, no reason why the combustion could not be effected just as completely as in the four or two-stroke cycle engine.

In the heat balance the upper calorific value has to be taken, because the exhaust gases are cooled down to almost the surrounding temperatures, and it will be seen that the sum of the measured heat quantities (indicated power plus exhaust gas plus cooling water heat) is smaller than the calorific value of the oil consumed.

TABLLE II.
(280 — 440 MM. BORE AND STROKE.)

		I.	II.	III.	IV.
Duration of test	Min.	62.5	50	47	52
Revolutions per sec		207.75	208.0	207.0	209.0
Electric output on switchboard	V.	189.20	182.50	189.20	197.10
	A.	130.00	147.20	153.60	80.68
Efficiency of dynamo	%	89.70	89.50	89.50	91.00
Effective output of engine	H.P.e	37.26	40.78	44.12	23.74
Pressure of air blast	Atm.	95.0	97.0	98.0	91.5
Mean indicated pressures—(*a*) Without subtracting negative work	Kg./cm.²	13.93	14.20	15.38	9.41
(*b*) With " " "	"	12.80	13.07	14.25	8.28
Indicated positive output	H.P.i	58.08	59.28	63.89	39.47
Indicated remaining output	H.P.i	53.37	54.56	59.20	34.73
Mechanical efficiency—(*a*) Without subtracting negative work	%	64.14	68.80	69.05	60.16
(*b*) With " " "	%	69.81	74.75	74.53	68.34
Oil consumption— (*a*) Without subtracting negative work	Kg./h.p.i-hour.	0.145	0.165	0.181	0.163
(*b*) with " "	"	0.158	0.179	0.195	0.186
Idem	Kg./h.p.e.-hour	0.226	0.240	0.262	0.271
Exhaust—gas temperature at outlet from calorimeter	C°	32.5	31.8	35.6	22.0
Heat value of fuel consumed per hour (calculated with low heat value)	Th.U./hour.	84490	97950	115800	64580
Heat value of the indicated output per hour	"	36938	37700	40636	25126
Heat absorbed by the cooling water	"	25400	29600	29100	19800
Heat carried away by the exhaust gas	"	19350	23800	25500	16800

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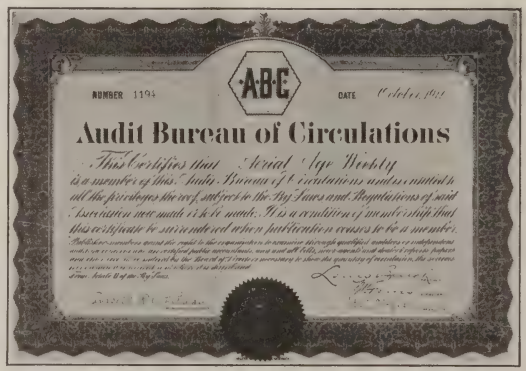


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AERIAL AGE WEEKLY

Vol. 8, No. 5 OCTOBER 14, 1918 10 CENTS A COPY



GERMAN PRISONERS BEING SENT BACK OF THE LINES
German prisoners passing a British anti-aircraft battery on their way back to the "cages"

Germany's Peace Offensive Against the Fourth Liberty Loan

World's Altitude Record Broken by American

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and Fortieth Street, New York City.
Subscription: Domestic, $4; Foreign, $6.
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879.

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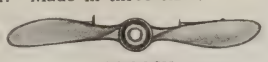


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AERIAL AGE WEEKLY

VOL. VIII OCTOBER 14, 1918 No. 5

TABLE OF CONTENTS

	PAGE
Is Germany's Demand for Peace a Trick to Defeat the Fourth Liberty Loan and Cause Us to Stop Sending Soldiers to France?	211
News of the Week	213
The Aircraft Trade Review	215
Air Service Clubs Association Formed	216
General Kenly Witnesses Test of New Oxygen Apparatus	216
Aero Club's Annual Meeting	217
Aerial League of America's Elections	217
Military Aerostatics	218
The Sopwith "Camel"	219
The A.E.G. Armored Biplane	220
The Hannoveraner Biplane	221
Test of 300 H.P. Mercedes Engine	222
Captain Schroeder Breaks World's Altitude Record	224
U. S. Aerial Mail	225
A Backfire Extinguisher	226
Naval and Military Aeronautics	227
Foreign News	230
Model News	231
Aeronitis	232

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

Uncle Sam, We Are Here!

WHEN Uncle Sam finally saw the importance of striking Germany through the air, in the Summer of 1917, and he wanted to place orders for about 25,000 aeroplanes, 40,000 motors, and the necessary equipment to build a real Air Service, he looked around and found a very meager aeronautic industry—meager because there had never been enough business on which to develop.

Then Uncle Sam called on the other industries for help and their answer was like General Pershing's answer when he landed in France. General Pershing said: "Lafayette, we are coming." The industries said: "Uncle Sam, we are coming."

On July 14th, 1918, General Pershing went to Lafayette's grave and said simply "Lafayette, we are here!" Only four words, but much more eloquent than a book.

Now that American battleplanes equipped with Liberty and Hispano Suiza Engines are actually helping the Allies' Advance, and, as the War Department announces, 6,600 training planes and 12,500 training engines have been produced, the Aeronautic Industry can say: "Uncle Sam, we are here!"

Believing that there is no better way of carrying this idea "across" than to paraphrase General Pershing's statements, as above, AERIAL AGE will issue a special number on October 21st, to be called the **"Uncle Sam, we are here"** Number.

In this number we will give a review of the status of the Aeronautic Industry and of the splendid outlook for quantity production. This number carries out the policy of President Wilson to do everything possible to cheer up our Allies and cast gloom in Germany, by showing that Uncle Sam is in this fight to win and that he is getting into a state of production and will soon be in a position to strike with both fists as well as with both feet.

Your firm is one of those who can say: "Uncle Sam, we are here."

Put the punch behind your advertising copy, and have it in our hands not later than October 15th, and we will do the rest.

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Oct. 14, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, OCTOBER 14, 1918 NO. 5

IS GERMANY'S DEMAND FOR PEACE A TRICK TO DEFEAT THE FOURTH LIBERTY LOAN AND CAUSE U. S. TO STOP SENDING SOLDIERS OVERSEAS?

THIS is the question we must ask ourselves—and we must not relax an instant from the work of producing war materials.

Let there be no pause in the production of aircraft. To-day's (October 6) despatches in telling of the attacks of German aviators on American troops on the Argonne front say:

"Our pursuit squadron tonight sought out the foe beyond the Kriemhild line and over our own lines as well, but still his airmen, singly and in groups, skimmed above our troops, sometimes at a recklessly low altitude."

We are dealing with a deceitful, resourceful enemy, let us beware.

Germany felt certain that our tonnage would never permit our sending overseas half a million men and she was not afraid of that number. She felt certain that we could not convoy our ships and that the output of aircraft, submarines, and artillery would be negligible. It did not occur to Germany that England would be in a position to transport one million Americans to France and to do seven-tenths of the convoying of troopships, protecting them against U-boat attacks.

If Germany could defeat the Fourth Liberty Loan and stop or retard the sending over of more soldiers and equipment or cause the United States to pause in its work of producing war material, she could then prepare throughout the winter months, so as to be ready next spring for a new offensive.

But the nation with one voice has answered the Germans as they should be answered and as President Wilson answered Austria recently.

Following are quotations from the leading newspapers throughout the country:

NEW YORK

No Peace with the Hohenzollern

From the New York *Times*

If Germany wants peace, let her do away with her irresponsible, braggart Kaiser and speak by a Government of her own people to the Governments of the allied peoples. It is not from Prince Maximilian, answerable only to imperial authority, but from a minister responsible to the German people that Germany's plea for peace must come.

President Wilson can be trusted to make an answer to these overtures which will leave no doubt as to the determination of Germany's foes to pursue their victories until she can fight no more, until surrender is forced upon her, and with it security against any further disturbances of the peace from that quarter.

"Autocracy Knows It Is Whipped"

From the New York *World*

It has taken the Imperial German Government more than four years to learn that it is easier to begin a war than to end it. When it staged the conflict such a thing as defeat was not considered. Now it finds its armies overmastered, its subjects at home sullen or revolutionary, its allies beaten or disheartened, and the vast delusion that it could not be conquered everlastingly shattered. To save what it can from the wreck, to preserve the dynasty, to restore as far as possible the lost prestige of militarism and to prepare for another day—what further motive can have inspired it and its Austrian vassal in renewing so soon and in phrases so little changed a proposal for a negotiated peace?

The answer to this question, we believe, is that autocracy is whipped and knows it is whipped, and that presently it will be compelled to acknowledge the fact.

Still "Force to the Utmost"

From the New York *Tribune*

They address their overtures to us, pretending to accept in principle the conditions of peace laid down by President Wilson. But they are wrong. We are not the peace makers. We are the war makers. It is true that we have laid down certain abstract conditions of peace, but these concern only our allies and ourselves exclusively, and are not open to Germany for discussion.

We have laid down one condition of war—one only—and that is to use force, force to the utmost, force without stint or limit, until we shall have destroyed forever in this world the indecent, intolerable, criminal thing that now holds out its dripping hand.

Acknowledgment of Defeat

From the New York *Herald*

It is Foch and Pershing and Haig and Diaz and d'Esperey and the valiant men of their commands, and the people back home who are giving them such splendid support, who are making for peace—the right sort of peace—but unconsciously Prince Maximilian and Baron Burian may be helping. The Hun is cracking. In these desperate appeals for peace will not the men at the front see an acknowledgment of defeat by the Governments upon which they have pinned their faith and whose word they have accepted with blind faith in their omnipotence? . . .

There will be no armistice. There will be no negotiations until Germany prefaces its plea with unconditional surrender. We have just begun to fight!

ALBANY, N. Y.

"Strikes Us as Only Funny"

From the *Knickerbocker Press*

Talk of peace from the Kaiser is momentous news. But except as news it is of no importance. We do not want to talk to the Kaiser. From him we want one thing first, unconditional surrender, and what happens afterward we will decide for ourselves. The Kaiser will not be there. His futile scurrying around to save his skin strikes us as only funny. Let him give up his arms and his armies and get back into Germany where he belongs, joining restitution to penitence, and guaranteeing both by a humility that cannot be questioned, and thereafter there may be a peace conference, but it will not be one with a German present.

BOSTON
Beware of Empty Talk
From *The Herald*

The Austro-German proposals for an armistice can have no success. An armistice would be of great military advantage to Germany, Austria-Hungary, and Turkey, enabling them to rest and reorganize their armies and construct new means of offense and defense. Not for one day, not for one hour, nor for one instant should continued occupation of the invaded territories be permitted by the Powers, whose very first purpose is to free them from the invaders. Then let us beware of calling a halt to listen to empty talk which is intended to flatter and dupe. The proper course was taken with Bulgaria. Unconditional surrender is the door to real peace negotiations.

Question of Germany's Fitness
From the Boston *Globe*

Revelations may occur overnight. Revolutions do not. And it will take more than Prince Maximilian's belief that Germany is now fit for decent nations to associate with, or to do anything but war against, to make her so. For it is not the kind of peace we make with Germany that matters so much as the kind of Germany with which we make peace.

Merely Ask for Armistice
From the Boston *Post*

It is impossible to regard this plea for an armistice as anything but a species of trickery either to gain military time, with armies hard pressed by the master genius, or to get around a peace table holding the better cards for the game. In fact, they do not ask for peace; they do not sue; they merely ask for a cessation of hostilities in order "to start without delay negotiations for peace"—and the world knows what such a proceeding would mean to the unscrupulous scoundrels who would, as things are today, speak for Germany in such a council. Armistice? A thousand times no.

BUFFALO
Must Be No Armistice
From the Buffalo *Express*

The *Express* regards the proposal as a "Kamerad" cry and thinks it evidence that the German army is beaten on the present front. There must be no armistice during which Germany could extricate her army and reorganize it on the short front of the German border, thereby prolonging the war two or three years. . . . If they want peace, let them seek it in the manner that Bulgaria did.

Same Deceptive Game
From the Buffalo *Courier*

The latest output of peace talk from Berlin is merely a part of the same deceptive game, under the guise of a new Chancellor with a curiosity-exciting advertisement of a new policy of moderation and concession, a policy of come into the spider's parlor and talk it over. No, the people of the United States have their eyes fixed steadfastly upon the battlefields, where they expect to see the winning of the victory that will enable the winners to dictate the terms of peace. Smash on, smash on!

PROVIDENCE, R. I.
Enemy Is Facing Justice
From the Providence *Journal*

It seems incredible that Germany should believe that her mouthings about the rights of nations are going to bring the Allies to kiss her bloodstained hands at the moment when she is facing the justice which comes sooner or later to those who violate the laws of God and man.

PHILADELPHIA
German Perfidy Known
From the Philadelphia *Public Ledger*

There is no occasion for the Allies to answer in detail the peace offer of the new German Chancellor. The Kaiser himself has answered it. His proclamation to the army and navy is in the old arrogant vein. "The Macedonian front has crumbled. Our front has not been broken and it will not be." The retreat in Belgium and France leaves him still boastful and unrepentant. If he foresees the end he will not admit it. He is still to dictate conditions. "It will be only an honorable peace for which we extend our hand." What is honor to him and his Government? We have learned from bitter experience the perfidy of both.

Why Negotiate?
From the Philadelphia *Record*

If the Central Powers are ready to stop fighting, let them stop and ask the Allies for terms. If they are not yet ready for that, they had better keep still and go on with their fighting. . . . Why should the Allies negotiate with them? They have plenty of men and plenty of money and munitions to carry on until the Central Powers make an unconditional surrender.

PITTSBURGH
Russia's Fate a Warning
From the Pittsburgh *Dispatch*

The German high command showed in its dealings with Russia that it has no more respect for an armistice than for a treaty. It cannot be trusted either in peace or war. Therefore, no armistice until the Germans are back in Germany. Prince Maximilian's peace offer is the same old trick in a new guise. Anything for an armistice that will save the German military situation and for negotiation that will befog the issue.

CLEVELAND
Utter Surrender Only
From the Cleveland *Plain Dealer*

There is but one possible termination to the war. The fighters will never pause until Potsdam is beaten down into the dust, until the Germany that seeks terms is a non-Potsdam Germany. Germany can have the peace that has come to Bulgaria. She can have the peace of utter surrender, the peace that is based on safe assurance of future decency. Other peace for Germany there can never be.

DETROIT
Example Set by Bulgaria
From the Detroit *Free Press*

The utterances of the President of the United States and of the Entente statesmen give us guarantee that the position taken toward Bulgaria when the Sofia Government asked for an armistice provides a forecast of the position the Entente will take toward Bulgaria's erstwhile ally and master. Don't relax. Don't quit until President Wilson announces that victory is ours.

TROY, N. Y.
No Dealings with Hohenzollerns
From the Troy *Record*

The Hohenzollern Noah has sent another dove from the ark with an olive branch in its mouth. It is a pretty ritual and can do no harm to the cause of freedom. For the Allies will have no dealings with the Hohenzollerns on Prince Max's terms or any others. When Germany itself offers unconditional surrender, talk of an armistice will be tolerable.

ST. LOUIS
Peace Talk Useless Now
From the *Globe-Democrat*

It is useless for the Central Powers to talk of peace when their talons clutch the land which they have grasped and while they hold the people of the countries they have overrun in enslavement. Ending the war is a mere incident in the achievement of the great purpose which has become the fundamental issue of the struggle.

Must Follow Bulgaria's Example
From the *Republic*

Austria has already been told that before its invitation to a peace conference is accepted the conditions already laid down by the Allies must be agreed to, not merely as a basis of discussion, but a basis of agrement. Austria can have an armistice if she agrees to terms similar to those agreed to by Bulgaria.

LOUISVILLE, KY.
America Has But One Answer
From the Louisville *Courier-Journal*

Whether the time for the peace conference is now or later, whether the reports are part of the giant propaganda styled "The Kaiser's Peace Drive," or whether they are the result of the downfall of the military colossus of Europe, the people of America have but one answer: Unconditional surrender. Military autocracy and its ambitions must be felled forever. The long line of allied fighting men from the North Sea to Colmar, moving in a trail of priceless blood toward the Rhine, will not find their home nations making terms behind them.

SAVANNAH, GA.
Must Lay Down Their Arms
From the Savannah *Morning News*

It seems to the *Morning News* that the answer of the President of the United States to this "offer" of peace should be that the United States cannot treat with the Kaiser. The German armies must lay down their arms before peace talk begins. The democratic world has the chance now to rid itself of Hohenzollernism. If this generation does not seize this opportunity it will deserve the condemnation of posterity. Let there be no "next war." Let's finish the business this time.

(*Continued on page* 235)



THE NEWS OF THE WEEK



To Berlin Via Airline

(*Written exclusively for* AERIAL AGE WEEKLY.)

The aeroplane typifies this war just as the phalanx typified the wars of Alexander the Great. This war has become a war in the air. Both sides are fighting for the supremacy of the skies, and America intends to help win it for the Allies. For that reason the United States is building thousands of aeroplanes. More than we possess will be needed to carry the war into Germany.

It takes vast sums of money to build aeroplanes in quantities sufficient to make sure of the sky battle. It also takes money for ships to combat the menace of the submarine—and money for our guns and all that land warfare necessitates in order to crush German militarism.

This money the United States *Government proposes to raise* by the Fourth Liberty Loan Campaign for *six billions of dollars*. The success of the campaign rests on the understanding of the people that this money is to be devoted solely to the nations' solemn purpose of liberating the world from the threat of German militarism.

The war has taken the aeroplane out of the experimental stage and made it a practical instrument of warfare and a useful means of transportation in times of peace.

We must have a never-ending procession of aeroplanes, an aerial Brooklyn Bridge, from America to Berlin. There must be aeroplanes tearing across the sky, winging their way over the sea into Germany, with Berlin as their journey's end.

So lend the Government your money—with Liberty Bonds as your security with interest—that sufficient quantities of aeroplanes may be built to crush Teuton vandalism and liberate the world from the threat of German militarism.

Flew from Aberdeen, Md., to New York

Lieut. E. M. Ronne, U. S. A. S., and Lieut. C. H. Roberts, U. S. A. S., recently flew from the Aberdeen proving grounds, Maryland, to New York City, a distance of about 185 miles, in two hours and fifteen minutes. On October fourth Lieut. Roberts and Ensign Davis, U. S. N., flew back to Aberdeen.

Need Mechanics for Air Service

Trade Test Board No. 2 has sent out the following statement: "The Government is now calling for skilled mechanics between the ages of eighteen and forty-six in the following trades. Motor mechanics, instrument repairers, coppersmiths, carpenters, ignition repair men, propeller makers, blacksmiths, cabinet makers, fabric workers. Mechanics wishing to answer the call and enter the United States air service may apply to Lieut. Billker, ninth floor of 104 Broad Street, any day except Sunday, between the hours of 8:30 in the morning and 5 o'clock in the afternoon."

Kaiser Hid in Cellar During Mannheim Raid

Geneva.—Emperor William, Field Marshal Duke Albrecht of Wurttemberg, and Prince Stephen of Schaumburg-Lippe were in Mannheim when British airmen raided the city.

The royal party, according to the *Democrate* of Geneva, was staying in the Royal Palace and the Emperor and his staff promptly took refuge in the cellar, remaining there twenty minutes. The palace was not hit, as it had been in a previous raid, but bombs fell in the vicinity.

France Honors U. S. Airman

Paris.—Lieut. W. Vernon Booth, Jr., of the American Flying Corps, was cited in the *Journal Officiel* on September 29 as a pilot of splendid courage. The citation says:

Seriously wounded during a fight with four enemy planes and his own plane on fire, he had the presence of mind, despite severe burns, to extinguish the fire and land between the lines, forty yards from the enemy trenches. He regained the French line through a heavy gun and machine gun fire.

Lieut. Booth died in a Scottish hospital near the fighting front early in July from injuries sustained in an aerial combat over the German lines. The injuries necessitated the amputation of a leg. In Paris last April, Lieut. Booth married Miss Ethel Forgan, daughter of a Chicago financier.

Benefit for Air Corps

White Sulphur Springs, W. Va.—Seven hundred dollars was raised on September 28 for the athletic and musical equipment fund of the National Aeronautic Committee, when official films were shown by Augustus Post, secretary of the Aero Club of America. Lieut. Reid Benham gave a short address. Mrs. Edward W. McKenna, chairman of the entertainment committee for the association, was in charge, assisted by Ethel Barrymore, Miss Josephine H. McClure, Mrs. David Stevenson and Mrs. J. Howard Slocum.



LIEUTENANT FRANK LUKE, JR., DESTROYS THREE GERMAN BALLOONS IN THIRTY-FIVE MINUTES

The photo shows Lieutenant F. Luke, Jr., who at dusk on the 17th of last month brought down three enemy balloons in the surprisingly short time of thirty-five minutes. Luke comes from Phoenix, Ariz., and he has done some wonderful work as a "bird man". These additional three bring his total for three days up to eleven. Eleven enemy balloons in three days! Lieutenant Luke has decidedly brought honor to his native city by his accomplishment in his air fighting on the Lorraine front

Germany Drops Its Plan to Punish Our Aviators

With the American Army in France.—A captured document says that the German decision regarding the courtmartialing of American aviators caught dropping propaganda pamphlets has been rescinded and that in the future only aviators having propaganda in their possession will be dealt with as "special cases."

Lieut. Luke "Hates" Balloons

Lieut. F. Luke, of Phoenix, Ariz., fattened his record of enemy balloon destruction by shooting down two additional balloons, making a total of eleven in four days. In addition he brought down two aeroplanes in that period.

One of the Lieutenant's victories over an enemy plane was confirmed by himself. He landed by the side of the fallen machine to make sure that its occupants did not escape and turned them over to the French. He then returned to his squadron with the confirmation papers in his pocket.

All of the eleven balloons were accounted for by means of incendiary bullets. The majority of the attacks on the balloons were made at the greatest personal risk to the flier because he was the objective of quantities of the type of anti-aircraft projectiles called "flaming onions," which set an aeroplane ablaze if they hit it accurately and which must be nimbly dodged in the air.

On the flight during which Lieut. Luke brought down three enemy balloons and an aeroplane, his gasoline became exhausted and he was forced to depend upon the small emergency tank. Lieut. Luke turned on this supply, sufficient only for ten minutes, and though on the German side of the lines he went after his two opponents in Fokker machines.

Hughes Resumes Hearings

Washington.—Hearings in the Department of Justice aeroplane investigation have been resumed after a recess of several weeks devoted to transcribing records of testimony.

Army officials, civil officials and representatives of aeroplane manufacturing concerns are to be heard here by Charles E. Hughes and Attorney General Gregory, and these officials expect to begin next week the task of compiling the final report. This probably will be completed and sent to President Wilson in about three weeks.

Prince Demands War Role

London.—The Prince of Wales has figured in many stories which concern his insistence on having a real part in the war, regardless of the danger to himself.

The Prince recently appeared on the Italian front and explained to the commanding officer of a British flying squadron that he had obtained permission from his father to accompany one of the fighting pilots over the Austrian lines.

One of the crack British airmen was just leaving on a strafing mission and reluctantly yielded to orders for the Prince to accompany him. The machine flew very low, using machine guns on the Austrians, to the great satisfaction of the Prince.

Must Fly in Planes They Declare O. K.

Washington.—Government inspectors of aeroplanes and engines who pronounce machines safe and ready for flight will be required henceforth to accompany the pilot on the initial test in the air. Likewise mechanics repairing aircraft will accompany pilots on first flights after the work is pronounced done. The idea, according to W. C. Potter, acting director of aircraft production, is to give the inspectors and mechanics "a proper appreciation of their responsibility."

"I know no better way of impressing upon these men the importance of their work," said Mr. Potter, "than by giving them a first hand demonstration of the very great stresses and strains put upon aeroplanes and engines."

D'Annunzio in New Flight

Rome.—Gabriele d'Annunzio, the Italian author-aviator, who on September 26 flew from Turin to Chalons, behind the French front, a distance of about 290 miles, made a return flight from the French front to Milan in three hours and ten minutes.

Aeroplane's Last Tribute

Hempstead, L. I.—While thirty-six aeroplanes hovered overhead dropping flowers, the body of Major Whitten J. East, commander of Mitchel Aviation Field, who was killed on October 2 in an automobile accident near Hazelhurst Field, was taken to the railroad station for transportation to the home of his parents in Sanatobia, Miss. A military escort went with the body. Just before the flyers took to the air, Major East's machine, "The Fighting Cock," was wheeled out to the starting line on Mitchel Field. It was draped in black and there was a wreath of roses on the propeller. One by one the "ships" ascended until "The Fighting Cock" stood alone on the wide field.

Downed 4 Times, U. S. Flyer Kept On

Shot down four times in a day, an American aviator named Allen, from California, landed safely each time and ended his day's work by capturing a squad of Germans single handed during the advance in the St. Mihiel salient.

Lieut. Robert Burton, of the Royal Flying Corps, is the authority for the story.

Lieut. Burton, himself a flyer, took part in the drive. He was shot down and is now on his way to his home in Manitoba with a broken leg.

"Some of your American aviators," he said, "flew for thirty-six hours, only descending for gasoline and bombs and ammunition, and they have demonstrated themselves as being in the top rank of the aviators of the world."

U. S. Flyers Down 33 Enemy Planes

With the American Army Northwest of Verdun—American aviators again demonstrated on September 28 that they are the masters of the air on this sector. They engaged in 52 combats and brought down 33 enemy machines without the loss of one American pilot.

The German airmen appear to have lost the daring which had characterized their work of the previous days, and did not venture across the American line with reconnoissance aeroplanes after they had been attacked once by the American machines. The German balloons were hastily lowered in the face of an American attack and did not appear again during the day.

One of the American pursuit groups engaged in 23 combats at low altitudes and brought down three enemy machines. Another pursuit wing had 17 battles in two sorties along the line. A third group dropped bombs on Romagne and Cunel and engaged in battles with German machines, bringing down six of them.

Americans Keep Up Victories in the Air

With the American Army northwest of Verdun.—Aerial activity continues despite the rainy weather. American pursuit groups making sorties from early morning until dark have accounted for twenty German machines and seventeen balloons in the last three days.

The American pilots continue to fly low over the battlefield and harass the troops and supply movements. American bombing squadrons got good results yesterday at Grandpre and at Marcq, southeast of the former place.

American Headquarters in France—The outstanding achievement of the American Army in the offensive is undoubtedly to the credit of its aviators, who have done all that was expected of them and much more.

General Pershing's report on September 28's operations stated that the Americans had "brought down twelve balloons and more than sixty enemy planes, while less than a third of that number of our planes were missing."

On September 28 the distance covered by the aeroplanes of a single wing of the service amounted to 44,150 miles. They fought fifty combats and destroyed nineteen machines without loss to themselves.

One patrol met ten enemy aeroplanes between Charpantery and Ivoiry, sent down one in flames, caused five to crash and drove down two out of control.

Another patrol, diving through a hole in the clouds to drop bombs, came upon seven Fokkers which were almost immediately joined by seven more. The Americans immediately got rid of their bombs and attacked the Fokkers. During a twenty-minute mix-up, which took the combatants from Sommerance to Liny, seven enemy aeroplanes were destroyed and the remainder scattered in all directions.

In addition to these successes the German balloons were literally swept from the sky. Indeed, the maintenance of a single balloon in the air is taxing all the enemy's ingenuity, for these cheerful American youngsters are by no means content with shooting down the balloons at their maximum altitude. Nothing pleases them more than to get a balloon just as it is brought down for the night, or is about to rise in the morning.

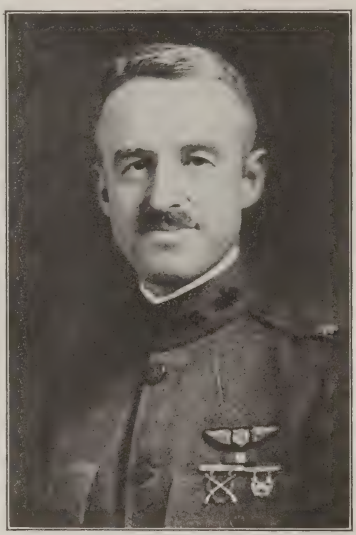
Lieut. Frank Luke, of Phoenix, Ariz., who the other day brought down three aeroplanes and two balloons in ten minutes, is an expert at getting the balloons "in their beds," dropping within 150 feet of the berth to do it and being blissfully indifferent to the riddling of his wings with bullets. In one instance he pounced upon a balloon being placidly towed to its position behind its lorry. Before the drivers were aware of it the gasbag was in flames behind them.

One pursuit group has sixty-five victims to its credit within three weeks after its arrival at the front, thirty-five of these being balloons.

The German balloon has become a rarity on this front any time after noon, and those that survive the day generally perish at nightfall, for it is the twilight period at both ends of the day that is the most favorable time for attack.

An American officer descending in a parachute after his observation balloon had been set on fire by a German aviator has had the experience of being fired upon and having his parachute pierced by machine gun bullets during the descent. When the observer saw the German aeroplane approaching he went over the side of the basket. A second afterward the balloon burst into flames from incendiary bullets fired from the German machine.

The observer was astonished to see the German turn and begin firing on him. Five bullets pierced the parachute, but the observer landed unharmed.



Colonel T. H. Bane is in charge of the Technical Section of the Division of Military Aeronautics, the organization which passes on designs of aircraft and accessories which it receives from both the Aircraft Board and from outsiders. This section is now moving from Washington to Dayton, Ohio. This move brings the entire section closer to its experimental field at Fairfield, Ohio

American Official

The Americans with the British and French dominated the air, Gen. Pershing reports. This fact is believed to have had undoubted effect on the military operations. Gen. Pershing's report follows:

American aviators have kept command of the air. They have brought down twelve balloons and more than sixty enemy planes, while less than a third of that number of our planes are missing. In conjunction with French and British aviators, they have, notwithstanding unfavorable weather, rendered valuable service and successfully executed many missions.

Since September 26 our aviators have shot down more than 100 hostile planes and twenty-one balloons.



Second Lieutenant George L. Bradford, Caproni Pilot at Mineola, L. I.

The D. H. 4

(Statement by Major General Wm. L. Kenly)

A captain of the Air Service, recently arrived from France, has reported to me that the first de Haviland 4 planes with Liberty motors arrived from the United States at stations in France as early as May 13, 1918, and since that date have been coming in ever increasing quantities. This officer left the assembling station in France on August 20. He said that it had been necessary to make some changes on the first planes received, but that each succeeding shipment evidenced better care, and, in general, when he left these aeroplanes were very satisfactory.

In his report he also said: "The performance of the planes was very good, and the plane and motor has become very popular with our pilots. We obtained approximately 130 miles per hour at ground level with one plane, and had without any special preparation obtained an altitude of 10,000 feet in 10 minutes and 21 seconds, full load, excepting bombs. We were able to loop, dive and otherwise stunt these planes exactly as well as we would any chasse plane.

"When I left the post, the planes were arriving at the rate of 15 to 18 per day. The cars were unloaded by our steam crane, and fuselages unpacked in one bay (platform), wings in another bay, and assembly was progressive, similar to the method used in automobile construction.

"After gun test, engine test, and final assembly, the compasses were tested and corrected for permanent magetnism. The machines were then sent to the flying field and were given test flight. After final approval they were then dispatched to stations for assignment to squadron.

"Air-test pilots and ferry pilots were all of the opinion that the plane was excellent. The French ministry thought so well of the Liberty motor that the Under Secretary of State for Aviation, Monsieur Dumesnil, informed me that the French would gladly take every motor we could produce which we could not use ourselves. I was also given the same information by Capt. de Haviland, the designer of the de Haviland plane.

"Lieut. Col. Warwick Wright, Royal Air Force, stated to me that the method of packing the plane was considered by the British to be so good that it could not be improved upon. Out of 750 cases which I inspected, I only discovered one in which the contents were badly damaged."

De Haviland 9 in Record Flight

Flying from McCook Field, Dayton, Ohio, to Bolling Field, Anacostia, D. C., with no stops, a de Haviland 9 plane, equipped with a Liberty engine, made the distance from field to field in three hours and five minutes. Taking the time of actual flight from a point over the city of Dayton to a point over Washington, the time was two hours and fifty minutes, or at approximately 143 miles an hour. The distance between these two cities is estimated at 430 miles, and it takes the fastest train on the Pennsylvania Railroad from 4:50 in the afternoon to 9:00 in the morning on the next day to make this distance.

Caleb Bragg, the civilian pilot, who flew the plane, is attached to the Engineering Department of the Bureau of Aircraft Production. He carried as passenger an engineer officer. The pilot travelled by compass at a high altitude and reported that he had no difficulty in holding his course the entire distance. He also stated that the atmosphere was clear and that he had the advantage of a favorable wind.

Captain Bartlett, Famous Explorer, and Two Aviators, Sold For $40,000 Liberty Bonds

Capt. Robert A. Bartlett, the famous explorer who participated in five Arctic expeditions, and was Admiral Peary's captain in the dash to the North Pole, and two Army aviators, were sold for $40,000 of Liberty Bonds by Mrs. Plummer, of the Liberty Loan Committee.

The sale took place at Terrace Gardens on Sunday, Oct. 6. The Aero Club of America arranged for Capt. Bartlett and two aviators to be present to carry out Mrs. Plummer's novel idea of selling bonds by "selling" Capt. Bartlett and the two aviators.

The plan was also successful the day before when Mrs. Plummer sold two Army aviators sent to her by the Aero Club of America for $25,000.

The bids for Capt. Bartlett were especially lively. In introducing him Mrs. Plummer stated that Capt. Bartlett, who is in the Transport Service, stationed at Hoboken, holds an exceptional record of being accomplished not only in the exploration line, but also in war work. She told how Capt. Bartlett last winter was selected to perform the difficult task of taking the cruiser "Favorite" out of the ice and read the following letter from Secretary of the Navy Daniels commending Capt. Bartlett for accomplishing this difficult task.

Capt. Bartlett, in his capacity of Captain in the Transport Service, has had a great deal to do with sending troops overseas, but for obvious reasons the Capt. will not talk on the subject.

After the lively bidding Capt. Bartlett was "sold" for $25,000 for tea and the two Army Aviators for $5,000 and $10,000 respectively.

The AIRCRAFT TRADE REVIEW

Canada Buys Flying Boat for Fire Patrol

In line with the decision announced some time ago to improve the system of forest protection, the British Columbia Provincial Government has contracted with the Hoffar Motor Boat Co., of Vancouver, for the construction of a patrol flying boat to be utilized for forest patrol.

Some two years ago this up-to-date method of forest protection was the subject of discussion at a gathering of Northwest lumbermen at Portland, and the idea of an air force of fire wardens was strongly advocated as both practical, economical and efficient. The great stretch of country that an airship could keep guard over, and the ability to distinguish the first beginnings of fire and ripidly get help to the spot to prevent its spread, were factors that appeared to be especially within the province of an air patrol. The idea has been seized upon by British Columbia, and will within a month or two be put into operation.

At first it was thought possible to arrange with the Imperial Government for the leasing a machine from the naval force, one of the obsolete hydroaeroplanes. But this idea has been abandoned in favor of the purchase of a flying boat type, which will be better adapted to the purpose. The machine contemplated will carry the pilot and one fire warden, it will have a wing spread of forty-two feet, and chord of five feet, will develop 100 horse-power, and have a speed of seventy-eight miles per hour, and a climbing capacity of about 3,000 feet in ten minutes.

Britain Is Using the Liberty Motor

(From the British Bureau of Information.)

The engine has always proved to be the limiting factor in the production of aeroplanes. Machines themselves can always be produced in quantities considerably in excess of engines. Large numbers of Liberty engines have been ordered by Great Britain from this country for installation in British machines. The Liberty engine has been described as excellent, and its performances on British testing grounds have been reported as being highly satisfactory.

The present Rolls-Royce engine was designed during the first fortnight of the war, and its horsepower was to have been approximately 250. It took 18 months to develop an engine which would give best results in the air and it has only been within the last six or eight months that this engine has been produced in any quantities, so the United States have done well in designing and obtaining an output of an aeroplane engine in the space of 14 months.

The Liberty engine has been submitted to a thorough test in England and France and in the opinion of experts it is sound and will be greatly improved upon after a few months' use under active service conditions. The Rolls-Royce, though at the moment considerably more reliable, gives slightly inferior performance, but it is as well to remember that the Liberty engine is not the last word in aerial motor construction, and that other experimental engines have been designed and manufactured which excel even the Liberty. Since, however, the Liberty engine has now been put on a productive basis, and great numbers are being turned out daily, we want as many of them as we can get; otherwise, by the spring of next year, we shall have many machines in storage without engines.

In the early days of the war the British expeditionary forces went over to France with some 60 odd machines of every type, which were used for every purpose. Nowadays there are special types of machines built to carry out certain functions, and among them are the following:

Fighter—high altitude—Single seater machines, giving the highest possible performance, which attack all enemy machines that may cross our lines.

Fighter—low altitude—Single seater machines, giving the highest possible performance, which attack all enemy machines that may cross our lines.

Fighter—low altitude—Single seater armored machines for low flying work, and attacking infantry formations on the ground.

Fighter—reconnaissance—Usually a two seater machine of high performance, which flies a considerable distance behind the enemy's lines, and is used for reconnaissance work or protecting bombing machines.

Corps reconnaissance—Two seater machines of moderate performance, which do photographic work and artillery observation.

Day bomber—A high performance long range machine, with large bomb carrying capacity.

Night bomber—Similar to the day bomber, but with greater carrying capacity and less speed.

Personal Pars

Graham W. Brogan has been appointed advertising manager of the Duesenberg Motors Corp., Elizabeth, N. J. He was formerly assistant to the general sales manager.

To Make Aeroplane Parts

Milwaukee, Wis.—The Lochman-Mayhew High Speed Propeller Co. has been organized at Milwaukee to engage in the manufacture of aircraft and hydroaeroplane parts. Articles of incorporation have been filed and give the capital stock as $1,000, which is to be increased later. The principals in the new organization are Emil R. Lochman, owner of the Lochman Machine Co., and William H. Mayhew, first vice-president of the Mayhew company, cabinet and furniture manufacturer.

Range of Travel Governing Factor in Aeroplane Future

Detroit.—Range of travel is the greatest problem which must be solved in determining the future of the aeroplane industry, according to C. F. Kettering, president of Delco and the S. A. E. President Kettering's address was given on the occasion of the first Detroit Section meeting for the year, held at the Hotel Pontchartrain on September 20.

The topic, "The Future of the Aeroplane Industry After the War," was of popular interest in this section, as shown by an attendance of 600 local S. A. E. members and their friends. Mr. Kettering largely repeated the address he gave before the Cleveland Section.

Inspection of Aircraft Factories Complete

The War Department authorizes the following: W. C. Potter, Acting Director of the Bureau of Aircraft Production, who has returned from an inspection of factories engaged in the manufacture of engines and planes, announced that the output of Liberty engines was fully up to expectation and had reached quantity production. Planes were now going ahead rapidly, he said, and were being shipped in trainload lots daily.

Aerial Posts in Morocco

In connection with the inauguration of aerial mails in France, it is pointed out that for over a year aeroplanes have been officially used in Morocco for linking up the various units. Each sub-division has a squadron at its disposal, the airmen ensuring a service between the chief town of the sub-division and distant outposts. They carry the ordinary mails, urgent despatches, and telegrams impossible to send by wire. Finally, they see that certain posts are kept in funds. All these activities are carried out automatically, without interferring with the normal service of the bombing, photographic, and patrol squadrons. It is suggested that in future it might be possible, by means of an agreement between the Morocco Protectorate and the Government of Algeria to establish aerial postal communication with the great North African colony, which would benefit no less than Morocco by the economy in time and expense thus assured.

Goodyear Engineer Goes to Government

William S. Wolfe, assistant chief experimental engineer of the Goodyear Tire & Rubber Co., Akron, Ohio, has entered the service of the maintenance division of the United States Government Motor Transport Corps, with headquarters at Washington, D. C. His six years' experience in tire development with the Goodyear company well equips him for his present duties in assisting in looking after the maintenance of all tires, rims and wheels in the motor transport service.

New Directors for Standard Aircraft

Elizabeth, N. J.—Joseph A. Bower, vice-president of the Liberty National Bank of New York, and Henry J. Fuller, vice-president of the Fairbanks-Morse Co., have been elected directors of the Standard Aircraft Corp. and the Standard Aero Corp. of New York.

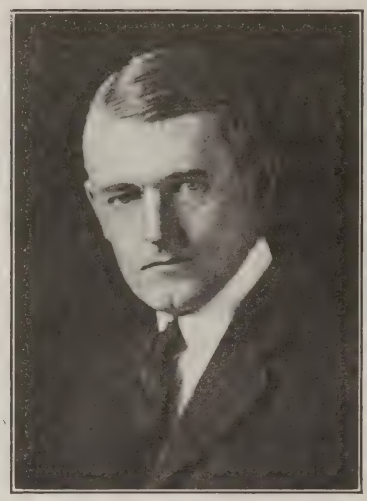
Franklin to Make Hispano-Suiza Parts

Syracuse.—The H. H. Franklin Mfg. Co. has received a contract from the Wright-Martin Aircraft Corp. for parts of Hispano-Suiza engines.



Women have taken up numerous kinds of munition work. Here is shown some of the work they are doing in the aircraft factories





Second Assistant Secretary of War John D. Ryan, Acting Director of Aircraft Production W. C. Potter, and Major General William S. Kenly, Director of Military Aeronautics



Officers of the Air Service Clubs Association

The Army Air Service announces the organization of the Air Service Clubs Association, which will incorporate all local Air Service Clubs recently organized at some of the flying fields and training stations.

The purpose of the Association is to promote the efficiency of the Air Service; to foster esprit de corps by maintaining its best standards and traditions, to disseminate professional knowledge and provide means for social activities at all places where members are stationed.

All officers of the various branches of the Air Service, civilian employees who are heads of departments of the Air Service and all foreign officers on duty with the Air Service are eligible to membership.

The second meeting of the Association was held in the Interior Building at Washington, on Tuesday, October 2, and was attended by about 300 officers of the Air Service stationed at Washington. Major General Wm. L. Kenly, Chief of the Division of Military Aeronautics, presided. Captain J. H. Packard, head of the Aeronautical Information Branch of the Air Service, acted as Secretary. Following the adoption of the constitution, an election of officers was held, and the following officers were elected:

Major General Wm. L. Kenly, President; W. C. Potter, 1st Vice-President; Col. G. C. Brant,, 2nd Vice-President; Col. G. C. Edgar, Treasurer; Lt. Col. H. S. Brown, Assistant Treasurer; Captain John H. Packard, Secretary, and 1st Lieut. Tom Poe, Assistant Secretary. John D. Ryan, Assistant Secretary of War, was elected chairman of the Board of Control, and the following were elected members of the Board of Control: Col. H. H. Arnold, Col. W. E. Gillmore, Col. C. A. Seonne, and Mr. A. A. Landan, for one year; Col. Arthur Woods, Col. F. R. Kenney, Col. G. H. Crabtree, and Mr. C. W. Nash, for two years; and Col. A. L. Fuller, Lt. Col. B. F. Castle, Lt. Col. Millard F. Harman, Jr., and Major Wm. R. Malone for three years.

It is the purpose of the Air Service Clubs Association to issue a magazine periodically and to organize clubs at all Air Service flying fields and stations.

Members of Association Will Enjoy Privileges of Aero Club of America and Affiliated Aero Clubs in All Allied Countries

The members of the Air Service Clubs' Association will enjoy the privileges of the Aero Club of America and affiliated aero clubs in all allied countries. Through this co-operation with the Aero Club of America the members of the Air Service Clubs' Association will enjoy the privileges of the club house in New York, the new Allied Aviators' Club of the Aero Club of America in Paris, the Aero Club of France, the Royal Aero Club of Great Britain, the Royal Aero Club of Italy, etc., etc.

General Kenly Witnesses Test of New Oxygen Apparatus

A new style oxygen apparatus, designed to enable aviators to fly at high altitudes, was given an official try-out in connection with the War Department at Grant Park, Chicago, on Sunday, September 8th, before a group of prominent officials of the air service of the government. Among those who witnessed the test were Major General W. L. Kenly, Director of Military Aeronautics; Brigadier General T. C. Lyster, M. C., of the Air Service Division; Surgeon General's office; Lieutenant Colonel Isaac Jones, M. C.; Lieutenant Colonel C. K. Rhinehardt, and Lieutenant Colonel E. R. Lewis, M. C.

The flight was made by Lieutenant M. B. Kelleher and State Senator Albert C. Clark of Illinois in one of the new model De Haviland 4 aeroplanes, equipped with a Liberty motor. In view of the nature of the flight, unusual precautions were taken to have the plane in first class condition. Before the machine was permitted to go up, Lieutenant Kelleher and Senator Clark were given a thorough physical examination by General Lyster personally.

According to the official report of the flight, the aeroplane left the ground at 12:55 P. M. The pilot took a southerly course mounting to fifteen thousand feet in seventeen minutes. At nine thousand feet it was necessary to detour around a large cloud bank so that the machine would not become moistened and affected by the low temperature in higher altitude. Slight motor trouble impeded for a few minutes the upward flight of the machine but the source was found quickly and corrected.

It took the aeroplane thirty-five minutes to climb from fifteen thousand to twenty-three thousand five hundred feet during which time, the report continued, exceptionally fine atmospheric conditions were encountered. A temperature of seventeen below zero was recorded at this altitude.

As soon as the rarity of the air became noticeable the flow of oxygen in the apparatus was permitted to start. The device functioned perfectly from the start, Lieutenant Kelleher and Senator Clark reported. Breathing was as natural, they said, as on the ground.

The pilot was compelled to start the descent to earth at the height of 23,500 feet, as the danger signal showed on the apparatus. At this height, the pilot and passenger said, they were able to breathe with ease by means of the device.

The aeroplane descended at the rate of a thousand feet a minute. The descent from the maximum altitude to the earth took twenty-five minutes. Both pilot and passenger experienced slight physical discomfort for a time by reason of the extremes of temperature.

In the opinion of Lieutenant Kelleher, the maximum altitude had not been reached. Additional tests may be made in the future to determine the effectiveness of the oxygen apparatus at greater heights in the air. Lieutenant Kelleher was enthusiastic over the performance of the De Haviland 4.

Aero Club's Annual Meeting

THE annual meeting of the club will be held at the club house, 297 Madison Avenue, New York City, on the second Monday in November, 1918, at 8:30 P. M.

Whereas a large part of the members of the Aero Club of America are in Government service and their addresses changed constantly, and that it takes longer for mail to reach them; and Whereas, the Government has issued instructions that Christmas presents for men overseas shall be mailed before November 12, therefore, the system of transportation of mail may be congested in the latter part of October and early in November, and Whereas, it is a patriotic duty of the Club to assist the Government and our members by mailing any notices or reports before the October and November rush; the Executive Committee, acting under Article 3, Section 2, of the Constitution, resolved to send out notices of the annual meeting to non-residenet members and to members who are known to be in Government service immediately.

Following are the nominees for officers and governors: For President, Alan R. Hawley; for Vice-President, Henry A. Wise Wood; for Second Vice-Presideent, Godfrey L. Cabot; for Third Vice-President, Rear Admiral Bradley A. Fiske; for Fourth Vice-President, Chas. Jerome Edwards. For Governors, Class A, Term Expiring 1922, Lieut.-Col. James A. Blair, U. S. A.; Henry Woodhouse, Allan A. Ryan, Rear Admiral Bradley A. Fiske. Class A, Term Expiring 1921, William Hawley. Governors, Class B, Major Albert B. Lambert, U. S. A.; Henry B. Joy, Lieut. Godfrey L. Cabot, U. S. Navy; George M. Myers, John Hays Hammond, Jr., Alberto Santos-Dumont, Brig.-General Robert K. Evans, U. S. A.; Major Max C. Fleischman, U. S. A. For Treasurer, Lieut.-Col. Charles Elliot Warren.

It is proposed to amend Chapter IX of the By-laws to meet the exigencies of war and enable the club to better protect the welfare of the United States, Allied Countries and the Aero Club of America.

The activities of the Aero Club of America during the past year have been extensive. The Army and Navy membership of the club has increased by over 350, due to the popularity of the club with both branches of the Service. A considerable number of military aviators applied for memeership from France, their desire to become members has been created by learning of the club's remarkable work in the assisting of the building of our Air Forces, and in helping the members of the Air Service in every possible way in the United States as well as overseas.

The club has assisted and is assisting in the building of the Air Service from every standpoint. Its efforts to make Congress recognize the necessity of a substantial Air Service and its efforts which resulted in training 300 aviators at private expense, who were taken in the Army and Navy upon America's entering the war, and who were the first 300 aviators to be sent overseas, are matters of history, thoroughly appreciated by the American and Allied Governments.

The club's care of the members of the Air Service begins with giving advice to candidates who wish to join the Service, directing them to the proper authorities and supplying them with any information which may speed up their entering the service and their becoming efficient. From the time they join the Service to the time they are ready to go overseas, the club acts as their adviser, and when it becomes necessary it helps them in other ways. During the early part of the year it become necessary for the club to represent the Army and Navy aviator's before Congress, preventing the cutting down of the aviator's pay. During the past winter and early spring the club assisted in looking after the welfare of members of the Air Service who need clothing and equipment while training and when going overseas.

The club looks after the welfare of the aviators overseas through its Foreign Service Committee, which has headquarters in Paris and which looks after the interests of the Air Service as closely as the club does in the United States, supplying aeronautic books and magazines, aeronautic maps, athletic equipment, games, etc., etc., and otherwise contributing in every way possible to their general comfort. The funds for this work have been procured under the auspices of the club.

The Foreign Service Committee also assists in locating aviators who are missing or prisoners, notifying parents, and represents the club and parents, whenever possible, at the funerals of those who have died in service.

When an aviator distinguishes himself, he is awarded the Aero Club of America's Medal of Honor, which is very much appreciated and sought after, not only by the American, but also by the Allied aviators. The club has received personal letters of appreciation of Medals from the two premier French Aces, Lieut. Fonck and Lieut. Nungesser, who called in person at the offices of the Foreign Service Committee to express their appreciation. While they were at the office, an enormous crowd of admirers gathered outside, and when the two aviators with the members of the Foreign Service Committee drove through the streets they were showered with roses.

The letters from American and Allied officers and from the highest American and Allied authorities, and from parents and aviators, and from patriotic Americans, praising the patriotic work of the Aero Club, would fill many books. They are being preserved, and it is possible that after the war they will be reproduced in book form, to make a historic record of the club's contribution to the prosecution of the war.

The club has continued its constructive activities for the extending and upbuilding of our Air Forces, fostering the developments of the aeronautic industry and the establishing and extending of the Aerial Mail Service, and educating the nation to its aeronautic task. It has also been active in the Liberty Loan, War Savings Stamps and Red Cross Campaigns.

The club has 800 members in the Service, all serving as commissioned officers, with a few exceptions, who are working with civilian status in different departments of the Government.

Aerial League of America Elections

THE election of directors of the Aerial League of America was held at 297 Madison Avenue, New York, on September 30.

The following directors were unanimously elected, over one thousand members voting in person or by proxy.

Directors, term of office to expire in August 1922: Rear Admiral Robert E. Peary, Alan R. Hawley, Henry Woodhouse.

Directors, term of office to expire in August, 1921: Henry A. Wise Wood, Charles Jerome Edwards, Augustus Post.

Directors, term of office to expire 1920: Brigadier General Robert K. Evans, U. S. A., Mrs. Henry A. Wise Wood, Mrs. William A. Bartlett. Directors, term of office to expire in August, 1919: Hon. Murray Hulbert, John Hays Hammond, Jr., Mrs. Marie E. Peary Stafford.

The League during the past year has done an enormous amount of patriotic work. It had a Float in the First Liberty Loan Parade in New York, and its officers and many of the members delivered addresses and participated actively in other ways in each of the Liberty Loan, War Savings Stamps, and Red Cross campaigns.

The League contributed largely to the success of the French Aerial Warfare Exhibit. One of the League's officers, Mr. Henry Woodhouse, was elected by the French authorities to be the Honorary Director of the Exhibit, and has acted in this capacity since last March, making all the arrangements to send this wonderful exhibit through the United States. As a result, not only has great interest been created in winning the war, in building our air forces, and in the Liberty Loan and in the Red Cross, but over $50,000 has been raised for the orphans of French aviators and maimed aviators.

The League has conducted a very extensive educational campaign, sending speakers to deliver addresses and showing aeronautic films to different parts of the country. It also took a prominent part in the establishing and making a success of the Aerial Mail Service, which has an important value from a military as well as a commercial standpoint, and supplied aeronautic literature to army and navy aviation stations.

These are only some of the important things accomplished during the past year by the League, the offices of which have become the clearing house to which officers and men in the Air Service, and men, women, and boys and girls write for advice and information.

On motion it was resolved to elect to honorary membership of the League Second Assistant Secretary of War John D. Ryan, Major General William L. Kenly, Director of Military Aeronautics, Second Assistant Postmaster Otto Praeger and Captain B. B. Lipsner.

A vote of thanks was expressed to Mr. Henry Woodhouse for his energetic work on behalf of the League. By his work Mr. Woodhonse has put the League on a self-supporting basis and membership of the League up to over 4,000 members, and extending its work overseas.

A vote of thanks was also extended for the hearty and substantial co-operation given to the League by officials of the Aero Club of America, especially by Messrs. Alan R. Hawley, Henry A. Wise Wood, and Augustus Post.

A hearty vote of thanks was extended to the Aero Club of America and its officials, not only for the assistance given to the League, but also for the inspiring example set by the club in every line of patriotic and aeronautic endeavor.

Expressions of appreciation were voted to Mrs. William A. Bartlett, chairman, and Mrs. Eliot Butler Whiting, Mrs. C. Lansing Baldwin, and Mrs. John H. Booth, members of the Aviation Committee of the National Special Aid Society; and to Mrs. Charles A. Van Rensselaer, Mrs. Henry A. Wise Wood, Miss Alice Carpenter, Miss Amy Grant, and Miss Portia Willis for their splendid work in looking after the welfare of our aviators.



MILITARY AEROSTATICS



By Lieut. H. K. BLACK, R. F. C., C. F. A.

A VERY necessary thing for a balloon bed is dryness. This, of course, is a relative term in France, and so long as a balloon bed is well drained that is about all that can be expected. The bed can be trenched around the same as a tent, but a word of advice, if you trench around a balloon bed, be very sure that you cover the trench with duck boards of some kind. Otherwise sometime, when the crew is holding down the balloon two or three are going to fall into the trench or rather step into it, and then there is going to be trouble. I once knew of a balloon blowing away just from that, and several of the crew who held on till they were well off the ground fell thirty feet or so and were badly smashed up.

However, when the site of the balloon bed has been decided upon,—as I said before it should be sheltered and drained, a gentle slope is not a bad position,—the preparation is an important part of the subsequent success of the bed. The bed must be very smooth. If it is so naturally, so much the better, but if it is lumpy, or rocky, or has small almost buried roots, these must be removed before proceeding further. In France, on several occasions, we removed roots and stumps by blasting. We found this very satisfactory. It not only removed the roots and stones but it also stirred up the subsoil in such a manner that drainage was facilitated. The ground after the blasting should be ploughed a bit and the roots taken out, put back in the holes and the whole covered with earth. The earth when smoothed should be covered with broken rock or small gravel. In France, particularly in the coal region, the slag from the mines makes an ideal bottom of the bed. A layer of slag broken into small pieces should be used for a top layer and then a top dressing of fine sand laid on. The top layer and the top dressing should be crowned slightly in the center. On top of this prepared bed the ground cloth of heavy tarpaulin or canvas should be laid and stretched tight. The cloth should be made fast to the ridge wire around the edge of the bed. This ridge wire is a thin steel cable which forms the periphery of the actual bed itself. It is fastened very securely by means of screw pickets screwed into the earth and one needn't be afraid of getting it too secure for it has a very heavy strain to bear. I have seen a four-foot screw picket, yes, several of them, torn out of the ground like a rotten tooth when a wind storm caught the balloon.

Of course a balloon offers a wonderful target for the wind when it is on its bed and it is almost unbelievable what a strain the ridge wire is under. One storm we had, I remember, we had the balloon weighted down with sandbags until we thought the bridles of the rigging would break. We put canvas bridles over the balloon, we weighted the mooring lines, we did everything we could think of to keep the gas bag on her bed, yet all our efforts were unavailing. An extra gust of wind hit her broadside and the balloon broke the mooring lines, the canvas bridles, tore the ridge wire out of the ground, bringing with it the screw pickets and numerous straight wooden pickets.

Incidentally, here it might be remarked that it is standard practice to fasten the rip cord securely to a separate picket driven well into the earth. On this occasion that did not do us any good. The rip cord simply tore the picket out of the ground and the balloon did not rip. There was so much weight on the gas bag, somewhere in the neighborhood of a ton, that she couldn't rise even when she did get away. She floundered along the ground with the wind, treating several tents which were in her path very much the same as if she had been a tank instead of a well brought up civilized balloon. Next she bumped through an artillery horse lines, shedding sandbags en route, much to the consternation of the horses, who just naturally stampeded. Finally the old sausage charged a tree with the evident intention of flattening it out. The tree, however, proved to be an old customer who had been through several battles and was still standing. The sharp, jagged branches crashed through the envelope, the gas rushed out whistling, the sausage shuddered, and in a very few seconds a perfectly good balloon was hanging, a mass of shredded fabric, entirely deflated, on the old tree. Yes, the ridge wire should be put down securely.

Stakes are driven, out from the sides of the bed, and also at the ends for the mooring lines.

It is very important in connection with bedding down a balloon, that the bed be kept absolutely clean. Small stones, twigs, even a little bit of mud or clay, will soon wear a hole in the fabric of a balloon, particularly if the balloon is not absolutely tight on its bed. This is seldom the case, as almost always there is a little regular chafing movement of a sausage on its bed. To bag a balloon down to its bed so tightly that there is no possibility of movement necessitates so much sand on the rigging as constitutes a strain on it. The valve cord must be let go of course else the valve would act from the increase of internal pressure. Then, of course, with the valve let go, the pressure on the interior of the envelope is apt to rise to or beyond the straining point.

The saddle referred to previously is a canvas strip or in some cases a canvas sheet which is put over the top of the balloon and moored securely to the ground outside the ridge wire. It is of great assistance in keeping a balloon on its bed during a wind storm. During the windy season, however, and in fact almost any time, a screen is a very necessary thing. This screen is naturally placed in those cases where a balloon is bedded down among trees, or between avenues of trees. In cases where a balloon is bedded down in the open, however, it is necessary to erect a screen. Practice only will tell one what kind of a screen is best.

(To be continued)



Laying out a French observation balloon in France. The ground cloth is spread on the bed and the balloon removed from its covering and stretched out, unfolded from the centre outward and the rigging attached. It will be noted that the bed is sited in a well sheltered position. The men work on the balloon bed either in their stocking feet or else in soft rubbersoled shoes. The filling hose may be seen running toward the middle of the balloon. The sand bags seen in the left background are used for holding the balloon on its bed, and not, as some people seem to think, as a protection from fire. In the far background may be seen some very typical dugouts; in fact the whole scene is one which is very common in France

THE SOPWITH "CAMEL"

THE following facts and photograph of the Sopwith "Camel" have been translated from a German contemporary:

This machine, built by the Sopwith Aviation Co., Ltd., of Kingston-on-Thames, carries the designation F.1 B. 6290. It is a single-strutter machine and is a development of the Sopwith "Pup," from which, however, it differs in many details, apart from the greater power of its engine.

As in the older type, the wings and tail plane with elevator are of trapezoidal plan form, but the greatest span occurs at the trailing edge. The top plane centre-section has a span of 2.17m., while the strut attachments are only 1.48m. apart. As the petrol pressure tank and gravity tank are placed rather far aft, the pilot's seat is placed immediately behind the motor, underneath the top plane centre-section. In order to provide a better view, a rectangular opening is cut in the centre section. The longitudinal edges of this opening are provided with three-ply plates projecting beyond the wing profile so as to reduce the amount of air flowing over the edges. To facilitate getting into and out of the machine the trailing edge of the centre-section has been cut away. Upper and lower planes have an equal span of 8.57m., and an equal chord of 1.37m. The aspect ratio is therefore 6.25 against the aspect ratio of 5.15 of the older type.

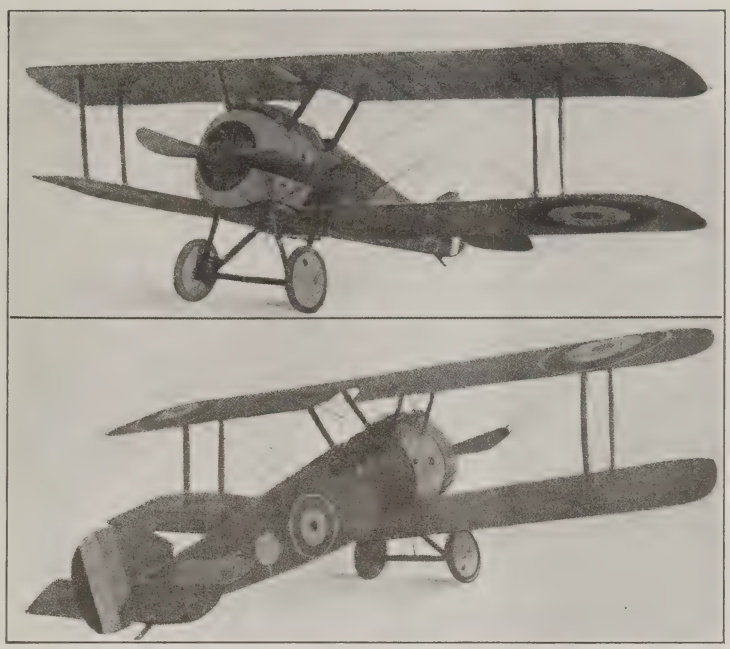
The wing spars, which are made of spruce, are spindled out to an I section, with the exception of the bottom rear spar, which is left solid. The gap between the planes is 1.31m. at the tips and 1.52m. near the body. (In the older single-seater the gaps were 1m. and 0.86m., respectively.) The upper plane is staggered forward 0.45m. There is no sweepback. The dihedral angle of the top plane is 178 deg. and of the bottom plane 170 deg. The angle of incidence of the top plane is 2 deg. at the centre-section, 3 deg. at the tip. The bottom plane has a uniform angle of incidence of 3 deg.

The inter-plane struts, which are of solid spruce of Streamline section, are, as in all Sopwith machines, placed with their ends in steel shoes welded to the fittings on the wing spars, and are provided with no further attachment. The lift wires and landing wires, of which the former are in duplicate, are in the form of stream-line wires.

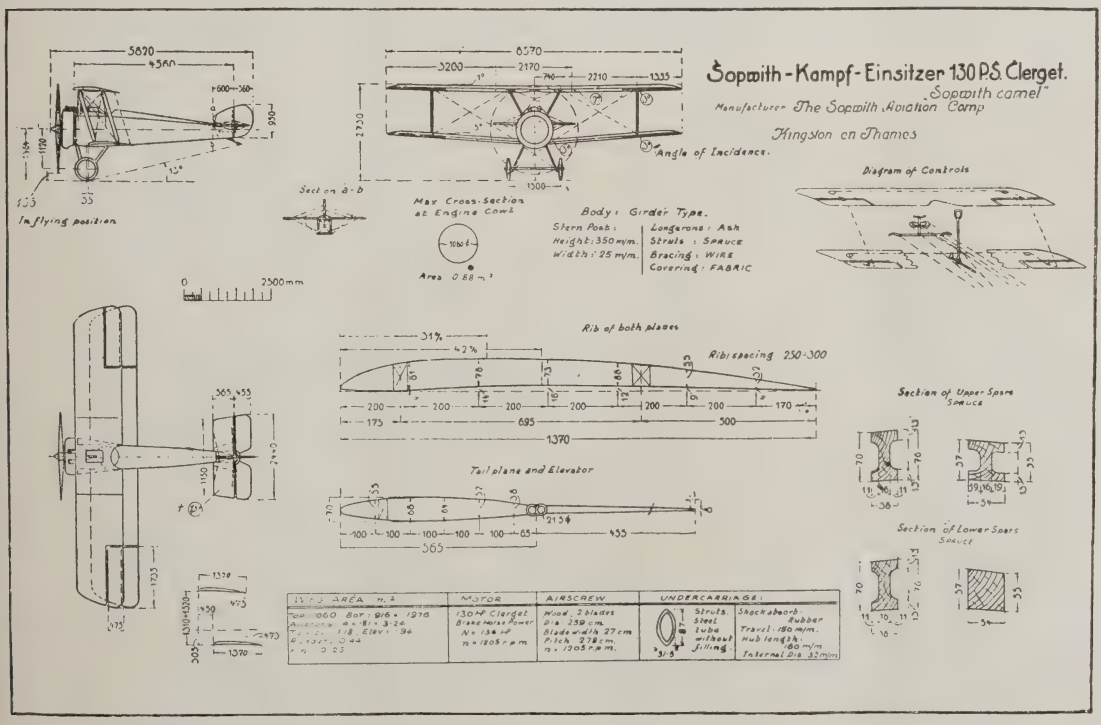
Non-balanced ailerons are fitted to the rear spars of both planes. The wing fabric, which is sewn on to the ribs, is cream colored underneath, and the top surface, as well as the body fabric, is painted a redish brown. The body, which is of the usual girder type with four longerons, has a rounded top. The undercarriage is of the usual Sopwith type. A divided aluminum axle rests in a stream-line covering of wood. The axle hinges are braced from the fuselage.

The tail plane, which is deeply cambered on both sides, is rigidly attached to the upper body longerons, with an angle of incidence of 1.5 deg. The tail plane trimming gear hitherto fitted to all Sopwith machines has been abandoned, in spite of the fact that the petrol tanks are placed behind the pilot's seat. The fin and rudder are of the usual characteristic Sopwith form.

The 130 h.p. Clerget motor, which is built by Gwynnes, Ltd., develops about 134 h.p. at 1,200



Two views of the Sopwith "Camel"



r.p.m. According to a plate in the pilot's cockpit the revolutions of the engine are not to exceed 1,250 r.p.m.

In the pilot's cockpit are the following instruments, &c.:

In the centre on the instrument board: Monometer, with safety valve, clock, pressure gauge, altimeter, compass, two switches, revolutions indicator, and pulsometer. On the right: The hand-pump (air). On the left: Control levers for pressure and gravity petrol tanks, petrol tap, throttle lever, petrol level indicator for pressure tank, Bowden cable for bomb release. A propeller air pump for the pressure tank is mounted on the starboard chassis strut. Two fixed Vickers guns are mounted on top of the fuselage. Their locks and feed block levers are inside the body covering. Between them is a telescopic sight. In a bomb rack under the body can be carried four bombs, the Bowden controls for which are placed to the left of the pilot. There is no bomb sight fitted.

The weight of the machine empty was ascertained to be 430 kg. With tanks full the weight of the fuel is 150 kg. With pilot and armament the useful load would then amount to 290 kg. It is therefore to be assumed that the weight of about 50 kg. of bombs is only carried when the tanks are not full. Assuming a useful load of 290 kg. the total weight "all up" amounts to 720 kg. As the wing area is 19.76m², the unloading is 36.5 kg. per sq. m., and the loading per h.p is 720; 134 = 5.37 lbs./h.p. The corresponding loadings for the Sopwith "Pup" were 23.4 and 6.6, respectively. The "Camel" has, therefore, a higher wing loading, but a considerably smaller loading per h.p.

THE A. E. G. ARMORED BIPLANE

THE Technical Department of the British Air Ministry has issued the following report and description of the A. E. G. Armored Biplane:

This aeroplane is designed for the purpose of carrying out offensive patrols against infantry, and is furnished with armor, which affords protection for its personnel. This armor appears, however, to be more or less experimental.

In general construction it closely follows the lines of the A. E. G. Twin Engined Bomber G. 105, reported on in I. C. 606, though the arrangement of the power plant is, of course, entirely different.

A steel tubular construction is used practically throughout. The machine was badly crashed, and some details are, therefore, not available; but the General Arrangement Drawings at the end of this report may be regarded as substantially accurate.

The leading particulars of the macchine are as follows:

Area of upper wings	190.4 sq. ft.
Area of lower wings	168 sq. ft.
Total area of wings	358.4 sq. ft.
Area of upper aileron	11.2 sq. ft.
Area of lower aileron	10 sq. ft.
Area of tail plane	9.4 sq. ft.
Area of fin	7.6 sq. ft.
Area of rudder	6 sq. ft.
Horizontal area of body	48.6 sq. ft.
Side area of body	54.8 sq. ft.
Cross sectional area of body	14.4 sq. ft.
Area of side armor	33 sq. ft.
Area of bottom armor	29.4 sq. ft.
Area of armor bulkhead	10.4 sq. ft.
Engine, 200 h.p. "Benz."	
Crew—pilot and gunner	360 lbs.
Armament—three guns.	
Petrol capacity	38 gallons
Oil capacity	3 gallons

The manner in which the wings are constructed is exactly as shown in the report of the A. E. G. Bomber—i. e., the spars consist of two steel tubes 40 mm. in diameter by 0.75 mm. thick. At their ends the upper and lower surfaces of the spares are chamfered away, and flat plates welded in position, so as to provide a taper within the washed-out portions of the wing tips. The wings were, unfortunately, so badly damaged that no accurate drawing of their section can be taken, but there is evidence that this very closely follows the section of the bomber, which has already been published. The ribs are of wood, and between each main rim is placed a half-rib joining the front spar to the semi-circular section wooden strip which forms the leading edge. The wing construction is strengthened by two light steel tubes passing through the ribs close behind and parallel to the leading spar, which are used for housing the aileron control wires. The bracing against drag consists of wires and transverse steel tubes welded in position. At the inner end of the wings special reinforced ribs of light gauge steel tube are provided. The spars are attached to the fuselage by plain pin joints.

The centre section of the upper surface is constructed in a similar manner to that of the wings, except that it is considerably reinforced, and the spars are larger in diameter. The leading spar has a diameter of 51 mm. and the rear spar 45 mm. The centre section is secured to the fuselage by a system of stream-lined steel struts, the feet of which terminate in ballends dropped into sockets, and there bolted in position.

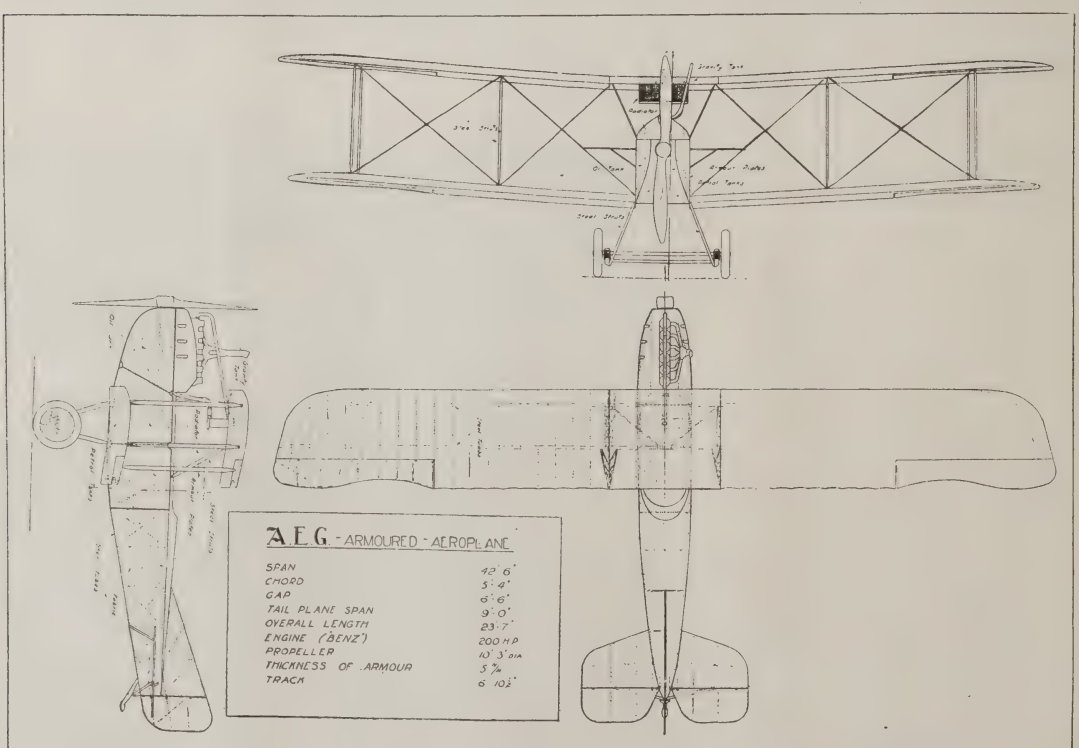
The centre section contains an auxiliary gravity petrol tank, and also the radiator, and is, therefore, substantially braced with steel tube transverse members.

The wings are set with a dihedral angle of approximately 6 deg.

The aileron framework is of light steel tube throughout, the tube forming the trailing edge being flattened into an eliptical section. The ribs are fixed by welding. The framework of the ailerons on the upper wing is reinforced by diagonal bracing of light tube.

These are of light steel tube streamline in section, tapered at each end, and terminating in a socket which abuts against a ball-headed pedestal carried on the wing spars; through the socket and the ball is passed a small bolt. The manner in which this attachment is carried out is exactly similar to that described in the report on the A. E. G. Bomber.

The whole of the fuselage is built up of steel tubes welded together, and having affixed at their junctions sheet steel lugs, which serve as the anchorage for the bracing wires. The diameter of the longerons and of the frame verticals is 20 mm., except the last three members adjacent to the tail, of which the diameter is 16 mm. The welding throughout the fuselage appears to be of very high quality. In Fig. 2 is illustrated a joint, which occurs in the fuselage immediately in front of the pilot's cockpit. The longeron is, from this point to the rear of the gunner's cockpit, fitted with a wooden strip taped in position. This joint shows the method in which the cross bracing wires are furnished with an anchorage. In one or two points in the frame con-



struction the bracing wire lies in the same plane as the transverse tube, and to allow for this a diagonal hole is drilled through the tube, and filled in with a small steel tube welded in place.

This consists of a triangulated arrangement of steel tubes carrying hollow rectangular section steel bearers, on which the crank chamber is slung. The bearers are well trussed both in the vertical and horizontal planes, and are shown in dotted lines in the General Arrangement Drawings. The engine bearers themselves are 2 mm. in thickness, and have an approximate sections of 2 1/16 ins. by 1½ in.

The empennage possesses no particular points of interest, the planes having the usual tubular framework. The tail plane is not fitted with any trimming gear, but a method of adjustment is provided. This is shown in Fig. 3, which is self-explanatory. The diagonal struts which proceed from the base of the fuselage to the tail plane spar are fitted at each end with a method of adjustment shown in Fig. 4, allowing them to be extended as required according to the particular socket which is used to carry the leading edge of the tail plane. Neither the elevators nor the rudder are balanced. The rudder post is mounted on the end of the fuselage, as shown in Fig. 5, in which it will be seen that the vertical frame tube of the fin is very stoutly attached to the frame by a triangulated foot.

THE HANNOVERANER BIPLANE

THE Technical Division of the British Air Ministry have issued the following report on the Hannoveraner biplane:

This machine was brought down by anti-aircraft fire near Lestrem, on March 29, 1918. As will be seen from the photographs, it is of highly characteristic design, and possesses numerous features of interest.

On labels protected by celluloid, and on the upper surfaces of the wings and fuselage, are identification marks with the date 15/2/18, showing that this machine is of recent construction.

Generally speaking, the construction is of wood throughout, steel being used sparingly, except in the interplane struts, landing chassis struts, centre section and some details of the tail.

Judged by contemporary British standards of design, the Hannoveraner biplane reaches a fairly high level, the construction throughout being sound, and the finish quite good.

The performance of the machine is not by any means bad.

The leading particulars of the machine are as follows:—

Weight Empty, 1,732 lbs.
Total Weight, 2,572 lbs.
Area of Upper Wings, 217.6 sq. ft.
Area of Lower Wings, 142.4 sq. ft.
Total Area of Wings, 360.0 sq. ft.
Loading per sq. ft. of Wing Surface, 7.29 lbs.
Area of Aileron, each, 16.4 sq. ft.
Area of Balance of Aileron, 1.6 sq. ft.
Area of Top Plane or Tail, 10.0 sq. ft.
Area of Bottom Plane of Tail, 19.2 sq. ft.
Total Area of Tail Plane, 29.2 sq. ft.
Area of Fin, 6.5 sq. ft. approx.
Area of Rudder, 6.4 sq. ft.
Area of Elevators, 22.0 sq. ft.
Horizontal Area of Body, 53.2 sq. ft.
Vertical Area of Body, 91.6 sq. ft.
Total Weight per h.p., 14.3 lbs. per h.p.
Crew, Pilot and Observer.
Armament, 1 Spandau firing through propeller.
1 Parabellum on ring mounting.
Engine, Opel Argus, 180 h.p.
Petrol Capacity, 37¼ gallons.
Oil Capacity, 3 gallons.

PERFORMANCE.

(a) Climb to 5,000 feet, 7 mins.
Rate of climb in ft. per min, 590.
Indicated air speed, 68.
Revolutions of Engine, 1,495.
(b) Climb to 10,000 ft., 18 mins.
Rate of climb in ft. per min., 340.
Indicated air speed, 65.
Revolutions of Engine, 1,475.
(c) Climb to 13,000 ft., 29 mins., 45 secs.
Rate of climb in ft. per min., 190.
Indicated air speed, 62.
Revolutions of Engine, 1,445.

SPEED.

At 10,000 ft. 96 miles an hour; Revolutions, 1,565.
At 13,000 89½ miles an hour; Revolutions, 1,520.
Service ceiling at which rate of climb is 100 ft. per min., 15,000.
Estimated absolute ceiling, 16,500.
Greatest height reached, 14,400 in 39 mins. 10 secs.
Rate of climb at this height, 120 ft. per min.
Air endurance, about 2½ hours at full speed at 10,000 ft., including climb to this height.
Military load, 545 lbs.

The machine is nose-heavy with the engine off, and slightly tail-heavy with the engine on. It tends to turn to the left with the engine on.

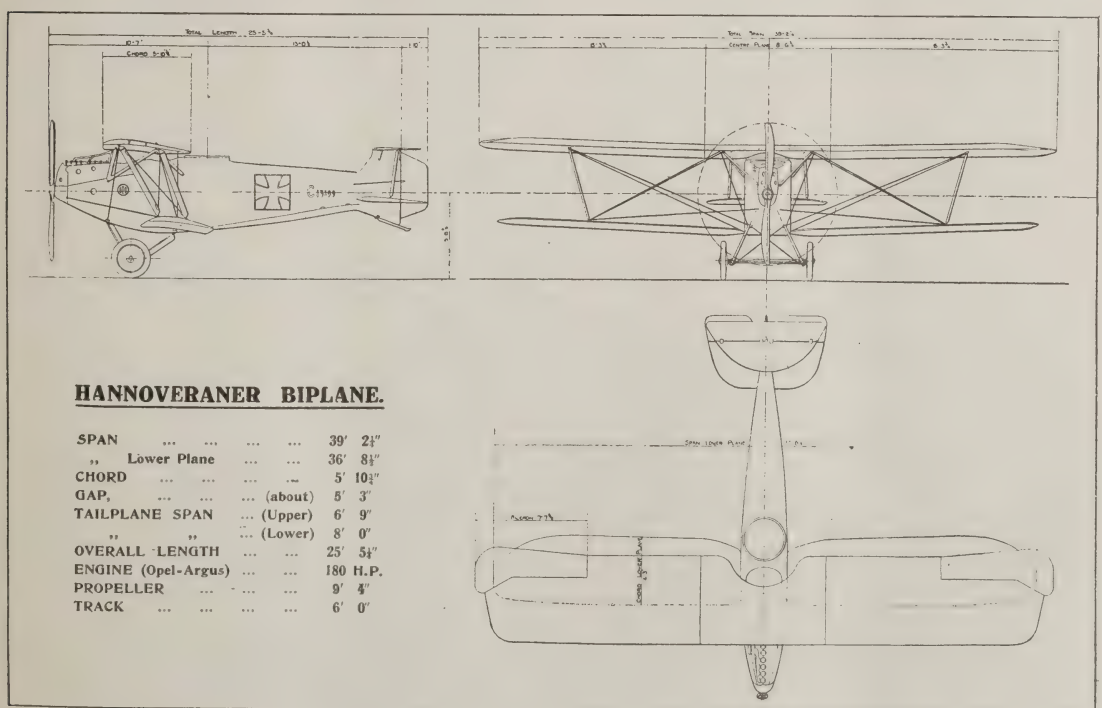
The machine is generally light on controls, except that the elevator seems rather insufficient at slow speeds. It is not very tiring to fly, and pulls up very quickly on landing.

The view is particularly good for both pilot and observer. The former sits with his eyes on a level with the top plane, and also enjoys a good view below him on account of the narrow chord of the lower plane.

The general arrangement of the Hannoveraner wings is somewhat reminiscent of the R.E.8 except, of course, that the bottom planes have no ailerons. The upper wings are practically flat in end elevation, but the lower have pronounced dihedral angles of 2.7 deg., and are set with a positive stagger of 2 ft. 7½ ins. The chord of the upper plane is 5 ft. 10¾ ins., and that of the lower plane 4 ft. 3 ins. In flying position, therefor, the trailing edge of the lower plane is slightly in advance of that of the upper plane. The angles of incidence marked on the manufacturer's rigging diagram, which is fixed to the side of the fuselage, and stamped on the fabric of the wing, are as follows:—

Lower Wings	5½ deg. at fuselage.
	5 deg. at struts.
Top Wings	5 deg. throughout.

The lower wings are carried direct from the bottom edge of the fuselage, the roots of the upper planes being carried on a rigidly constructed centre section, which embraces the radiator and the gravity feed petrol tank. The rearward portion of the centre section is cut away immediately over the pilot's seat, and at this point the wing is about 1 ft. above the upper surface of the fuselage. The lower plane has no very pronounced wash-out, but this feature is more noticeable in the upper plane, and is enhanced by the design of the ailerons, the tips of which are set at a slightly negative angle. This gives the characteristic German appearance to the aeroplane when seen in flight.



HANNOVERANER BIPLANE.

SPAN	39′	2¼″
,, Lower Plane	36′	8½″
CHORD	5′	10¾″
GAP, ... (about)	5′	3″
TAILPLANE SPAN ... (Upper)	6′	9″
,, ,, ... (Lower)	8′	0″
OVERALL LENGTH	25′	5½″
ENGINE (Opel-Argus)	180	H.P.
PROPELLER	9′	4″
TRACK	6′	0″

TEST OF 300 H. P. MERCEDES ENGINE

(April 5, 1918)

Calibration and Endurance Tests

The Maybach engine (No. 1261) after several slight repairs had been carried out to the cylinders and propeller hub flange and coupling, was erected on a test bed, coupled to a Heenan and Froude dynamometer, and submitted to the following power and consumption tes.s, including a one hour's duration test at normal speed. The results of the calibration tests are as follows:

R. P. M.	1,200	1,300	1,400	1,500
B. H. P.	258	279	294.5	304.5
Brake, M. E. P.	120.5	120.3	118	113.9
Petrol consumption in pints, B. H. P. hour	.53	.52	.526	.545

One Hour Test

At the conclusion of the above tests a run of one hour's duration at normal revolutions (1,400 r.p.m) was carried out with the following results:

Average B.H.P.	290.
Petrol consumption	20 gallons = .55 pint per B.H.P. hour
Oil consumption	11 pints = .038 pint per B.H.P. hour
Oil pressure	5 lbs./sq. in.
Oil temperature	67° C.
Water temperature (inlet)	57° C.
Water temperature (outlet)	68° C.

Valve Timing During Tests

Inlet.	Exhaust.
O. 8°E.	O. 33°E.
C. 35°L.	C. 7°L.
Magneto advance	38°E.

Running was steady at all speeds between 900 and 1,400 r.p.m., but owing to the fact that the propeller hub flange on the crankshaft was damaged, and was running slightly out of truth, the vibration became excessive above 1,400 r.p.m.

Considerable trouble was experienced with the water connection between the cylinders on the exhaust side. The running became unsteady below 900 r.p.m.

Distribution

Owing to the exhaust manifold being fitted as part of the engine starting gear, it was not possible to form an idea of the distribution.

F. G. C. Ap.D. (L.).
May, 1918.

J. G. Weir,
Lieutenant-Colonel,
Controller, Technical Department.

General Data

Make of engine and rated h.p.	Maybach 300 h.p.
Type number	1261.
Number and arrangement of cylinders	Six vertical.
Bore	165.0 mm. = 6.50 in.
Stroke	180.0 = 7.09 in.
Stroke/bore ratio	1.09 : 1.
Area of one piston	213.825 sq. cm. = 33.2 sq. in.
Total piston area of engine	1282.95 sq. cm. = 199.2 sq. in.
Swept volume of one cylinder	3848.85 cu. cm. = 235.3 cu. in.
Total swept volume of engine	23093.1 cu. cm. = 1412.0 cu. in.
Clearance volume of one cylinder	778.9 cu. cm. = 47.54 cu. in.
Compression ratio	5.95 : 1.
Normal b.h.p. and speed	294.0 b.h.p. at 1,400 r.p.m.
Maxium b.h.p. and sped	304.5 b.h.p. at 1,500 r.p.m.
Normal b.m.e.p.	117.7 lbs. per sq. in. at 1,400 r.p.m.
Maximum b.m.e.p.	120.5 lbs. per sq. in. at 1,200 r.p.m.
Piston speed	1654.0 ft. per min. at 1,400 r.p.m.
Mechanical efficiency (calculated)	86.0%.
Indicated mean pressure (calculated)	137.0 lbs. sq. in.
Fuel consumption per b.h.p. hour	0.526 pint = 0.473 lbs.
Brake thermal efficiency	28.9%.
Indicated thermal efficiency	33.6%.
Air standard efficiency	51.0%.
Relative efficiency	65.9%.
Cu. in, of swept volume, per b.h.p.	4.80 c. in.
Sq. in. of piston area per b.h.p.	0.678 sq. in.
H.p. per cu. ft. of swept volume	360.0 b.h.p.
H.p. per sq. ft. of piston area	212.4 b.h.p.
Direction of rotation of crankshaft.	Anti-clockwise (facing propeller)
Direction of rotation of propeller	Anti-clockwise (facing propeller)
Type of valve gear	overhead valve rocker and push rods.
Type of starting gear	Maybach of special design.
Number of carburettors	Two Maybach.
Bore of main jets	Variable from 0.0 to 2.5 mm.
Bore of pilot jets	Variable from 0.0 to 1.1 mm.
Fuel consumption per hour	19.33 gallons.

Valve Areas and Gas Velocities

Diameters	
Induction pipe	62.0 mm. = 2.44 in.
Inlet port	45 × 67 mm. = 1.77 × 2.64 in.
Exhaust port	45 × 67 mm. = 1.77 × 2.64 in.
Exhaust branch pipes	66.0 mm. = 2.60 in. (approx.).
Cross Sectional Areas.	
Induction pipe	29.26 sq. cm. = 4.67 sq. in.
Inlet port	30.15 sq. cm. = 4.67 sq. in.
Inlet valve (π dh.)	4.416 sq. in. (total).
Exhaust valve (π dh.)	4.366 sq. in. (total).
Exhaust port	30.15 sq. cm. = 4.67 sq. in.
Exhaust branch pipes	34.11 sq. cm. = 5.31 sq. in.
Gas Velocities.	
Induction pipe	196.1 ft. per sec.
Inlet port	196.1 ft. per sec.
Inlet valve	208.0 ft. per sec.
Exhaust value	210.0 ft. per sec.
Exhaust port	196.1 ft. per sec.
Exhaust branch pipes	172.5 ft. per sec.

(INLET VALVES (Two per cylinder).

Outside diameter	54.0 mm. = 2.126 in.
Port diameter (in cylinder head)	48.0 mm. = 1.89 in.
Width of seating	3.5 mm. = 0.137 in.
Angle of seating	30°
Radius under valve head	20.0 mm. = 0.787 in.
Lift of valve	9.45 mm. = 0.372 in.
Diameter of stem	11.0 mm. = 0.433 in.
Over-all length of valve	136.5 mm. = 5.373 in.
Number of springs per valve	One.
Free length of spring	52.5 mm. = 2.066 in.
Length of spring in position (no lift)	39.5 mm. = 1.55 in.
Mean diameter of coils	51.0 mm. = 2.00 in.

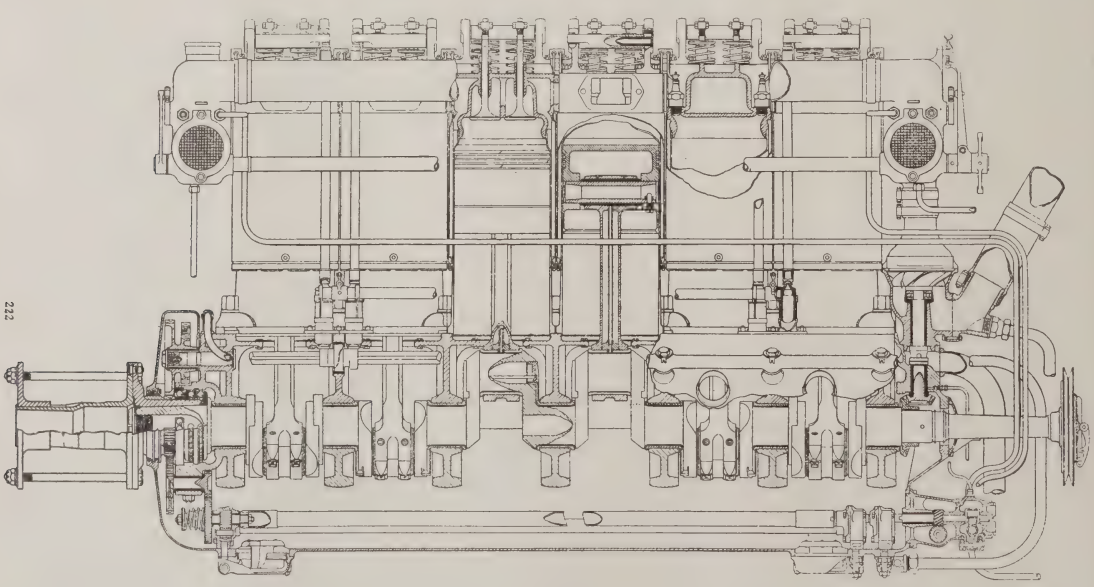


FIG. 49
GENERAL SECTIONAL ARRANGEMENT OF THE 300 h.p. MAYBACH ENGINE

Gauge of wire	No. 6 b.w.g.
Ratio length of spring/lift of valve	4.17 : 1.
Weight of valve complete with spring	0.843 lb.
Weight of spring bare	0.281 lb.
Inlet valve opens, deg. on crank	8° early.
Inlet valve closes, deg. on crank	35° late.
Period of induction	223°
Inlet tappet clearance	0.3 mm. = 0.012 in.

Connecting Rod

Length between centres	310.0 mm. = 12.205 in.
Ratio. Connecting rod/crank throw	3.44 : 1.
Little end bearing type	Floating cast-iron bush.
Floating bush, diameter, inside	38.0 mm. = 1.496 in.
Floating bush, diameter, outside	44.3 mm. = 1.743 in.
Floating bush, effective length inside	93.0 mm. = 3.661 in.
Floating bush, projected area of bearing on gudgeon pin	35.35 sq. cm. = 5.48 sq. in.
Ratio. Piston area/projected area of little end bearing	6.06 : 1.
Big end bearing. Type	Bronze shell lined white metal.
Big end bearing. Diameter	66.0 mm. = 2.598 in.
Big end bearing. Length (actual)	73.56 mm. = 2.893 in.
Big end bearing. Length (effective)	65.5 mm. = 2.580 in.
Big end bearing. Projected area	43.23 sq. cm. = 6.700 sq. in.
Ratio. Piston area/projected area of big end bearing	4.96 : 1.
Number of big end bolts	Four.
Full diameter of bolts	14.0 mm. = 0.551 in.
Diameter at bottom of threads	12.0 mm. = 0.472 in.
Total cross sectional area, bottom of threads	4.520 sq. cm. = 0.70 sq. in.
Pitch of threads	1.5 mm.
Total load on bolts at 1,400 r.p.m.	5,824 lbs.
Total load on bolts at 1,600 r.p.m.	7,602 lbs.
Stress per sq. in. at 1,400 r.p.m.	8,320 lbs. sq. in.
Stress per sq. in. at 1,600 r.p.m.	10,860 lbs. sq. in.

Crankshaft

Number and type of main bearings	Seven bronze shell lined white metal.
Cylinder centres	187.0 mm = 7.362 in.
Crank-pins.	
Outside diameter	66.00 mm. = 2.598 in.
Inside diameter	38.0 mm. = 1.496 in.
Length	74.0 mm. = 2.913 in.
Journals.	
Outside diameter	66.0 mm. = 2.598 in.
Inside diameter	36.0 mm. = 1.417 in.
Length, propeller end	67.0 mm. = 2.638 in.
Length, rear end	67.0 mm. = 2.638 in.
Length, centre	67.0 mm. = 2.638 in.
Length, intermediate	67.0 mm. = 2.638 in.
Crank Webs.	
Width	95.0 mm. = 3.740 in.
Thickness	23.0 mm. = 0.906 in.
Radius at ends of journals and crank-pins	4.5 mm. = 0.171 in.
Weight of complete shaft	99.9 lbs.

Working Clearances

Piston clearance, top (total)	0.75 mm. = 0.029 in.
Piston clearance, bottom (total)	0.25 mm. = 0.009 in.
Side clearance of connecting rod in piston (total)	11.8 mm. = 0.464 in.
Side clearance of big end on crank-pin (total)	0.44 mm. = 0.0173 in.
End clearance of crankshaft in main bearings	3.0 mm. = 0.118 in.
Clearance of valve stem in guide (inlet)	0.12 mm.= 0.00472 in.
Clearance of valve stem in guide (exhaust)	0.15 mm.= 0.0059 in.

Lubrication System

Number and type of oil pumps	Three, rotary gear.
Oil consumption per hour	11.0 pints.
Oil consumption per b.h.p. hour	0.037 pints.
Oil temperature	65° Centigrade.
Oil pressure	5.0 lbs. per sq. in.
Specific gravity of oil	0.899 s.p.g.
Ratio. Pump speed/crankshaft speed	1 : 2.
Pump delivery (calculated at 100% volumetric efficiency)	91 gallons per hour at normal engine revs.

Ignition

Number and type of magnetos	Two Bosch.
Firing sequence of engine	1-5-3-6-2-4.
Ignition timing (fully advanced)	38° early.
Number of plugs per cylinder	Two.
Type of plugs	Bosch 3 point.
Ratio. Magneto speed/engine speed	1.5 : 1.

Cooling System

Number and type of water pumps	One centrifugal.
Diameter of inlet pipe	54.0 mm. = 2.126 in.
Diameter of outlet pipe	50.0 mm. = 1.966 in.
Diameter of rotor	111.0 mm. = 4.36 in.
Water capacity of one cylinder	1284.0 cu. cm.
Number and type of radiators	One, semi-circular honeycomb.
Ratio. Water pump speed/engine speed	2 : 1.
Water temperature, inlet	57° Centigrade.
Water temperature, outlet	68° Centigrade.

Petrol Pump

Number and type of petrol pumps	One Maybach, double acting.
Bore	15.0 mm. = 0.59 in.
Stroke	17 mm. = 0.66 in.
Normal delivery	264 pints per hour at 800 r.p.m.
Maximum delivery	630 pints per hour at 1,275 r.p.m.
Ratio. Pump speed/crankshaft speed	1 : 2.

Weights

Weight of complete engine, dry, with propeller boss and exhaust manifold	911 lbs.
Weight per b.h.p., ditto	3.10 lbs.
Weight of fuel per hour	139 lbs.
Weight of oil per hour (s.p.g. 0.899)	12.36 lbs.
Total weight of fuel and oil per hour	151.36 lbs.
Gross weight of engine in running order, less fuel and oil (cooling system at 0.65 lbs. per b.h.p.)	1102.0 lbs.
Weight per b.h.p., ditto	3.79 lbs.
Gross weight of engine in running order, with fuel and oil for six hours (tankage at 10% weight of fuel and oil)	2100.9 lbs.
Weight per b.h.p., ditto	7.14 lbs.

General Analysis of Weights

Description of Part	No. per set	Average unit in lbs.	Weight of complete set in lbs.	Percentage of total weight
Cylinders, bare	6	32.75	196.50	21.59
Pistons, complete with rings and gudgeon pin set screws	6	12.30	73.80	8.11
Gudgeon pins	6	1.75	10.50	1.15
Connecting rods and floating bushes	6	8.93	49.12	5.39
Crankshaft, complete with oil rings	1	99.90	99.90	10.98
Crankshaft extension, with nut and pin	1	4.00	4.00	0.44
Inlet valves	12	0.43	5.25	0.57
Exhaust valves	12	0.47	5.70	0.62
Inlet and exhaust valve springs	24	0.28	6.74	0.74
Inlet and exhaust valve collars, with cotters and locking device	24	0.12	3.00	0.32
Thrust, complete with bull races, propeller hub flange, and camshaft driving sprocket	1	17.68	17.68	1.94
Camshafts	2	10.00	20.00	2.20
Overhead valve rockets, complete	12	1.08	12.99	1.42
Overhead rocker bearings, complete	24	0.42	10.50	1.15
Valve tappets and guides	12	0.93	11.25	1.23
Crankcase, top half	1	94.30	94.30	10.36
Crankcase, bottom half	1	41.32	41.32	4.54
Bearing caps	6	2.68	16.12	1.77
Front bearing cap	1	5.56	5.56	0.61
Crankcase holding-down bolts, with clamps, nuts and washers	14	2.40	33.60	3.70
Induction pipe, complete	1	9.09	9.09	1.00
Propeller hub, with bolts and nuts	1	21.00	21.00	2.30
Inlet valve push rods	6	0.48	2.90	0.32
Exhaust valve push rods	6	0.49	2.97	0.33
Inlet and exhaust stiffening plates	2	2.00	4.00	0.44
Oil pumps, with drive and pipe	1	9.00	9.00	0.98
Rear cover plate	1	6.06	6.06	0.66
Front cover plate	1	4.00	4.00	0.44
Water pump, complete	1	8.50	8.50	0.93
Camshaft, oil and water pumps driving gears	1	13.65	13.65	1.50
Wireless clutch	1	5.06	5.06	0.55
Revolution counter gear	1	2.62	2.62	0.28
Machine gun interrupter gear	1	1.82	1.82	0.20
Petrol pump	1	3.50	3.50	0.38
Magnetos	2	10.75	21.50	2.36
Magneto wiring	1	4.75	4.75	0.52
Oil pipes	1	4.00	4.00	0.44
Self-starter gear	1	6.00	6.00	0.66
Exhaust manifold	1	27.00	27.00	2.96
Carburettors	2	16.00	32.00	3.51
Miscellaneous	—	—	3.75	0.41
Total weight of engine	—	—	911.00	100.00

Metallurgical Analysis of Principal Parts

	Carbon per cent.	Graphite Carbon per cent.	Combined Carbon per cent.	Silicon per cent.	Manganese per cent.	Sulphur per cent.	Phosphorus per cent.	Nickel	Chromium per cent.
Cylinder head	—	2.57	0.91	1.60	0.70	0.131	0.34	—	—
Cylinder barrel	0.49	—	—	0.33	1.01	0.028	0.054	—	—
Cylinder water jacket	0.25	—	—	0.27	0.63	0.032	0.037	—	—
Piston	—	2.42	0.83	1.29	0.83	0.111	0.30	—	—
Gudgeon pin floating bush	—	2.39	0.65	1.43	0.76	0.146	0.47	—	—
Gudgeon pin	0.28	—	—	0.23	0.48	0.028	0.022	—	—
Connecting rod	0.15	—	—	0.33	0.31	0.027	0.010	1.42	0.49
Inlet valve	0.53	—	—	0.30	0.48	0.032	0.044	4.01	0.51
Exhaust valve	0.10	—	—	0.20	0.26	0.019	0.023	3.62	1.16
Crankshaft	0.31	—	—	0.31	0.63	0.030	0.015	4.01	0.83
Camshaft	0.40	—	—	0.25	0.23	0.022	0.040	3.46	0.68
Camcore	0.17	—	—	0.23	0.75	0.036	0.014	0.47	—

	Lead per cent.	Iron per cent.	Tin per cent.	Copper per cent.	Zinc per cent.	Antimony per cent.	Silicon per cent.	Manganese per cent.
Big-end bearing metal	3.51	—	80.05	6.34	—	9.90	—	—
Main journal bearing	0.92	—	77.65	10.00	—	11.18	—	—
Crankcase	—	0.99	—	0.87	12.01	Aluminum (by Diff) 86.57	0.56	trace

CAPTAIN SCHROEDER ESTABLISHES WORLD ALTITUDE RECORD

THE Contest Committee of the Aero Club of America has homologated the world's altitude record made by Captain R. W. Schroeder, in a Bristol fighter equipped with 300 H. P. Hispano-Suiza motor, of 28,900 feet above sea level, during a flight on September 18, 1918, at Wilbur Wright Field, Fairfield, Ohio, near Dayton.

Nothing was more fitting. While the Allies' aviators overseas are beating the Germans on the various fronts, an American aviator, Captain R. W. Schroeder, U. S. Air Service, beats the German aeroplane altitude record.

Captain Schroeder left the ground at 1:45 P. M., September 18, 1918, and reached his highest point in 105 minutes, which would have been at about 3:30 P. M. It took him about twenty minutes to descend, landing about 200 miles from where he started, at about 3:50 P. M.

Captain Schroeder is in charge of all Performance Tests at the Wilbur Wright Station and his duties require him to go to 21,000 and 22,000 feet quite often, and he generally goes without oxygen. In this record climb, he got along well up to 25,000 feet without oxygen. He used no anti-freezing mixture and his maximum water temperature was 85 degrees centigrade at the start minimum and of 60 degrees centigrade at the highest altitude. The temperature of the air was 32 degrees centigrade below zero.

The reports, including the two barograph charts, duly calibrated and corrected; the performance curves, and the temperature record were certified to by Lieut. George B. Patterson, O. I. C. Performance Tests Reports and the instruments were calibrated by the Bureau of Standards, and adjusted locally at the McCook Field Laboratory and personally installed on the aeroplane by Lieut. Patterson.

The previous American altitude record was made by Caleb Bragg at Mineola, L. I., September 20, 1917, in a Wright Martin, Model V machine, when he reached the altitude of 20,250 feet, and the last world's record of the International Aeronautic Federation made by G. Legagneux in France on the 28th of December, 1913, was 6,120 meters (20,258 feet). In July, 1914, a German aviator was reported as having flown to 26,200 feet, but the record was never submitted for homologation.

This world's record, made by Captain Ruddy W. Schroeder, is the first world's aeroplane altitude record held by an American since the world's altitude record made by Lincoln Beachey, at Chicago, Ill., during the International Meet, August 20, 1911, when he reached the height of 11,642 feet (3,548 meters).

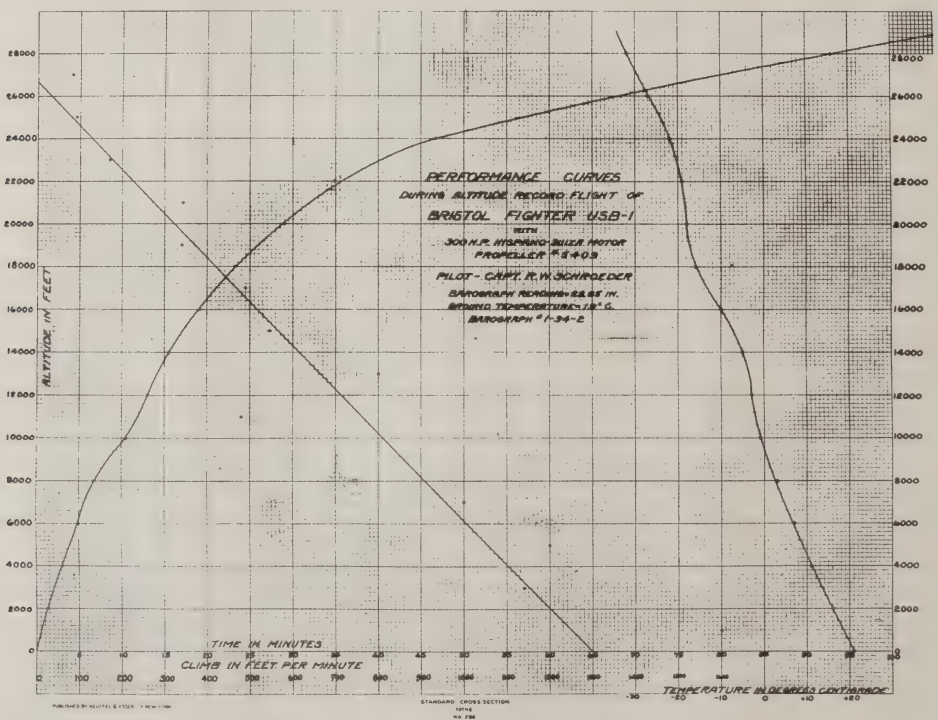
Under the rules of the International Aeronautic Federation, the international aeronautic body which controls all aeronautic sports and gives the necessary official recognition to records, a pilot must hold the International Aviator's certificate to have his record recognized. This certificate is issued in the United States by the Aero Club of America, which is the Federation's sole representative in this country. Captain Schroeder held the F. A. I. certificate at the time he made the record, therefore his record will be accepted by all the countries affiliated with the International Aeronautic Federation and the Pan-American Aeronautic Federation, which represents the twenty Latin-American republics.

Under the rules of the Federation to establish an altitude record it is necessary to beat the old record by at least 100 meters. Captain Schroeder, therefore, beat the record by a good margin and has gone higher than the highest of mountains, with the exception of the highest peak of the Himalaya, which rises to 29,002 feet.

Captain Schroeder is a veteran in the aeronautic movement. He is an old time member of the Aero Club of Illinois and well known for his ability as an aviator and aeronautic engineer.



Capt. R. W. Schroeder who made the new altitude record



Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville

Aero Mail Scores 100% for September

The record of the Air Mail Service between Washington, Philadelphia and New York for the month of September was 100% perfect.

The operation of the aeroplanes, constructed for the Post Office Department, by civilian pilots of the postal service was inaugurated August 12. The record of all the flights from this date to the first of September, except two, was 100% perfect, the score of two flights being reduced to 99% by reason of forced landings.

The September report covers the first full month of operation under entirely civilian organization, and the round trip flight was made each day without a break in the service. The distance covered by these flights was 11,351 miles; the total time consumed 156 hours and 9 minutes, and the total weight of mail carried was 15,199 lbs.

During the month there were but three forced landings and these were not such as to interrupt the flights.

AERIAL MAIL OPERATION FOR THE MONTH OF SEPTEMBER, 1918

Date	*Miles flown*	*Hrs. of flying*		*Mail carried*		*Percent of Performance*	*Arrival*	
		hrs.	*min.*	*A.*	*O.*		*Wash.*	*N. Y.*
SEPT.	1.	2.		3.		4.	5.	
2	436	5	29	27	515	100%	2.44	2.40
3	436	5	30	31½	580	100%	3.15	2.15
4	436	5	39	39½	617	100%	3.10	2.20
5	436	6	11	36	581	100%	4.00	2.08
6	436	5	35	35	608	100%	3.05	2.35
7	436	5	37	35	589	100%	3.18	2.18
9	436	5	51	48½	562	100%	2.47	2.59
10	436	6	03	38½	585	100%	3.05	2.48
11	436	5	50	36	573	100%	2.36	3.04
12	436	5	45	35½	603	100%	3.05	2.27
13	436	5	13	34	559	100%	3.05	2.05
14	436	6	22	34	558	100%	4.00	2.15
16	436	6	11	33½	582	100%	4.05	2.00
17	436	5	26	35	482	100%	3.30	1.50
18	436	7	11	39½	444	100%	7.30	2.50
19	436	6	06	35	608	100%	4.05	1.53
20	436	6	29	33	574	100%	3.50	3.12
21	444	6	04	31	618	100%	5.00	2.30
23	436	5	48	34½	566	100%	3.05	2.44
24	436	6	17	36½	575	100%	3.31	3.30
25	436	6	41	31	361	100%	4.31	2.37
26	654	9	03	34¼	771½	100%	4.10	2.39
27	661	9	25	32½	857½	100%	3.42	2.42
28	436	6	41	34½	589	100%	5.05	1.48
30	436	5	42	34	367	100%	3.08	2.42
Total	11,351	156	09	874¾	14,325			

NOTE—Number of hours of dead flying for the month, 14 hrs., 40 min.

Explanation of Tabulation:

1. *Miles flown:*
   Leg from Washington to Philadelphia.... 128 miles
   Leg from Philadelphia to New York..... 90 miles
   Miles flown for the day; whether one,two, three or four legs of the trip have been made. The aim is to get exactly the number of miles flown in connection with the mail service each day. Therefore, mileage of partial trips should be indicated.
2. *Hours of flying:* To include the actual hours and minutes machine is in the air with mail.
3. *Mail carried:* In this column, under A, give pounds of aeroplane mail; and under O, give pounds of ordinary mail.
4. *Percent of Performance:* Round trip Washington-New York consists of four legs, each leg valued at 25% if completed by aeroplane and not by train before close of day.

PERFORMANCE OF AVIATORS DURING THE MONTH OF SEPTEMBER, 1918.

Total possible number of flights	100
Total possilbe mileage	10,900
Total perfect (uninterrupted) flights made	97
Total interrupted flights made	3
Total flights defaulted on account of weather	0

Pilot	*Perfect Flights*		*Forced Landings Interrupted Flights*	*Uncompleted Flights*	*Total Flights*	
	No.	*Miles*			*No*	*Miles*
Dana C. DeHart	32	4388	2 (a)	0	34	3706
Robert F. Shank	33	3616	1 (b)	0	34	3706
Maurice A. Newton	30	3270	0	0	30	3270
Max Miller	2	218	0	0	2	218
Total	97	10,592	3	0	100	10,900

Cause of Forced Landings:

(a) DeHart, September 18th, compass disturbances in storm; September 21st, ignition trouble.

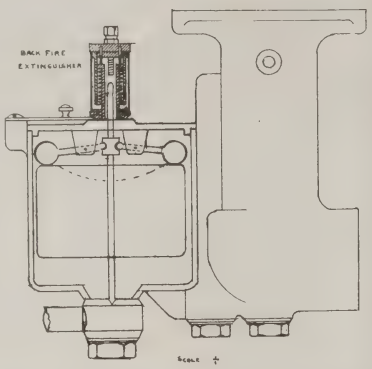
(b) Shank, September 24th, water-system trouble.

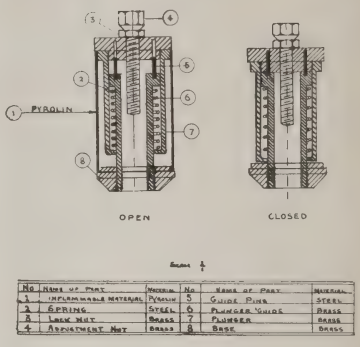
A BACK-FIRE EXTINGUISHER

MR. HAROLD SUCKERT, a well-known carburetor expert and engineer, has designed the Back-fire Extinguisher shown in the accompanying sketches and plates.

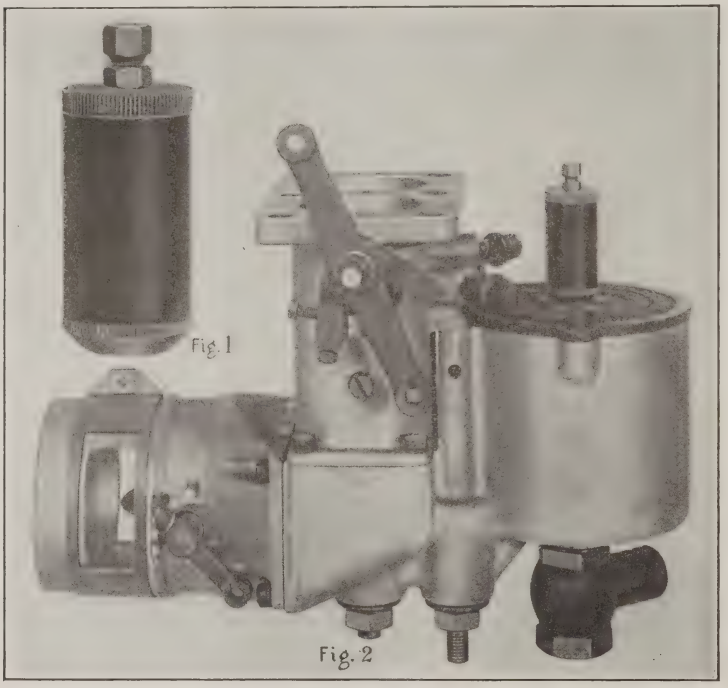
While it is not claimed that it will prevent back fires, which are unavoidable, it is claimed and has been demonstrated, that this simple device will shut off the gasoline from the tank, the moment a back fire sets fire to the carburetor, thus making possible the prevention of serious accidents. The device can be attached to any type of carburetor, either on aeroplanes, automobiles or motor boats, its action is as follows:

It is screwed on the top of the carburetor float chamber, directly over the intake needle valve, which extends up into the body of the device, within an eighth of an inch of the bottom of the adjustable rod No. 4, which is carried by the plunger No. 7. The spring No. 2, which is under compression, surrounds the plunger guide No. 6, which screws onto the top of the carburetor float chamber. This spring is kept under compression by a highly inflammable perforated collar of Pyrolin, which flashes instantly on coming into contact with any flame. This immediately releases the tension on the spring, which causes the plunger No. 7 to seat on the base No. 8, thus forcing the intake needle valve firmly against its seat, shutting off all flow of gasoline from the tank.





No.	Name of Part	Material	No.	Name of Part	Material
1	Inflammable Material	Pyralin	5	Guide Pins	Steel
2	Spring	Steel	6	Plunger Guide	Brass
3	Lock Nut	Brass	7	Plunger	Brass
4	Adjustment Nut	Brass	8	Base	Brass



It is a well-known fact that any contingency which causes the motor to race, such as a broken propeller blade or particularly rarified strata of air, draws the fuel out of the float chamber faster than it can be supplied. This invariably causes a back fire, due to too thin a mixture. When this occurs, the float is usually down, and the gas line fully open. The gasoline under pressure is forced into the flame, and this usually spells disaster.

The Back-fire Extinguisher does automatically what the operator is supposed to do manually, shuts off the supply from the tank.

This does not necessarily put the engine out of commission as there is a connection to the dash board which permits the driver to immediately raise the device to its original position, and continue his flight.

A supply of Pyrolin collars is furnished with each device. The Back-fire Extinguisher is controlled by W. H. de Fontaine of 1697 Broadway, New York, formerly President of the H and N Carburetor Company, who has offered it to the United States Government and her Allies.

THIRD ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE ON AERONAUTICS

Physical Problems

(*Concluded from page* 175)

BESIDE the more general problems, the following problems of a physical, rather than an aeronautical nature, are of particular interest, and under same the following progress is noted:

A. *Noncorrosive materials.*—For the production of iron and steel, investigations of zinc coatings produced by the hot dip, sherardizing, and electroplating processes have been carried on at the Bureau of Standards. Investigations are under way to determine the relative resistance to corrosion by these processes and also the effect on the physical properties of steel as influenced by such processes. Various methods of testing these products as by accelerated tests, such as the salt-spray test, measurements of thickness and quantity of coating are being studied to develop adequate specifications for these materials.

Some work has also been done in connection with the following additional rust-proof processes: Copper and nickel plating; Parker process (which consists in treating with phosphoric acid and final oiling); the magnetic oxide coating such as Bon Tempi process, which may or may not be oiled; lead coating as produced by the Lohman hot-dip process; tin coating; metallic coatings produced by the metal-spraying process; inert coating, such as paint, japan, and baked enamels.

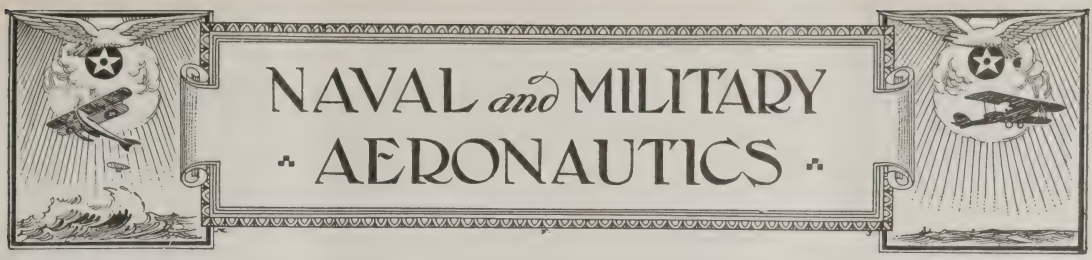
The great variation in thickness and weight of the metallic coatings produced under commercial conditions are such as to make it difficult if not impossible to determine their value by these measurements alone. Some standard accelerated corrosion tests are therefore necessary before uniformly protected coatings can be specified.

B. *Flat and cambered surfaces.*—The committee has obtained reports of several tests conducted at the National Physical Laboratory of Great Britain, which contain valuable information on stabilizers, elevators, and rudders.

Accurate data can be obtained from Report No. 17, previously referred to, as to variations to be made in tail surfaces, viz: size; position, both longitudinal and vertical; angles of tail plane to wing; aspect ratio; and sections, flat and cambered.

C. *Terminal connections.*— Tests have been made on two forms of terminal connection, one a sleeve allowing the forming of a solderless loop and the other a turnbuckle by means of which a cable or wire may be loosened without unscrewing the turnbuckle barrel. The tests thus far are not

(*Continued on page* 239)



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Reprt to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to Students' Army Training School, Univ. of Ark., Fayetteville, Ark.

Note 3—Report to Students' Army Training School, Valparaiso Unit., Valparaiso, Ind.

Note 4—Report to Students' Army Training School, Purdue Univ., Lafayette, Ind.

Note 5—Report to Students' Army Training School, Univ. of Me., Orono, Maine.

Note 6—Report to Students' Army Training School, Iowa State College, Ames, Iowa.

Note 7—Report to Students' Army Training School, Univ. of Cinn., Cincinnati, Ohio.

Note 8—Report to Students' Army Training School, Carnegie Tech., Pittsburgh, Pa.

Note 9—Report to Students' Army Training School, Boston College, Boston, Mass.

Note 10—Report to Students' Army Training School, Ind. Chamber of Commerce, Indianapolis, Ind.

Note 11—Report to Aviation Repair Depot, Indianapolis, Ind.

Note 12—Report to Dis. Mgr. Finance, Yeon Bldg., Portland, Ore.

Note 13—Report to Aviation Gen. Supply Depot, Middletown, Pa.

Note 14—Report to Acceptance Park, Detroit, Mich. Wire DAP.

Note 15—Report to Chief Technical Division, Dayton, O.

Note 16—Report to Production Dept., Saving and Trust Bldg., Dayton, O.

Note 17—Report to Dis. Mgr., 480 Lexington Ave., New York City.

Note 18—Report to Dis. Mgr., Aircraft Production, Dayton, O.

Special Orders Nos. 215-221, Inclusive

A

Arthur, Ira W.....SLA; BFT
Abbey, Evers.....SLA; CUI
Ault, Leo V.....CUI
Allen, Harold Draper.....SLA; CJW
Alexander, Robert P.....PMT
A'Hearn, Clarence Joseph.....SLA; KST
Andrews, Howard Milo.....KST
Andrews, Harold W.....SLA
Andrews, Elmer Frank.....SLA; SAG
Andrews, Lloyd James.....SLA; CFT
Andrews, Howard B.....FLA
Adams, Alfred Azel.....FLA
Allen, Porter W.....WFO
Ayres, Stanley Wrightman.....SLA; CFT
Austin, Edward Cowles.....SLA; RWT
Atkinson, William T.....RWT
Athey, Gerald Browne.....CWT
Avent, Ira M.....EOT
Allison, Ernest M.....SBI
Aehle, Truman H.....CGC
Alway, James Douglas.....PWM

B

Brown, Mays Priest.....SLA; TMA
Berens, Fred W.....FRF
Beymer, Harold Scoville.....SLA; ELA
Born, Jacob.....SLA; CWT
Butler, Lawrence Otis.....SLA; BFT
Bradley, Timothy W.....TFT
Barnes, Gerald Kneedy.....SLA; ABC
Burnham, Stanley.....ABC
Bailey, Elmer Samuel.....FLA
Bocker, Leon Morris.....FLA
Bradford, Harry Alonzo.....FLA
Brang, Raymond L.....FLA
Beggs, Joseph D.....CGC
Benedict, Frank Griffith.....SLA; GLC
Butler, Frederick W.....TFT
Brawley, William Foote.....SLA; CWT
Buck, Carl Edward.....SLA; KST
Brown, Warren D.....CGC
Burbank, Wayne.....SLA; ABC
Bishop, Joseph Alfred.....SLA; TMA
Bowe, Charles James.....SLA; GLC
Blair, Edward.....CUI
Brown, Albert S.....TFT
Bourne, Granville H.....DAP
Bushman, Francis Lawrence.....SLA; TMA
Brown, Homer.....SLA; BFT
Buck, Robert Wales.....SLA; VBW
Billings, John Shaw.....SLA; CRI
Brown, Edward Tilden.....SLA; CWT
Browne, Robert E.....TFT
Boggs, Harry Ariail.....SLA; SAG
Bushnell, Sherman W.....ASM
Bankart, Lawrence Hardy.....FLA; HHN
Budd, Thomas Gallaudet.....SLA; SAG
Brockway, George Glen.....SLA; PMT
Blair, Frank Williamson.....CWT
Benvie, Frank William.....CWT
Bell, Harry Smith.....CWT
Brodd, Earl Frederick.....CWT
Boggs, Paul Raymond.....CWT
Bridgman, Orlando Wilson.....CWT
Beattie, Harold Goldsmith.....SLA; PMT
Birnn, Roland.....WFO
Banta, George Henry.....SLA; CFT
Brown, Courtlandt Moshier.....SLA; CJW
Boyden, William Edward.....SLA; PMT
Brock, Harry.....SLA; TMA

Bullock, Wiley O.....WFO
Brown, Ray Walter.....SLA; GLC
Brown, Albert Skillman.....SLA; KST
Brown, Edward T.....WFO
Beverley, George H.....SAG
Billig, Hal C.....SAG
Blackler, Perry W.....SAG
Bronez, Frank Louis, Jr.....SLA; ELA
Burge, Kemp S.....LHV
Bennett, Thomas Edmund.....SLA; KST
Buster, Melvin Wright.....TMA
Bachelder, Harold K.....UTA
Buckley, James Whitcomb.....SLA; KST
Bates, Richard Jacob.....SLA; VBW
Berg, Lawrence Fabian.....SLA; CWT
Beecher, John F.....LHV
Barnard, Albert.....RWT
Burke, William J.....RWT
Burger, Valentine Joseph.....SLA
Bailey, Raymond L.....SAG
Boyd, George W.....SAG
Block, Kenwood M.....WFO
Bell, Robert Maxwell.....SLA; CWT
Baker, Russell I.....WFO
Bissonnet, George H.....WFO
Bailey, James Ruskin.....CAF
Baker, Robert L.....CGC
Burton, Charles H.....PWM
Behse, Joseph E.....PWM
Blevins, Beeler B.....PWM
Beehler, Charles H.....CGC
Bunn, James H.....CGC
Baker, Joseph B.....CGC
Bennett, Fred C.....CGC
Byrne, Edward Peter.....SLA; Note 14
Barker, Stephen R.....PWM
Bishop, Edward P.....PWM
Bleakley, Wayne W.....Note 12
Burr, Kinsley.....CJW
Booth, John C.....PWM
Birchler, Oscar A.....PWM
Biber, Walter E.....PWM
Bruegger, Edwin K.....PWM
Brown, Sidney F.....PWM
Bolt, Dean B.....DAF
Billuns, Val T.....DAF
Brock, William A.....CGC

C

Carter, William Jamison.....SLA; FOB
Crosby, Victor Anderson.....SLA; GLC
Cooper, Howard.....FLA; DMA
Cary, Joseph Breckenridge.....SLA; PMT
Canmack, Howard E.....DMA
Crook, Maurice W.....TFT
Carlberk, Don Philip.....SLA; BFT
Cook, Ray C.....CWT
Cote, Charles Louis.....SLA; PMT
Clark, Roy E.....WFO
Courtney, Edward W.....WFO
Cann, Frederick B.....PMT
Casey, Michael J.....HHN
Cunningham, Edward Gilmore.....SLA; KST
Choate, George Francis.....SLA
Canfield, John P.....FRF
Cornthwaite, Guy Huber.....SLA; WFO
Clark, George Arthur.....SLA; KST
Casey, Albert Francis.....FLA
Childs, Charles W.....FLA
Claghorn, James Lawrence.....FLA
Clyde, Robert William.....FLA
Cone, Clarence Nelson.....FLA
Coulter, Wilmer Vincent.....SLA; SAG
Caldwell, Victor B.....DMA
Cross, Eugene Herbert.....CWT
Collins, Kenneth Roger.....CWT
Cunningham, Parker Hale.....FLA; DAP
Cleaver, Carl Donald.....SLA; CWT
Craighead, Philip Brooks.....SLA; SAG
Crisp, James Van D.....DAP
Crary, Roy Jennings.....SLA; CFT
Close, Wirt George.....SLA; GLC
Cartmell, Nathaniel J.....HHN
Cordner, Frank N.....FLA
Coulter, Marion Elmer.....SLA; BFT
Carleton, George Leslie.....SLA; FOB
Clough, Charles E.....WFO
Carr, Harold H.....WFO
Coray, Francis M.....SAG
Connell, David Evans.....CWT
Coleman, Leighton H.....WFO
Case, Ira H.....DMA
Cross, John Milton.....SLA; BFT
Close, Wirt G.....PWM
Conrad, Charles M.....ABC
Crawford, Norman F.....CGC
Cain, George W.....PWM
Chandler, George D.....PWM
Cushman, Robert G.....PWM
Casey, Mathew A.....PWM
Clark, Dana V.....PWM
Clark, Lucius L.....PWM
Callender, Lynn West.....SLA; CWT
Cramer, Parker D.....SBI

D

Dahl, Newton A.....WFO
Deaton, Ernest A.....HHN
Deuel, Thorne.....CGC
Day, Oswald Newton.....SLA; VBW
Downey, James Francis, Jr.....SLA; CRI
Dupre, Naasson Kelley.....SLA; KST
Dunn, Stanley Mangold.....SLA; BFT
Duncan, Thomas.....DMA
Davis, Thomas Jefferson.....SLA; BFT
Dice, Agnew T., Jr.....FLA
Davis, Paul Herbert.....SLA; GLC
Davidson, William Gilman.....SLA; KST
DeForrest, John.....CUI
Darr, Harold S.....ABC
Dudley, George Louis, Jr.....SLA; CWT
Duke, Leslie B.....TFT
Dungan, Edmund Dale.....SLA; BFT
Denny, Harman Denny, Jr.....FLA
Dooley, William Thomas.....FLA
Daubner, George Elton.....SLA; VBW
Dana, Alfred L.....CAF
Daugherty, Earl Stanley.....SLA; MAC
Dahl, George Leighton.....FLA
Duke, Will B.....WFO
Drake, Albert Burbank.....SLA; BFT
Dean, William Winter.....SLA; VBW
Downey, Hugh Chester.....SLA; BFT
DeForest, Edward Earley.....SLA; CWT
Duke, Llewellyn B.....WFO
Dawson, Earl Rufus.....SLA; BFT
Donohue, Gerald.....SLA; PMT
Davis, William Kinnard.....SLA; CFT
Davidson, William G.....WFO
Davis, Harris Eli.....SLA; PMT
Davis, Paul J.....PWM
Douglas, Norman J.....PWM
Dooley, William T.....UTA
Dhein, Orian I.....CGC
Dunton, Delmar H.....CGC
Davidson, Kenneth S.....CGC
Darling, Harold P.....HHN

E

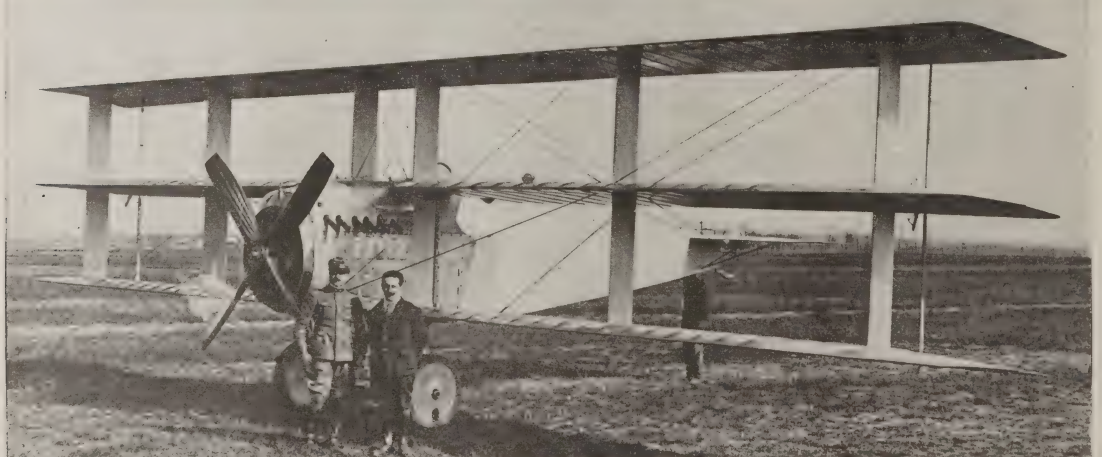
Edwards, Richard Dix.....SLA; CRI
Earl, Kenneth Alexander.....SLA; SAG
Evans, Stephen G.....TFT
Elsasser, Hugh.....EOT
Evans, John Manderson.....SLA; LHV
Engblom, Oscar H.....CWT
Eich, Charles P.....CUI
Ely, Matthew G.....REL
Edgerton, James Clark.....FLA
Edwards, Paul Nelson.....FLA
Egan, T. Francis.....FLA
Evans, Frederic W.....FLA
Elliott, Clifford W.....DIK
Eames, Richard Davis.....SLA; TFT
Elliott, Daniel Walter.....SLA; MAC
Ellershaw, William.....CGC
Eddy, Charles Peirson.....SLA; ELA
Essig, Fred N., Jr.....SAG
Edward, Frederick E.....EOT
Evans, Dean P.....PWM
Elleman, Clifford.....PWM
Epler, Earl N.....WFO

F

Foster, Traverse S.....ARV
Ford, Fred M.....CGC
Frantz, Samuel Gibson.....SLA; FOB
Fristoe, Horatio Monroe.....SLA; UTA
Fouraker, Raymond Spivey.....SLA; GLC
Franz, Joseph Parke.....SLA; EOT
Frew, James Ramsey.....SLA; BFT
French, Leigh Hill.....VBW
Fenno, George F.....CPA; DMA
Fogel, Martin.....TFT
Fitch, Victor W.....DMA
Franklin, George T.....TFT
Flynn, Mortimer G.....TFT
Farnam, Julian P.....MAT
Fickel, Jacob E.....JMA
Forrest, Robert Porter.....SLA; KST
Fitgerald, William J.....WFO
Fagan, Paul I.....CPA
Feitner, Quentin Field.....CPA
Faris, Nicholas D.....WFO
Forsyth, Ralph E.....WFO
Fife, John A.....EOT
Fishleigh, Clarence Turner.....SLA
Flood, Albert Edward.....SLA; BFT
Foster, William J., Jr.....TMA
Frindel, Samuel, Jr.....Note 3
Frees, Arthur L.....DMA
Farnham, Charles V.....PWM
Siedle, Raymond A.....CGC
Fairclough, Richard E.....PWM

G

Gearish, Charles Alanson.....SLA; ABC
Guild, Bartlett.....SLA; KST
Gabbert, Thomas Arthur.....SLA; BFT
Greer, Jack.....SLA; BFT
Galligan, Frank Andrews.....SLA; TMA
Grethen, John P.....WFO
Goodnough, Lewis E.....WFO
Garrity, George F.....HHN
Glogau, William E.....FRF
Gile, Richard D.....CGC
Guilford, Edward H.....DMA
Gallagher, Benjamin H.....TFT
Gunther, Lawrence O.....TFT
Griffith, Ralph E.....FRF
Gray, Clifton Charles.....SLA; ARV
Gillespie, Franklin Simcoe.....SLA; BFT
Garner, Bernard R.....TFT
Greene, Charles C.....TFT
Greenshields, Bryce W.....BST
Gray, Will K.....RWT
Geisse, John H.....SLA
Gregory, William Robert.....SLA; LHV
Gardner, J. Francis.....SLA; PMT
Graham, John Allen.....SLA; VBW
Goodwin, Thomas G.....PWM
Guenther, Karl Derby.....SLA; CRI
Graham, Ralph Edmundson.....SLA; CFT
Grier, Alexander Toadvine.....SLA
Greenshields, Bryce Wallace.....SLA; PMT
Green, Gerald Robertson.....SLA; PMT
Glatts, Bernard R.....WFO
Gibson, Howard Lyon.....TMA
Grady, George.....SLA; CJW
Graves, Thomas E.....CAF
Grekila, John Henry.....SLA; PMT
Golden, Robert J.....CGC



The Caproni Triplane, the "baby" of the Caproni family



The American-made De Haviland "four" and the Liberty Motor "12"

Grange, Hermon S.....CGC
Gaston, Wentworth M.....CGC
Green, Le Roy S.....GLC

H

Hunt, Mark Barksdale, Jr.....SLA; SAG
House, William Rowland.....SLA; BFT
Hatch, Arthur Clarkson.....SLA; PMT
Hughes, Archibald Jones.....SLA; BFT
Haseltine, Emery.....SLA; CRI
Harris, Dale Andrew.....SLA; CRI
Hawks, Horace G.....CRI
Hay, Malcolm.....SLA; BFT
Harwood, Herbert E.....CGC
Harding, Ray Wendell.....SLA; ABC
Heath, Fred T.....TFT
Hopkins, Frederick M.....TFT
Hiatt, Louis Eugene.....SLA; FOB
Harvey, George W.....DMA
Hopkins, Thomas, Jr.....SLA; CWT
Hall, Theodore Edward.....SLA; CWT
Helms, Leslie R.....CAF
Haskell, Albert McClellan.....SLA; BFT
Heartfield, Charles B.....PMT
Hightower, Chares D.....TFT
Hudspeth, Clyde E.....WFO
Harrison, William H.....TFT
Hawley, Walter James.....SLA; BST
Hutchins, Benjamin B.....DMA
Huck, Herbert.....SLA SAG
Haile, Thomas Jefferson, Jr.....SLA; PMT
Holmes, James Everette.....SLA; BFT
Haim, Calvin S.....WFO
Hutson, Harry M.....TFT
Hager, John Manfred.....FLA
Hamilton, Andrew A.....WFO
Hickman, James Clarence.....SLA; TMA
Hatch, Horace McK.....UTA
Hill, Thomas Russell.....SLA; CUI
Hoyt, Werner F.....EOT
Howeth, Woodfin Grady.....SLA; TMA
Hamilton, Andrew Alexander.....SLA; ELA
Hansell, Don Marvin.....SLA; CWT
Hardage, Lewis Woodford.....SLA; BFT
Harris, Ray Guy.....SLA; BFT
Hart, Haden B.....WFO
Hall, Norman Sanford.....SLA; MAC
Hampton, Stanlee Robbins.....SLA; MAC
Hoag, Elbert C. H.....CGC
Harrel, Samuel C.....DAF
Hancock, William W.....Note 8
Harding, Clifford L.....Note 3
Harris, Harold R.....Note 15
Hart, Elwood N.....CUI
Huber, Gilbert J.....CGC
Halsey, Wilmot B.....CGC
Hitchcock, William C.....CGC
Hersey, Henry B.....DMA
Hudley, Lawrence B.....CGC
Henderson, Denny E.....CGC
Hodgson, Harold C.....CGC
Hewins, John H.....PWM
Haggerty, Lyman H.....CGC
Hansom, Archie M.....CGC
Hartnett, Harold J.....CGC
Hezlett, Edward H.....PWM
Haskell, Albert M.....EOT

I

Irwin, Theodore H.....FRF
Irwin, Charles Lewis.....SLA; ABC
Irwin, Harry A.....DMA
Ingersoll, Edward.....CPA

J

Joseph, Samuel.....SLA; EOT
Jackson, Ralph L.....TFT
Jones, Charles Edward, Jr.....SLA; CRI
Joquel, Arthur Louis.....SLA; BFT
Joyce, Frank Arthur.....SLA; VBW
Johnson, Henry Alto, Jr.....SLA; EOT
Johnson, Emil R.....DMA
Jackson, Roger William.....SLA; CWT
Janssen, Edward A., Jr.....FRF
Jackson, Allan Cummings.....SLA; PMT
Jones, Kenneth Hugh.....SLA; CRI
Johnston, Ralph Steele.....SLA; RSD
Johnson, Albert Loftin.....SLA; MAC
Johnson, George T.....RWT

K

Kelty, William R.....FRF
King, Cloize Anthony.....SLA; BFT
Krech, Karl Gilbert.....SLA; CUI
Kuechler, Gustave Henry.....SLA; SAG
Kingsley, Daniel P.....ARV
Kempter, Charles W.....CGC
Kelley, William Michael.....SLA; BST
Kase, John A.....SLA; TMA
Kitchen, Benjamin Ford.....SLA; BFT
Kidder, Charles D.....DAP
Keith, Edward.....SLA; BFT
Kirshner, Robert F.....FRF
Kenny, Frederick Putnam.....FLA; TMA
Knight, Frederick Hammond.....SLA; CWT
Kohler, Raymond Lloyd.....SLA; CWT
Kinnear, James Stewart.....SLA; MAC
Keelan, Frank Bernard.....SLA; VBW
Kendall, Harold Laverne.....SLA; SAG
Kotcher, George Andrew.....AMV
Kennedy, James Edward.....SLA; BFT
Kinne, Harold Clarence.....SLA; CWT
Knowlson, Roland Southard.....SLA; CWT
Knight, Earl W.....SLA
Kraft, Lester L.....WFO
Kinney, Kenneth Kieran.....SLA; CFT
Kirkham, James E.....WFO
Kellegrew, Edward W.....HHN
Keeley, James H., Jr.....PWM
Kilburn, George W.....PWM
Kirkpatrick, George M.....SBI
Korman, Howard.....SBI

L

Lauermaan, Otto Simon.....SLA; CFT
Lemon, Hobart Flint.....SLA; BFT
Lyle, John Marquess.....SLA; BFT
Lamkin, William L.....RWT
Leary, Matthew Mark.....FLA; HHN
Leonard, Kenneth Lee.....SLA; BFT
Layne, Edward Goode.....SLA; CWT
Lewis, Halstead H.....TFT
Ligon, Robert.....CUI
Leadbetter, Arthur Olin.....SLA; LHV
Laughlin, Douglass E. S.....DMA
Lokey, Thomas E.....DMA
Lowell, Robert Horace Wentworth.....SLA; CRI
Lloyd, Thomas Leslie.....SLA; CWT
Loehr, Theodore Edwin.....SLA; CWT
Lee, Everett Samuel.....FLA
Landstrom, Adolph Walter
.....SLA; CFT; WDM; Note 1
Lynch, Russell William.....SLA; PMT
Lovell, Walter.....FRF
Lausier, Edwin B.....DAP
Lindstrom, Alfot J.....EOT
Lake, Horace A.....SLA
Lucey, Edgar A.....Note 7
Lindsay, Philip K.....CGC
Lincoln, Oren E.....Note 10
Linda, Lloyd B. Vanda.....CGC
Lewis, Thomas J.....PUP

M

Montell, Arthur Cleveland, Jr.....SLA; BFT
Morgan, Stuart A.....CAF
Monticue, Verne M.....FRF
Madsen, Gustave Harold.....SLA; CJW
Morehead, Hobart E.....TFT
Middleton, James Adam.....SLA; CWT
Marks, Alan David.....SLA; ELA
Moland, George R.....FRF
Mauch, Eugene A.....CAF
Murphy, Frank D.....CRI
Mooers, Clifford.....SLA; BFT
Murphy, James Benjamin.....SLA; BFT
Merrill, Mazel Melburn.....SLA; BST
Mahr, Ralph E.....WFO
McNeill, John Francis.....SLA; CFT
Mingins, Leicester Holm.....SLA; CRI
Mullaney, John F.....FRF
Miller, Arthur J.....WFO
Massingill, Martin L.....TFT
Myers, Norman Harley.....SLA; KST
Murphy, Eugene A.....FLA
Morgan, John R.....WFO
Murphy, William Thomas.....SLA; AAD
Musick, Edwaard.....SLA; CWT
Murphy, Harry Joseph.....SLA; SAG
Meyer, Charles Louis.....SLA; BFT
Miller, Rudolph Nelson.....SLA; SAG
Mahoney, Justin T.....EOT
Martin, Bruce Broadway.....SLA; SAG
Miller, Heber Curtis.....SLA; MAC
Montague, Harley H.....TFT
Morgan, Charles Lewalling.....SLA; BFT
Ming, Christopher Morris.....SLA; SAG
Miles, Homer Ulysses.....SLA; TMA
Manzelman, Earle H.....SAG
Mann, Hammond V.....Note 3
Mulder, Leon L.....Note 2
Martin, John M.....CRI
Maynz, Theodore.....TFT
Matthews, Stanley G.....SBI
Merrill, Cedric V.....SBI
Morgan, Harry R.....CGC
Mulvihill, Bernard H.....CGC
Metcalf.....DMA
Meyer, Charles L.....PWM

Mc

McDonald, Frank Witten, Jr.....SLA; CFT
McKinney, Coryell.....CGC
McKinney, Carlos James.....SLA; EOT
McKinney, Norman.....SLA; KST
McCracken, Nelson.....DIS
McElihinney, Ralph L.....WFO
McLinden, Daniel Joseph.....SLA; TMA
McClure, Lloyd Milton.....SLA; KST
McKee, James Dalzell.....SLA; SBI
McNamara, Sherman E.....KST
McCarl, Merritt D.....SLA; VBW
McMullen, Ivon Dale.....SLA; VBW
McCord, Charles G.....TMA
McClees, Ralph L.....SAG
McEvers, Ernest.....WFO

N

Noble, Arthur W.....ELA
Noon, Frank Joseph.....SLA; BFT
Northrup, James A.....MJA
Neil, James G.....BST
Nordhorn, Welzie Louis.....SLA; ABC
Nelson, William T.....FRF
Nason, George H.....WFO

O

O'Neil, Larkin Alucious.....SLA; ABC
Overcashier, Clarence Stanley.....SLA; CFT
O'Brien, Matthew H.....CGC
O'Sullivan, Matthew H.....SLA; SAG
O'Neil, Henry, Jr.....SLA; SAG
O'Brien, Thomas Edward.....SLA; MAC
O'Donnell, Paul J.....SLA
Ozanne, Porter L.....UTA
Owen, Hubert Keys.....FLA
Overley, Harry Russell.....SLA; SAG

P

Phelan, Joseph Percival.....SLA; SBI
Pendleton, Howard.....DMA
Pitkin, Loren H.....DMA
Perry, William H.....RSD
Preston, Charles Raymond.....SLA; LDT
Phelps, Edgar Manly.....SLA; VBW
Pingenot, Augustus Celestin.....SLA; CFT
Phillips, Douglas Lucas.....SLA; HHN
Peterson, Lowell McKinley.....SLA; SBI
Patton, Glenn Arthur.....SLA; SBI
Payton, Gwynne Harrison.....SLA; BFT
Panzer, Carl Herman.....SLA; KST
Pooley, Edward Murray.....SLA; CFT
Perego, Alfred K.....WFO
Pilkington, Fred W.....TFT
Pound, Murphey.....TFT
Poe, William L.....TFT
Peterson, Amos G.....CGC
Parsons, Willard Charles.....SLA; ABC
Pinaire, Owen Hobart.....SLA; BFT
Porter, Philip Wells.....SLA; BFT
Penfield, Paul.....SLA
Pfaff, Lawrence L.....SLA
Posey, John A.....SLA
Perego, Alfred Kenneth.....SLA; KST
Preston, Charles Raymond.....LDT
Pence, Winfield S.....WFO
Pratt, Henry C.....DMA

FOREIGN NEWS

GREAT BRITAIN

A report from Saloniki on Sept. 19 says: "Four of our scouts engaged fourteen enemy machines and crashed two of them to the ground. One of our machines is missing.

"Clouds and a strong wind interfered with air work on Sept. 18 and observation was carried on with difficulty. Squadrons working on the 3d and 4th Army fronts kept in close touch with the troops, reported positions of enemy batteries and delivered ammunition to machine gunners in the forward areas.

"Five and a half tons of explosives were dropped and two hostile machines were downed and two sent down out of control. None of our machines is missing. Night flying was impossible."

The British air forces have dropped sixty tons of bombs on German territory in five days. This exceeds the record for any previous for.-night.

These long distance raids have been directed chiefly against poison gas and aeroplane factories at Mannheim, the Daimler works at Stuttgart, the railway station at Frankfort and the docks and sidings at Karlsruhe. Their destructive effect is shown by photographs.

Aerial assaults over the battle area have been numerous. Acting in conjunction with the Franco-American offensive thirty-five separate raids were made between September 13 and 16 against important enemy aerodromes and vital railway junctions. Thirteen of them were against the Metz-Sablon railroad.

Altogether British airmen have dropped 120 tons of bombs upon the western battle front in the course of a week exclusive of the explosives dropped in Germany. Nineteen tons were dropped on Bruges, Ostend and other German coastal defences in air fighting, during which seventeen enemy machines were destroyed and nine disabled, while five British planes were lost. The number of German machines destroyed altogether in the week was 101, while thirty-seven were disabled. The British losses totalled fifty.

The allied independent air force dropped bombs on Sept. 20 on Mannheim, Karlsruhe, Boulay, Frescaty and Morhange, according to an official statement issued by the British Government.

Explosives were dropped on the Lanz works at Mannheim, on wharves and factories at Karlsruhe, on blast furnaces at the Burbach works and on aerodromes at Boulay, Frescaty and Morhange. One German machine was brought down. One allied machine is missing.

On the front held by Field Marshal Haig nineteen German aeroplanes have been accounted for by British airmen, while the British themselves have lost eleven machines, according to Marshal Haig's report, which says:

"Despite low clouds and frequent showers our aeroplanes carried out useful work in all departments Friday.

"Sixteen hostile machines were downed and three sent down out of control. Eleven of ours are missing.

"Twenty-six and a half tons of bombs were dropped during the twenty-four hours.

"Eleven tons of bombs were dropped on Sept. 22. Eight enemy planes were destroyed. Four of ours are missing.

"That night four tons of bombs were dropped on the Valenciennes aerodrome.

"The Greeks co-operated in the bombing of Constantinople on Sept. 20 and 21 and dropped thousands of leaflets into Stamboul.

"A balloon, shot down in flames in the European operations set fire to three hangars, which were burned out."

Machines of the British Independent Air Force dropped nearly sixteen tons of bombs on German aerodromes and on blast furnaces in the Metz region on Sept. 21, it was officially announced.

The blast furnaces attacked were those at Hagendingen and Rombach. Four enemy aerodromes were bombed by the raiders.

Fifty-three hostile aeroplanes were accounted for by British aviators on Sept. 24, acording to the official announcement. Thirty-one of these were destroyed and twenty-two were driven down. Ten British machines failed to return. More than 2,000 photographs were taken and 12½ tons of bombs dropped in twenty-four hours.

British aeroplanes dropped bombs on Sept. 25 on the German city of Frankfort, according to an official statement issued by the War Office. Five enemy machines were shot down. Four British aeroplanes are missing.

Another communication says: "On Sept. 25 ten enemy machines were brought down. In twenty-four hours we dropped thirty-five tons of bombs on aerodromes and railways."

The German aerodromes at Buhl, twenty-five miles southwest of Karlsruhe, and Kaiserslauterm, between Metz and Mannheim, have been bombed by machines of the British Independent Air Force. Fighting took place during the expedition, with the result that two enemy machines were destroyed. Three of the British machines have not been located.

British aeroplanes on September 25 dropped bombs on the German city of Frankfort, according to an official statement issued by the War Office. Five enemy machines were shot down. Four British aeroplanes are missing.

The following official communication dealing with the operations of the British independent air force was issued on September 27:

"In conjunction with the Franco-American operations Thursday our machines in the afternoon attacked the railways of Metz-Sablon and Audun-le-Roman with good results. Large numbers of enemy aeroplanes were encountered and bitter fighting took place.

"Two enemy machines were destroyed and one was sent down out of control. Six of ours failed to return.

"On the night of September 26 in heavy attacks on the Metz-Sablon region many direct hits were observed. The railways of Mezieres and Thionville and the Frescati aerodrome were attacked. There were several direct hits on the Thionville station and junction. All our machines returned."

Another communication, dealing with operations over other parts of the fighting front and behind the lines, says:

"Our machines on September 26 carried out a large number of reconnoissance flights and manoeuvres for observing the effect of our artillery fire.

"More than twenty tons of bombs were dropped on railheads and billets. In a raid on an enemy aerodrome several hangars were set on fire and a hostile machine was destroyed on the ground, and seven others which attempted to repel the attacking squadron were shot down. Four hostile machines were destroyed on other parts of the front. Five of our machines were missing during the day. Little flying was possible at night."

The British aerial communication of September 28 says:

Our machines were active on every part of the front throughout Friday that kept close watch from the air on the course of the various operations. Bombing patrols carried out at a low altitude along the battle front attacks on enemy troops and transports at the canal crossings and along the roads, and heavily engaged the enemy with machine gun fire.

Four machines, working in coöperation with the artillery, reported a great number of targets and observed the fall of the rounds. Many explosions and fires were observed in hostile battery positions. Over a thousand photographs were taken during the day.

In addition to extensive bombing just beyond the lines, several enemy aerodromes and a number of railway junctions were attacked with excellent effect. Thirty tons of bombs were dropped by us in the day and eighteen and a half tons at night.

Twenty-two German machines and eight balloons were shot down by our airmen. Twenty enemy machines were driven down out of control in the course of the air fighting. Another machine was destroyed by anti-aircraft fire. Nineteen of our machines are missing.

In the last week the British airmen have undertaken important offensive operations in no fewer than six separate theatres of war, ranging from the coast of Flanders to the fringes of the Syrian Desert.

On the northern coastal sector destructive aid raids were made upon the German submarine, naval and aircraft stations in Belgium. On the battlefront in France there was intense air fighting between La Bassée and Péronne on the St. Quentin road. On the Rhine front sixteen bombing raids were made by the R. A. F. Independent Force into Germany. On the Salonica front there was much low-height bombing and machine-gun fighting from the air on the roads to Strumnitza. The Aegean front was chosen for a double raid upon Constantinople, causing damage to the station and military buildings at Nagara and Stamboul. The Palestine front was marked by great British aerial activity, resulting in heavy destruction of enemy transport stores and war material, and heavy casualties to the retreating enemy.

Two points of unusual interest stand out in this fighting, the increasingly important part played by aerial reconnoissance in preparing the way for an offensive, and the striking power of modern aircraft to intensify the disorder in the rear of a defeated army. Thus, in Palestine, contingents of the Royal Air Force and the Australian Flying Corps have been carrying out reconnoissance upon a wide scale over the maritime plain stretching from Mount Carmel to the Shechem-Joppa road, as well as over Samaria and the Valley of the Jordon from the edge of the Judean Plateau to the Sea of Galilee. Excellent aerial photographs were taken, which proved of very great value to the British Staff. Other aerial contingents, crossing the eastern range of hills, attacked vigorously the enemy centres at Amman and Deraa, in the Hedjaz Railway.

These operations were preliminary to the offensive at the end of the week. Acting in close coöperation with the infantry and cavalry, British airmen on the night of September 18 heavily bombed the vital railway junction at El Afules, south of Nazareth, thus hindering the dispatch of reinforcements from the north and adding enormously to the difficulties of the enemy. Throughout the following day British aeroplanes bombed the enemy's headquarters and harassed his retreat by firing many thousands of rounds and dropping more than eleven tons of bombs behind his lines.

Nablus, the strategic centre of Samaria, was heavily attacked by air from the commencement of the offensive, and on September 21 and 22, as the Turkish retreat developed into a rout, British airmen inflicted very heavy casualties and enormous material damage upon the enemy in the congested mountain roads, notably on those leading to the famous Damieh Ford across the Jordan.

Scarcely less disastrous to the enemy were the operations of the British airmen on the Salonica front. Here, as in Palestine, a large number of reconnoissance and bombing raids were carried out prior to the offensive on September 18. On the morning of the 21st aeroplanes brought timely advice of the impending retirement of the enemy, extensive fires being observed at Hudova station behind the lines, while later in the day the Kosturino-Sturza road was seen to be densely packed with troops and transports, hurrying to the rear. Squadrons of British airmen continuously attacked these from a low height, causing much material destruction and many casualties.

The work of the airmen in the battle zone is described by Field Marshal Haig in his report of September 29 as follows:

"The air force coöperated in every phase of Saturday's operations. Patrols carried out flights far behind the German lines, reconnoitering roads and railroads by day and night. In spite of the clouds and rain, successful observation for the artillery was accomplished. The location of advancing troops was constantly reported to the headquarters of all formations. Enemy troops were bombed and machine-gunned from extremely low heights and heavy casualties were inflicted.

ITALY

The aerial activity was handicapped by the bad weather prevailing on the whole front during the last week, nevertheless numerous bombardments were made by our squadrons on the important deposits of the enemy. The enemy's aerial activity did not amount to anything.

Italian Headquarters publish the following summary of both the Italian and Austrian losses during the last big drive from the 20th of June until the last of July.

(from the 20th of June until the 1st of July)

Austrian machines brought down	150
Austrian balloons brought down	5
Italian machines lost	16

(During the month of July)

Austrian machines brought down	109
Austrian balloons brought down	2
Italian machines lost	4

These numbers show the great superiority of the Italian Aviation compared with the Austrian, and it is increasing each day.

The statements of the prisoners continuously confirm the terrible effects of the Italian Aviation in the bombardment work and in the machine-gun attacks on the soldiers.

Entire forces were destroyed by machine-gun fire from special armored aeroplanes at a very low altitude.

The Italian Aviators carry on with great success on the discouraged Austrian population a propaganda by means of pamphlets.

MODEL NEWS

Edited by John F. McMahon

Model Aeroplane Building as a Step to Aeronautical Engineering

When wings are finished, the struts should be made. These are made of spruce 2" x 1", 4' 10" long and corners rounded off to an oval shape. The ends of the struts are tapered to 1" square, after which they are bound by cotton tape and glued to prevent splitting when the eye-screw is inserted. This eye-screw is standard ¼" diameter and can be purchased in any hardware store. The size of the eye should be at least 5/16" and no more than ⅜" in diameter. One of these eye-screws is screwed into each end of the strut as far as it will go as shown in Figure 6.

The strut connection to the wing spar is shown at the right, Figure 1. The reader can see just how it is made and the assembling. The sort of "U" bolt which is used as the clamp is made from a piece of 3/16" drill rod, threaded at each end. A standard size die for threading these ends can be purchased cheaply and the Lexagon nuts as well. Each piece of drill rod is 6⅜" long. After threading each end the piece should be bent to the shape shown in Figure 3. Two plates of iron or steel 1/16" thick to the dimensions given in Figure 2. These plates are placed over and under the wing spar. When set up on the wings the bracing wires or turnbuckles are fastened to the eye-screw and "U" bolt as shown in the sketch, Figure 1. The reader will note that the strut fittings for the eight outer struts are fastened alongside the bracing strut in the wing, while the four center struts are fastener directly over or in line with the wing-bracing struts. When placed over the struts it is necessary to drill a 3/16" hole through the metal straps 2 19/32" from the outside edge of the wing spars. No top plate is needed on the center strut fittings as the metal strap will keep them from crushing the wing beam. On the outer strut fittings it is necessary to have something to keep them from moving out of place when a strain is on the bracing wires. A fitting for this purpose is made from a piece of 1/16" thick steel or iron about 1½" long and ½" wide with two 3/16" holes at each end. This plate is bent in the centre and then flattened to the ends to allow it to be screwed to the wing beams, as shown in Figure 4. The inside prong of "U" bolt is then shoved through this fitting and bolted in place. Arrows point from Figures 4 and 5 to show the fittings that apply to the struts. Of course, the rear strut fittings are identical with the front ones.

The plane should be set up before covering to see how things fit, as it is easier to make corrections when covering is not on. When set up, the leading edge of the planes should be 4" higher than the trailing edge, to give it the necessary angle for flying. See Figure 7.

It is necessary to have some sort of support for the operator, so we will place two bars of spruce, 2" x 1", between the two centre struts and fasten them in place with metal straps. Notice that the bracing wires don't go to the bottom fittings in this case instead the end at the cross bars, so as not to interfere with the operator, as he will use these bars to support his weight by hooking his arms over them when in flight. This will be shown later.

The method of bracing is shown in the large sketch. The wires are fastened to each strut fitting and cross to the opposite one, above or below, as the case may be. Some of the bracing wires are left out of the sketch for clearness.

When the reader is satisfied that everything fits correctly, he can cover the planes with some thin, white material, such as muslin, and then dope it with a mixture of 1 pound of powdered glue, 1 ounce of alum, 2 ounces of glycerine, and boiled in enough water to allow it to be painted on with a brush.

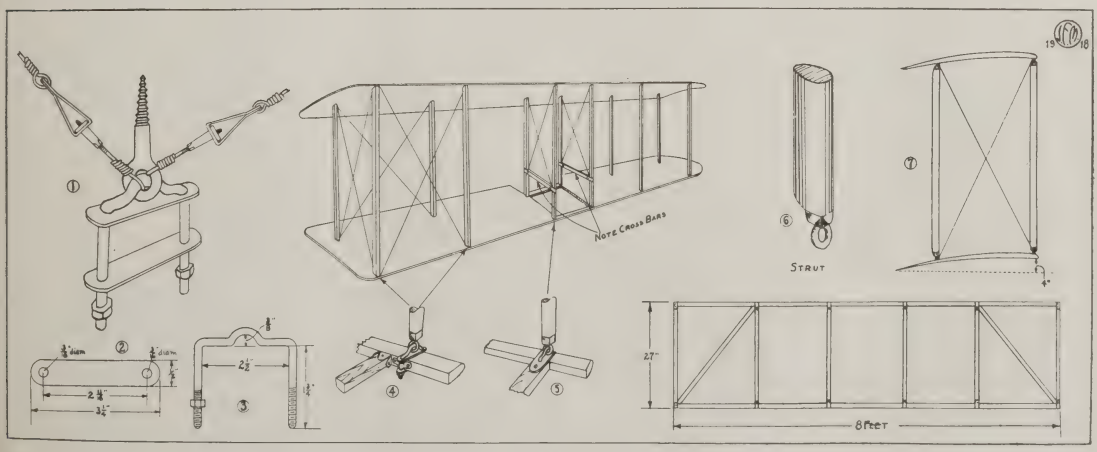
The material should be cut in pieces 10' 6" long and sawed together side by side until the width is over 26' or the length of the planes.

To cover, fasten the cloth to the front wing spar with small tacks. The covering is then brought back, so that the two ends of the cloth double over one another and are fastened at the trailing edge. The strut fittings are not in place when covering is applied, but holes are made for them in the covering.

The tail plane is made of ½" square spruce, as shown in the lower right hand side of the cut.

The cross pieces are fastened to the long strips by thin metal straps and small nails.

(To be continued)





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

"The Hymn of Hate"—Offensive Patrol

Onward, Baby Nieuports,
Flying out to war,
Lewis guns all loaded
Engines all a'roar.
See, the Flight Commander
Leads against the foe,
Five machines with engines revving
Cylinders a'glow.
Onward, Baby Nieuports,
Flying out to war,
Lewis guns all loaded
Engines all a'roar.

At the sign of triumph
The wily Hun doth flee.
"Dive then, Baby Nieuports,
Dive to victory."
Albatrosses quiver,
Engines glowing red,
Crack! crack! crack! behind them,
Pumping them with lead.

See the Albatros's
Tanks begin to leak,
As the guns of Nieuports
One and all do speak.
Diving ever downwards,
Every wily Hun,
Into flames they're bursting.
"Nieuports—you have won."

Pull your joy-sticks backwards
Zoom towards the skies.
Up to fifteen thousand
Fast the Nieuports rise
Guns once more are silent,
All their rounds are loosed,
Now they're flying Westwards—
Flying home to roost.

Welcome, Bristol Fighters,
Who towards us soar,
Blend with ours your engines
As we homewards roar,
"We have done much battle
With the Albatros,
Never will they fly again
Now they bite the moss."
Onward, Nieuports, Bristols,
Flying out to war,
Lewis guns all loaded
Vickers guns galore.

—The Aeroplane.

Extracts from the Letters of My Chum in France

It is cold and misty, and when it is not misty it is windy, and when it is neither, it rains and so on, but mist from the marshes is the worst by far. So sometimes we sits and thinks and cusses and smokes; and sometimes we just sits.

This morning I stalled machine all round aerodrome. Wind screen completely frozen over; had to take machines to 1,000 feet, lean out and clean screen. Same day got in hot air over factory chimneys. Hell.

Second solo on new type. Sideslipped through not having flying speed on a turn. Ghastly sensation.

Dunno why the other squadron was mentioned in despatches. They have about seven of our chaps there. Maybe that was why, or perhaps the General lost some money at Bridge to the C. O., or perhaps they drew lots for it.

One could hear the bang of the big guns as they fired salvos under us, and at times we got bumps from the shells passing close to us. I don't know how close they were, but they were not fired at us.

Was sent out photographing, had a dozen shots at it and then, as I reached a height of 6,000 feet, I thought I would try to do my first loop. I shoved the nose down, 70, 80, 90, 100 m. p. h. The pitot tube would not register any higher; the liquid went out at the top—pulled the joystick back into my tummy and up went the nose—Gee—how slowly it seemed to go. Ah, she's over at last. Cheer-o. Now I'll write home and tell them. No, I must do another. If I did only one, they would think I had funked it after the first shot. Down goes the nose again, then up-up slower, slower. By Jove, she's going to stick at the top of the loop this time—I grip the joystick with both hands. Ah, she's over. Now I'll get off to the aerodrome and show them how to do it. I was quite bucked at having done it and it was a curious sensation, to say the least. I have been warmly congratulated; they were d—d good loops.

As I was going out of the aerodrome, I flew over a passing car and we waved merrily to each other. Then I chased the car, slowed my engine and dived at it, and a little later flew at it again. The driver must have been watching me too closely, for he went into the ditch. My passenger was awfully bucked about it.

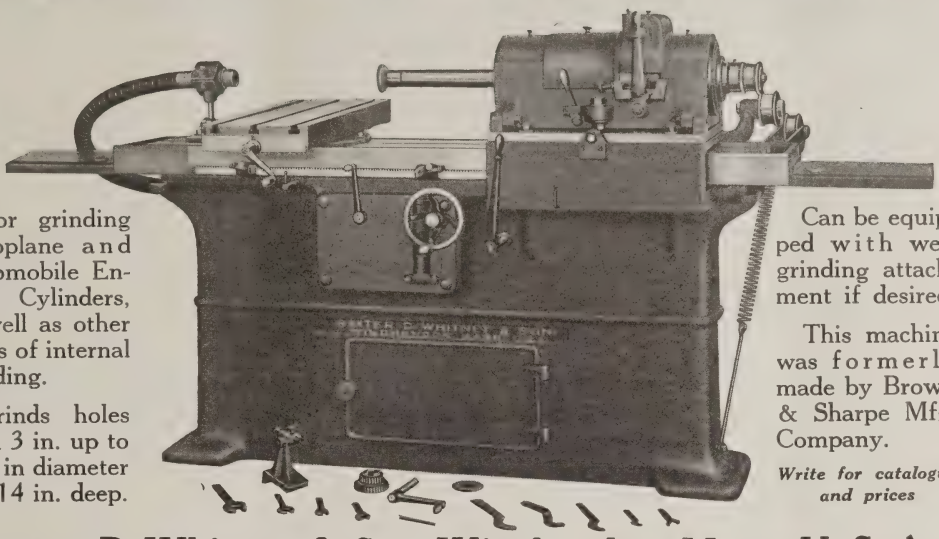
Well, I have very little news for you this time. To let you down lightly, I will tell you that I am having several new walking sticks made, and you, with your usual Sherlock Holmes intelligence, you will deduce, quite accurately, that I have carefully and conscientiously reduced a B. E. 2c. to its molecular constituents—in other words, crashed it.

OUI, THIS IS FRANCE

By "Alex"



Cylinder Grinding Machine



For grinding Aeroplane and Automobile Engine Cylinders, as well as other kinds of internal grinding.

Grinds holes from 3 in. up to 7 in. in diameter and 14 in. deep.

Can be equipped with wet-grinding attachment if desired.

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Canadian Agents: Canadian Fairbanks-Morse Co., Montreal, P. Q. **Foreign Agents:** Buck & Hickman, Ltd., London, England. Fenwick Freres Co., Paris, France.

RESISTAL EYETECTS

STANDARDIZED BY THE U. S. NAVY



A special test of RESISTAL AVIATOR EYETECTS was conducted on September 18th by the U. S. Bureau of Standards. This test was both optical and physical. The official report of the Bureau of Standards found that the surfaces of the lenses were flat to within about a dozen wave lengths of sodium light and therefore would not magnify the image nor trouble the user by distorting his vision. One fact of great importance, they said, was **that the lenses gave off no splinters when broken.**

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> **"Boiling tests and salt water soaking tests as follows were made on each specimen: Specimens were boiled for 8 hours, then baked for 24 hours at 100 deg. C.; specimens were soaked in salt water (4% salt by weight) at room temperature for 24 hours and then baked for 24 hours at 100 deg. C.**
>
> **"Results:—The glue held firmly in all tests. Neither the boiling nor the salt water soaking tests caused any indications of separations of the plies of the veneers tested."**
>
> **Dated, March 30th, 1918.**

Laminated wing beams of spruce. We have under contract a supply of aeroplane spruce and could undertake to manufacture 50 sets of 8 wing-beams daily. In an official Government report on a sample wing-beam section submitted by us for test, it was stated —

> **"Conclusion:—These beams carried a much greater transverse load than solid wood beams of the same material and section. The glue joints between web and flanges are stronger in shear than the web section, and the glue had fairly good waterproof qualities. These beams show the superiority of the laminated construction over the solid construction as to strength and great saving in material."**
>
> **Dated, March 11th, 1918.**

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Spruce, Ash, Oak, Birch, Cherry and other manufactured aeroplane lumber.

IMPORTER OF CLAUDEL CARBURETORS

(*Continued from page* 212)

ROCHESTER, N. Y.

Kaiser Trying to Save Throne

From the *Democrat and Chronicle*

The Kaiser is trying to save his throne. He is seeking to end the war before his people find out that he has lost it. He does not want peace. He wants an armistice of a dozen years in which to get ready for another war. He has got himself into a bad hole, and he is trying to crawl out of it. The Germans can give only one acceptable guarantee that they really want peace—that is, the unconditional surrender of the German army and the German navy.

SPRINGFIELD, MASS.

Surrender and Reparation

From the Springfield *Union*

When Germany and her allies are prepared to make an unconditional surrender, then will it be time to discuss matters of territorial settlement in accordance with the principles of essential justice. A peace of concessions to Germany cannot be other than a dangerous peace for the future safety of civilization. Unconditional surrender and reparation for her crimes, so far as such reparation can be made by the payment of indemnities, should be our answer to the Huns' cry for peace.

CHICAGO

No Potsdam Peace Wanted

From *The Tribune*

Potsdam has rested its fate on power. The Allies will rest their fate on power. Potsdam has never kept faith. The Allies will make peace when Potsdam cannot be faithless to it. All the world longs for peace, but the Allies want no Potsdam peace, and will fight until peace is our peace. There is but one answer to such offers of parley as have been made or are predicted. That answer is our redoubled efforts against the enemy. We can rely upon that answer from our fighting men, and we at home must back them with a singleness of purpose matching theirs. All that we can give is little to what they are giving. But let us give with a will. Let the answer of the American people be the answer of the victorious army.

BALTIMORE

Exterminating a Criminal

From the Baltimore *Sun*

Absolute surrender is the sine qua non for peace, the condition precedent to the consideration of terms. The fact to be kept constantly in mind is that this is not a war against a nation or a combination of nations, but against a great criminal which has deliberately organized to conquer and plunder the world.

No Peace by Negotiations

From the Baltimore *American*

There can be no peace by negotiations with the Central Powers as at present organized. This suggestion cannot be put too nakedly or bluntly. It is time for shirtsleeve directness. The United States is preparing to put all of its tremendous potency into the smashing of Hunism. Our getting into this war is no bluff, and Hunism will not be permitted to turn it into a bluff.

CINCINNATI

"On to Berlin"

From the Cincinnati *Enquirer*

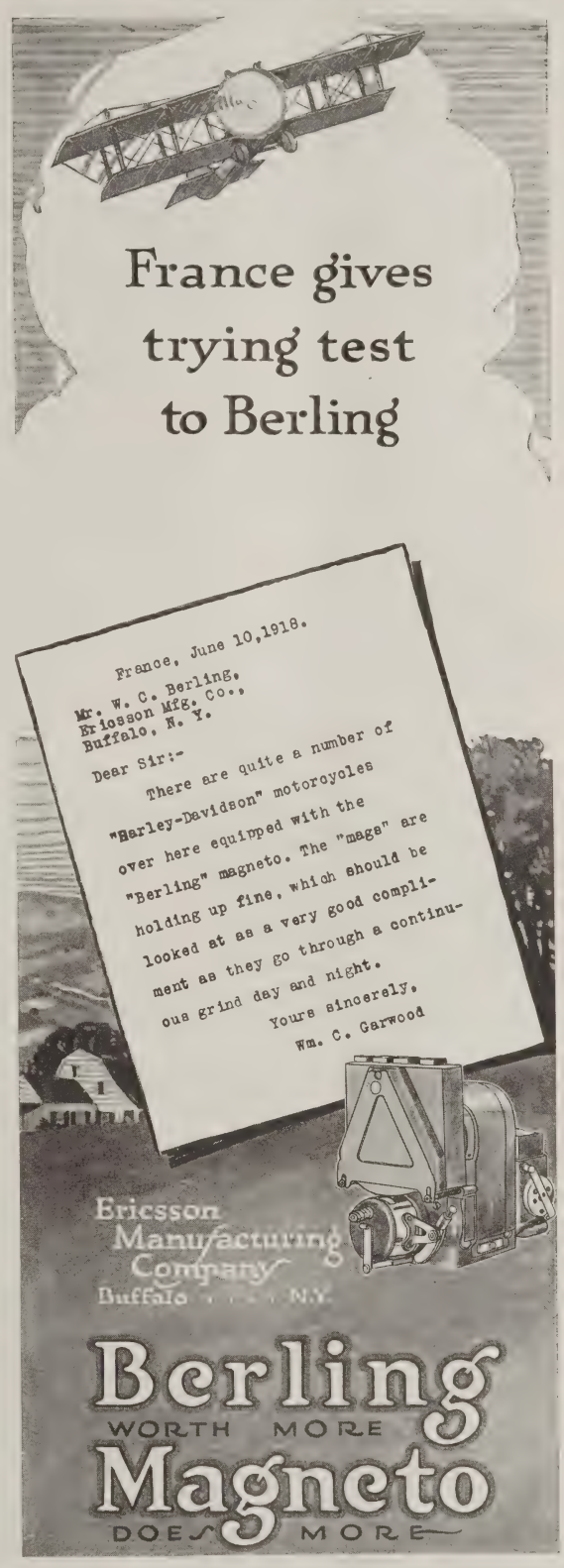
Unconditional surrender will dominate all peace terms considered by America and her allies. The only peace terms that will be accepted will be dictated with the flags of all the Allies floating triumphantly in Berlin. Terms so clearly and forcibly stated by President Wilson, ratified by each and every one of the nations warring against Prussianism—these terms, and these alone, will be accepted at the proper time and place. Restoration and indemnification of Belgium, restitution of devastated France, recognition of independent Poland—these are only a few of the essential, vital and acceptable terms of peace that must be considered at any conference of the Allies. "On to Berlin."

INDIANAPOLIS

Militarism Must Be Crushed

From the Indianapolis *Star*

Militarism must be crushed. That cannot be accomplished by compromise or negotiations; the militarists must lay down their arms, surrender unconditionally, so that there can be no doubt either in the Teutonic mind or elsewhere that the German war machine and the spirit that made it possible has been broken.

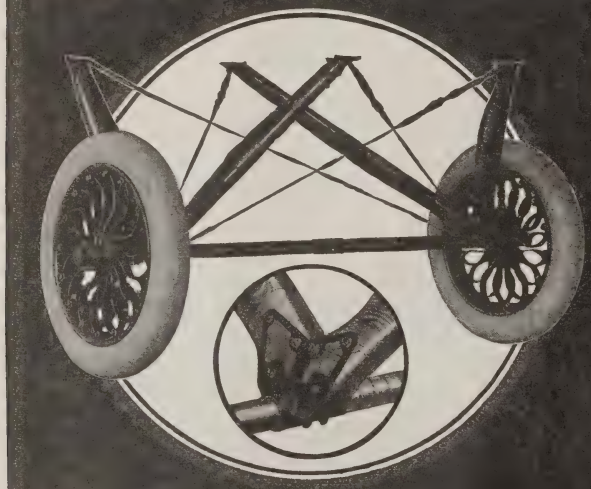


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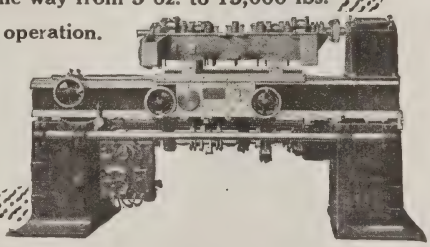
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Price, Owen N.....EOT
Parsons, Frederick C.....CGC
Piper, Raymond A.....CGC
Pruden, Gordon L.....RV
Powell, Clifford Ross.....FLA
Painter, Parker.....EOT
Pierce, Dale Frank.....SLA; SAG

R

Randall, Norman LeRoy.....SLA; KST
Royall, Nelson M.....FRF
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Rice, Ward Hench.....SLA; TFT
Rafter, John Michael.....SLA; SBI
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Russell, Herbert O.....DMA
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Reymiller, John L.....HHN
Rumney, Andrew C.....WFO
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Robinson, Paul Donald.....SLA; SAG
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Reid, James D.....WFO
Ray, Chester M.....WFO
Roemer, Albert John.....SLA; KST

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Spencer, Albert O.....PWM
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Shanks, Herschel Vespasian.....SLA; BFT
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Stauffer, John Ervin.....SLA; KST
Salzman, Rafael Louis.....SLA; VBW
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Spain, Thomaas Howard.....TMA
Spencer, Edward J.....WFO
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Salyers, Charles D.....EOT
South, John C.....CGC
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Sly, Nelson Aldrich.....SLA; ELA
Schroeder, Clarence W.....UIU
Strong, Foster G.....PWM
Sargent, Winthrop Otis.....SLA; BFT
Stedman, Livingston B.....WFO
Soper, Arthur A.....UTA
Stolz, Alexander Francis.....SLA; BFT
Seifert, Fraank W.....EOT
Shelton, William Gentry.....SLA; CJW
Schumacher, Herman O.....CWT
Stein, Charles J.....Note 10
Starring, David S.....Note 17
Shaffer, Harry.....SLA
Stocking, Homer M.....Note 3
Smith, Dewitt C.....Note 3

T

Twitchell, Roger T.....WFO
Terry, Daniel Grant.....SLA; BFT
Thompson, Marvin Waterbury.....SLA; GLC
Thompson, Gough W.....WFO
Tobey, Paul T.....LHV
Tapley, Elmer Babbidge.....SLA; KST
Tebb, Gordon Edward.....SLA; KST
Turner, Wiley B.....WFO
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(Some names are unavoidably held over till next week)

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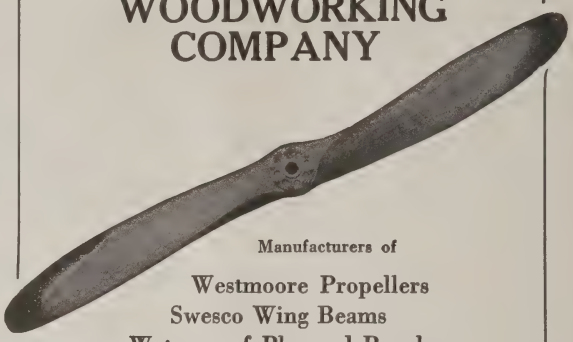
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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of AERIAL AGE WEEKLY, published weekly at New York, N. Y., for October 1, 1918, State of New York, County of New York, ss: Before me, a Notary Public, in and for the State and county aforesaid, personally appeared G. Douglas Wardrop, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the AERIAL AGE WEEKLY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Aerial Age Co., Inc., 280 Madison Avenue, New York; Editor, Henry Woodhouse, 280 Madison Avenue, New York; Managing Editor, G. Douglas Wardrop, 280 Madison Avenue, New York; Business Manager, G. Douglas Wardrop, 280 Madison Avenue, New York.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.): Aerial Age Co., Inc., 280 Madison Avenue, New York; Henry Woodhouse, 280 Madison Avenue, New York; G. Douglas Wardrop, 280 Madison Avenue, New York.

3. That the known bondholders, mortgages, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: (This information is required from daily publications only.)

G. DOUGLAS WARDROP,
Business Manager.

Sworn to and subscribed before me this 27th day of September, 1918.

(Seal) JOHN J. HALEY,
Notary Public, New York Co., No. 18.
(My commission expires March 30, 1920.)



(*Continued from page* 216)

wholly conclusive as to the special value of these connections, and further tests are contemplated.

D. *Characteristics of constructive materials.*—A number of tests on materials entering into aeroplane construction have been made, and in particular satisfactory progress is reported in the development of a cotton substitute for linen aeroplane fabric. (See Report No. 22, pt. 1.) An extended investigation has also been carried on relating to the physical characteristics of balloon fabrics and with special reference to the factors which enter into the strength, durability, and gas-tightness of such fabrics. Specifications for balloon fabrics have been furnished to the Army and Navy covering fabrics of the same general type as are now being used, and with the addition of certain refinements relating to uniformity of construction and finish considered from the viewpoint of the influence of the fabric on the gas-retaining properties of the rubber film. (See Report No. 22, pt. 2.) A considerable amount of experimental work has also been carried on in connection with the physical properties of light alloys adapted to aeronautic construction, and also types of alloy steel. This investigation is continuing, and report in detail is not available for inclusion in this report.

E. *Generation of hydrogen.*—Satsfactory progress of a confidential nature has been made by the Bureau of Steam Engineering of the Navy Department in connection with the installation of hydrogen plants aboard ships.

F. *Standardization of specifications for materials.*—The Joint Army and Navy Technical Board, which was organized on recommendation of the Advisory Committee, is engaged with this problem, and substantial progress has been made.

The International Aircraft Standards Committee, with which this committee is working in full co-operation, is also actively engaged in the work of developing satisfacory standards for international adoption at the forthcoming conference to be held in London, and definite progress is anticipated along these important lines.

Appropriations for the Fiscal Year 1918

The appropriation "National Advisory Committee for Aeronautics, 1917-18" carried in the naval appropriation act approved March 3, 1917, is as follows:

For scientific research, technical investigation, and special reports in the field of aeronautics, including the necessary laboratory and technical assistants; traveling expenses of members and employees; rent (office in the District of Columbia, not ot exceed $1,500); office supplies, printing and other miscellaneous expenses; clerks; draftsmen; personal services in the field and in the District of Columbia: *Provided*, That the sums to be paid out of this appropriation for clerical, drafting, watchmen and messenger service for the fiscal year ending June 30, 1918, shall not exceed $12,000; in all, $107,000.

This appropriation became immediately available upon the passage of the act, and, added to the continuing appropriation of $5,000 a year for five years, carried in the act establishing the committee, made a total of $112,000 available for the fiscal year 1918.

In order to provide funds for the completion of the committee's research laboratory, the following amendment to the above appropriation was contained in the urgent deficiency act approved October 6, 1917:

National Advisory Committee for Aeronautics: Such portion of the appropriation "National Advisory Committee for Aeronautics" carried in the act making appropriations for the Naval Service for the fiscal year ending June thirtieth, nineteen hundred and eighteen, approved March fourth, nineteen hundred and seventeen, as may be necessary, not to exceed $40,000, is made available for the completion of the committee's research laboratory now under construction, and for the construction of additional buildings necessary in connection therewith.

Estimates for the Fiscal Year 1919

The following estimates of expenses for the fiscal year 1919 have been submitted by the committee in due form:

For scientific research, technical investigations, and special reports in the field of aeronautics, including the necessary laboratory and technical assistants, traveling expenses of members and employees, rent of offices in the District of Columbia, office supplies, printing, and other miscellaneous expenses, equipment, maintenance, and operation of research laboratory, and construction of additional buildings necessary in connection therewith; purchase, maintenance, operation, and exchange of necessary aeroplanes and one motor-propelled, passenger-carrying vehicle; clerks; draftsmen; personal services in the field and in the District of Columbia: *Provided*, That the sum to be paid out of this appropriation for clerical, drafting, watchmen, and messenger service for the fiscal year ending June thirtieth, nineteen hundred and nineteen, shall not exceed $20,000; in all, $260,000.

Conclusion

In conclusion attention is invited to the following:

1. The committee has been in existence about two and one-half years and during that time has carried through and prepared for publication 23 technical reports dealing with various phases of the science and art of aeronautics. It has further been occupied in the design and construction of its first laboratory units at Langley Field, which will be ready for occupancy early in 1918. It has further occupied itself with a great variety of questions relating to the preparations for war and with the various activities which have sprung up as a result of the existing state of war.

2. The plans contemplated for the coming year include:

(*a*) A continuance of the manifold miscellaneous activities resulting from the existing state of war.

(*b*) The completion of the first laboratory units at Langley Field and the installation of the necessary apparatus and equipment.

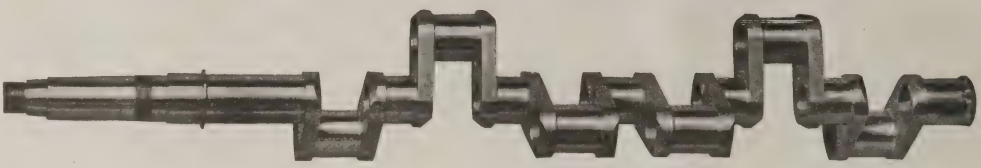
(*c*) The organization of a small scientific staff and the investigation of many important problems relating to the science and art of aeronautics, and with a view to their practical solution and application to the present war demands.

3. The preceding years of the committee's activities must therefore be viewed in some degree as preparatory for the more effective service which the committee hopes to render through its laboratory facilities at Langley Field and through the enlarged technical and scientific staff contemplated in connection therewith.

4. The committee trusts that these opportunities for enlarged service, and with special reference to the present war conditions, may be found an adequate justification for the appropriation herein requested.

Respectfully submitted.

W. F. Durand, *Chairman.*



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AERIAL AGE WEEKLY

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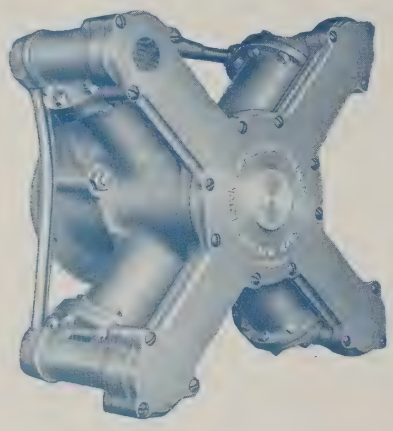
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AERIAL AGE WEEKLY

VOL. VIII OCTOBER 21, 1918 No. 6

TABLE OF CONTENTS

	PAGE
Uncle Sam, We Are Here!	281
Aero Club of America Gives $6,000.00 in Trophies	282
News of the Week	283
Nothing More Gratifying to the Nation Than to Know That the Aeronautic Industry Can Say "Uncle Sam, We are Here!"	285
The Aircraft Trade Review	286
The Organization in Charge of Aircraft Production for the Army	289
Dayton—Aviation Center of the Nation	290
The Personnel of the Air Service in Dayton	296
The Liberty Starter	297
The Engineering and Business Genius Back of the Curtiss Aeroplane and Motor Company	298
Ten Years of Hall-Scott	300
Air Division Discovers Wealth of Surplus and Unused Materials	301
The St. Louis Aircraft Corporation	302
Aeromarine Development a Monument to Inglis M. Uppercu	303
The Standard Aircraft Corporation—Builders of Bombers	304
Development of the Wright-Martin Company	305
The Hasler Revolution Circumference and Cutting Speeds Indicator	305
Titanine Development	305
Woodworking Machines for Aeroplane Parts	306
Insignia Prescribed for Air Service	306
Lieut. Ralph E. de Castro, Associate Editor of Aerial Age, Cited for Bravery	308
The Panhard—300 H.P. Direct Type Aviation Motor	308
The London Enemy Aircraft Exhibit	310
Liberty Walnut Propellers and the Men Who Make Them	312
Goodyear Performances	313
Captain Schroeder's Story of Altitude Record	314
The Continental Training Tractor	316
How to Send Christmas Presents to France and Russia	317
Naval and Military Aeronautics	318
The Theoretical Basis of Model Strength Tested for Aeroplane Structures	322
U. S. Aerial Mail	324
Military Aerostatics	325
Foreign News	326
Model News	327
Aeronitis	328

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.

Foster Bldg., Madison Ave. and Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6

Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879



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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Oct. 21, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, OCTOBER 21, 1918 NO. 6

UNCLE SAM, WE ARE HERE!

By HENRY WOODHOUSE

WHEN Uncle Sam finally saw the importance of striking Germany through the air, in the summer of 1917, and he wanted to place orders for about 25,000 aeroplanes, 40,000 motors, and the necessary equipment to build a real Air Service, he looked around and found a very meager aeronautic industry—meager because there had never been enough business on which to develop.

Then Uncle Sam called on the other industries for help and their answer was like General Pershing's answer when he landed in France. General Pershing said: "Lafayette, we are coming." The industries said: "Uncle Sam, we are coming."

On July 14th, 1918, General Pershing went to Lafayette's grave and said simply "Lafayette, we are here!" Only four words, but much more eloquent than a book.

Now that American battleplanes equipped with Liberty and Hispano-Suiza engines are actually helping the Allies advance, and, as the War Department announces, 6,600 training planes and 12,500 training engines have been produced, the Aeronautic Industry can say: "Uncle Sam, we are here!"

The next step will be to say: *"Uncle Sam, we are there!"*

This will happen soon. The shipments of planes and motors are increasing more and more substantial—and Second Assistant Secretary of War John D. Ryan will soon return from overseas with intimate knowledge of the quantity of aircraft and motors wanted, and a man-size aircraft program can be expected.

The $2,000,000,000 Aeronautic Industry of the United States

Over two billions of dollars are being spent in aeronautics in the United States. The Army in the past fifteen months was allowed by Congress a total of $1,672,000,000 for aeronautics. The naval appropriations and the orders from the Allied countries bring the total to over two billions of dollars.

To this stupendous sum will, no doubt, have to be added at least another billion dollars in the near future, because it is being realized that the number of aircraft required to prepare to win the war is much larger than was realized before.

It is generally admitted that the least that the United States can plan to do is to put and keep five thousand aviators on the fronts. This means training twenty-four thousands and supplying 118,000 aeroplanes and a minimum of 250,000 motors in one year. And propellers, radiators, magnetos, carburetors, instruments, etc., in proportion.

As was testified before the Senate Committee on Military Affairs last March by officers, and again last July, forty per cent of the aviators at the front must be replaced monthly. The replacements in machines is one hundred per cent monthly. In other words, to keep 5,000 aviators at the front for one year we must supply 24,000 aviators and 60,000 aeroplanes.

As it takes an average of two aeroplanes to train a military aviator the total aeroplanes to be supplied in a year to keep 5,000 aviators at the front would be 108,000.

About 20% of these aeroplanes will have to be single motored combat or advanced training machines; 30% will be single or double motored machines used for scouting, directing artillery fire, aerial photography, contact patrol and short distance bombing. The other 50% will have to be long distance bombing type machines as large as can be obtained. The larger the machines used for night bombing are, the greater the load of bombs they can carry. Therefore they cannot be too large.

This does not include any contribution to the Allied aircraft programs, which must be considered.

Allies Will Take Everything the Aeronautic Industry Can Produce

The Allies will take everything the aeronautic industry can produce—and more!

This is true of engines, of aeroplanes, of parts, of instruments and devices and of raw materials.

Great Britain, Italy and France have asked for thousands of motors. Great Britain has the planes ready for the motors, and the aviators ready to fly the machines and there is general regret that we cannot supply them as fast as needed because those idle planes and aviators could do wonderful work for the cause of civilization.

Able Men in Charge of Aircraft Program

The men in charge of production and operations in the U. S. Army and Navy Air Service are energetic men who can be counted upon to go as far as the official aircraft program permits them to go without delay.

The size of the program itself is, of course, the deciding factor. For this reason there is hope that during their last trip overseas Secretary of War Baker and Second Assistant Secretary of War John D. Ryan have had opportunity to go over the aeronautic subject thoroughly and that they will make recommendations to Congress for an adequate program, which will take into consideration the facts given in the first part of this article regarding the necessity of making provision for the monthly replacements in aviators and machines.

The Future of the Aeronautic Industry

To answer the query regarding the future of the aeronautic industry we must look into the future just as we looked into the future two years ago, or six and eight years ago, and try to estimate the changes which may be expected in the world's affairs from the present extraordinary situation and the possible development in size and employment of aeroplanes. I have already discussed this subject twice in the editorial pages of AERIAL AGE in the past two months and a detailed article appeared in *Flying* for October.

The duration of the war is the first thing to be considered. A war of such magnitude as the present war cannot end like a summer shower. It is more likely to smoulder on for years like a forest fire, because even if Germany should propose peace under conditions entirely favorable to the Allies, it would not be wise to discontinue the work of preparedness or to stop the manufacturing of war materials, because our enemy is a treacherous enemy and cannot be trusted. Therefore the manufacturing of war materials may be expected to continue for probably a year after the negotiations for peace begin.

Supposing the war lasts another two years—and that seems to be the absolute minimum. Considered from the standpoint of two years hence, and with two years in which to develop commercial aeronautics and establish aerial mail lines across

the continent, across the Atlantic, in South and Central America, Canada, Australia and other countries where aerial transportation will solve some of the great difficult problems of transportation, we can expect to be able to use 50 per cent of the entire output of aircraft for commercial purposes. This may be true if every effort is made in the meantime, beginning right away, to develop the aerial mail service.

If the war lasts three years longer, and every effort is made in developing the aerial mail service, when the war comes to an end not less than 70 per cent of the aeroplanes being built today can be used for the maintenance of our national defences and the aerial mail and express service.

If the war lasts four years and every effort is made, the entire output of our factories can be utilized entirely for transportation and maintenance of our national defences.

Just as those of us who worked for the building of our air forces pointed out in 1914, 1915, 1916 and 1917, that a substantial aerial mail service would build up a powerful reserve of trained aviators and develop valuable aircraft manufacturing facilities which would be available for national defence in case of need, we must today recommend this same measure to protect the welfare of this country and safeguard civilization.

It is hardly necessary for me to point out that now that we have aeroplanes capable of lifting fifteen tons and going at a speed of about 100 miles per hour, and the Air Service comprises over 10,000 aviators, and the non-flying personnel numbers over 100,000 men, the general application of aircraft for transportation is to come fast.

The delivery of mail across the Atlantic and across the continent may be as common next year at this time as the delivery of mail by aeroplane on the New York-Philadelphia-Washington route is today. The mail will be much heavier over long distances, because then the aeroplane will make it possible to make deliveries a number of days sooner.

By demonstrating that mail can be sent from Chicago to New York by aeroplane in eight hours the Post Office has emphasized the military and commercial value of a permanent aerial mail line between New York, Cleveland and Chicago.

Government orders, specifications for war materials, contracts, bids, authorizations of various kinds can be sent by aerial mail at a saving of over one day. This means truly a day gained in the production of the things needed to win the war.

It means that the regular office correspondence which, in accordance with business routine, is mailed late in the afternoon in New York will reach Chicago the following morning, thus saving a full day. By the fastest train it would only arrive there twenty-four hours later, too late to be attended to that same day.

Makes Quicker Train and Boat Connections

The initial saving of one day in the transmission of mail from Chicago to New York and vice versa is greatly increased when the letter is destined to make train connections for the West or the North or boat connections for Europe or South and Central America and the Pacific possessions and China and Japan.

Then it means a saving of days and weeks.

$50,000,000 Worth of Aerial Mail Business Waiting Development of Aerial Mail Service

To run a single line across the Atlantic will mean sending out two large aeroplanes every hour, with relays from Newfoundland to the Azores and from the Azores to Portugal, England and France. As they will be large machines, it will keep a large factory busy to supply the machines for a single line.

This will be equally true if the line is to be direct from the United States to Ireland, using large flying boats which may land at intervals to get fuel.

Here are a few points worthy of special consideration:

(1) If we all help the Post Office, within twelve months a dozen additional aerial mail lines can be established, and the Post Office will be able to send by aeroplane at least half of the one hundred million day and night letters and of the fifty million special delivery letters that are being sent each year in the United States.

(2) The day and night letters average close to $1 each, and special delivery letters thirteen cents each, making a total of over fifty million dollars' worth of business which is waiting for the development of the aerial mail service.

(3) Aerial mail day letters are most effective within distance of 400 miles. Night aerial mail letters are effective over any distance, because the aeroplane can carry mail over 1,000 miles between 6 P. M. and 8 A. M.

(4) The aerial mail system will be much more efficient and cheaper than the present telegraphic night and day letter system can be, because the sender can send a letter written in his office which does not have to be transcribed by an operator, who may make mistakes, and the message will reach the person to whom it is addressed without anybody else reading it, thereby insuring greater privacy. The cost of an aerial mail letter will be only sixteen cents, for which price there can be sent a message that would cost $5 or more by telegraph.

(5) Twenty-five million dollars' worth of parcel post can be sent by aeroplane, and about as much of trans-Atlantic mail.

(6) The Post Office pays eighty cents a pound to steamships of American registry to carry mail across the Atlantic. Charging one dollar per letter sent by aeroplane across the Atlantic, will make mail carrying across the Atlantic and across the Continent a paying proposition even now. The super Handley Page or the 2,100-h.p. Caproni could take easily in the fuselage fifty bags of mail, weighing fifty pounds each, making a total of 100,000 letters each trip.

Passenger Carrying Between New York and Chicago in Six Hours at $150 Per

Passenger carrying between New York and Chicago at $150 each is going to be a fair business proposition. A great many people would be willing to pay even more to cut the journey between the two cities down to six hours. We may predict that within two years we will see air lines between New York and Chicago having to run an aeroplane every half hour, having stations along the route, and having express and "local" service.

I could go on quoting hundreds of possible lines of development, but the above suffice to give a good idea of what we may expect—provided the aeronautic industry give due consideration to the necessity of working for its future. Few manufacturers are doing so at present. Few are taking interest in or supporting the aerial mail service.

AERO CLUB OF AMERICA GIVES $6,000.00 IN TROPHIES AND LIBERTY BONDS TO PROMOTE EFFICIENCY IN U. S. ARMY, NAVY, AND MARINE CORPS AVIATION

THE Aero Club of America announces the gift of $6,000,00 trophies and Liberty Bonds, to promote efficiency in the U. S. Army, Navy and Marine Corps Aviation.

The gift is made under the terms of the will of the late Mr. Samuel Valentine, who was member of the Board of Governors of the Club, and left $10,000.00, to be spent at the discretion of the Board of Governors of the Club, for the development of aviation.

After giving the matter thorough consideration, the Board of Governors of the Club, came to the following conclusions:

(1) That it would prove a great incentive for the development of efficiency in flying, bomb dropping, theoretical aerial combat, scouting, formation flying, and other phases of military and naval aviation, if the thousands of aviators and aviation students, who form the different Army Aviation Wings, and Naval and Marine Corps Aviation Stations, had competition.

(2) It became evident that the best results could be brought about by establishing several trophies to be competed for, under rules to be made by the Military, Naval and Marine Corps authorities, providing a trophy for each of the First and Second Provisional Wings of the U. S. Army, and one for the group of Naval and Marine Corps Air Stations located on the Atlantic Coast; and one for the group of Naval and Marine Corps Air Stations located on the Pacific Coast.

(3) The First Provisional Wing comprises a number of Army Aviation Fields which are separate units. The same is true of the Second Provisional Wing, which comprises a number of Aviation Schools located in the West. The aviators in the First Provisional Wing are mostly men who have had, or are having, advanced courses in military aeronautics. On the other hand, the Second Provisional Wing has more aviators who have not had the advanced courses. This, and the

(*Continued on page* 335)



THE NEWS OF THE WEEK



Officers Permitted to Write for Publication

The War Department authorizes the following statement:

The bar has just been removed from literary effort by persons in the military service. Hitherto, General Order No. 1, January 2, 1918, forbade them to contribute to publications or to accept pay for their writings.

Representations were made to the General Staff that since the universal service idea gathered into the army of the United States all the literary ability in the country below the age of 45, this fund of strength should be as free for use as any other special technical equipment.

It was further pointed out that since soldiers have many periods of leisure, there was no legitimate objection to their employing their spare hours in writing, and that any moneys they might thus secure they might well be permitted to accept; particularly in view of the return to the government in the form of income taxes, and the purchase of Liberty bonds and War Savings Stamps.

The General Staff was sympathetic to this suggestion and a revision of General Order No. 1 was directed. This was a matter of some difficulty, as steps had to be taken to make sure that military writers would not use their freedom for the purpose of making indiscreet utterances or giving out information of value to the enemy.

It was not thought fit that soldiers should enter into competition with the regularly accredited news correspondents; they are, consequently, still forbidden to act as regular contributors of news.

Accredited correspondents are permitted to write criticisms of the conditions and activities they encounter, but this privilege of a free press could hardly be granted to soldiers under discipline. Where they encounter incapacity or injustice they have regular channels already provided for making their complaints to the proper authorities without hindrance from offenders.

The writing of fiction, though forbidden in the original General Order No. 1, had been permitted by a special ruling, but in the new form it is specifically sanctioned. Under "fiction" will be included the drama, motion picture scenarios, and other forms of imaginative expression.

Soldiers may write letters for publication and receive money for them. Literary work of all sorts is permissible, "in so far as it does not interfere with the proper performance of duty and the full observance of discipline."

One necessary and important provision is made that "such matter as relates to the military profession, the war, or to current events" must first be submitted to and approved by the Chief Military Censor, who is also the Director of Military Intelligence, with an office at Washington.

The Censor, it may be stated, believes that the writing gift should be encouraged. It is the best form of propaganda; it keeps alive the interest in individual achievement and point of view; it will bring to light numberless picturesque bits of character and conduct otherwise unchronicled; it offers encouragement to the free expression of the American soul in those hours of its greatest experience.

The new order is dated September 28, 1918, and it is quoted in full for the information of all concerned.

"The Secretary of War directs that these papers be filed in the office of the Adjutant General of the Army, and that an amendment to Section V, General Order No. 1, War Department, January 2, 1918, be published as follows:

"V.—1. All persons in the military service, except those who are duly authorized, are forbidden to utter or publish, whether by speech, writing, print or picture, any true or false report likely to be of use to the enemy, or any criticism of persons in the Government service to the detriment of any department of the Government or to the successful prosecution of the war. This rule applies also to persons not in the military service who may be permitted to accompany any part of the army, save that it is not binding upon authorized correspondents for whose guidance special regulations are provided.

"2. All persons in the military service are forbidden to act as regular correspondents or contributors of news or articles of an informational military nature to newspapers or other periodicals.

"3. Except as above prohibited, and in so far as it does not interfere with the proper performance of military duty and the full observance of discipline, there is no objection to the publication, or to the receipt of payment for, fiction, verse, essays, letters, descriptive or technical articles, pamphlets, books, or illustrations, provided that such matter as relates to the military profession, the war or to current events is first submitted to and approved by the Chief Military Censor, Military Intelligence Division, General Staff.

"4. In the case of troops in foreign territory, the Commanding General of such expeditionary force may establish such modification or further regulations as the situation may seem to him to require.

"The object of this order is to satisfy, as far as is compatible with the protection of military interests, the natural desire of the people to keep in touch with their soldier representatives. It is, therefore, expected that all concerned will comply with both the letter and the spirit of its provisions.

"None of the foregoing applies to press dispatches filed from cantonments or camps by regularly paid newspaper correspondents not in the military service. Their copy will not be censored by military authority, but the camp commander will instruct them that they must rigidly adhere to the requests for secrecy with respect to information of value to the enemy, as defined in the printed card sent out by the Committee on Public Information. On violation of these requests, the offending correspondent will be deprived of the privilege of the camp."

Aviator Garros Is Missing Once More

Paris.—Lieutenant Roland G. Garros, a French aviator well known in the United States, who escaped last February from a German prison and rejoined his aerial squadron, has again been posted as missing after a recent flight across the German lines.

Garros figured in many aerial competitions in America in the pioneer days of aviation. At one time he held the record for altitude. He appeared in meets in New York and Southern cities, as well as in Cuba and Mexico. Garros was born at Cape Town, South Africa, of French parents, in 1885.

Air Service Age Limit 56

An announcement issued by the Air Service Officer Headquarters of the Eastern Division of the United States Army, states that the War Department through a special ruling has raised to 56 the age limit for men who desire to enlist in the Air Service.

Major Willard Wadsworth, Department Air officer in New York, in commenting on the ruling, said: "Heretofore we have been reluctantly compelled to turn down applicants who were more than 46. The majority of those rejected were skilled men, and the service has suffered a distinct loss as a result of our inability to enlist them. It is hoped that they will reapply for enlistment."

The announcement also stated that applications are again being received for commissions as pilots, bombers, observers and balloonists. Applications may be filed at 104 Broad Street.

Aeroplane Takes Piano from London to Paris

Paris.—One of the new large Allied bombing planes has brought from London a full-sized upright piano, landing in Paris safely.

The aeroplane can carry six persons and a large quantity of bombing explosives, but this



At the Aerial Gunnery School at North Island, Cal. From clay pigeons the student advances to machine guns until he can bag a Boche in the air. Here is shown one of the latest types of machine guns

weight measured in pounds was not readily comprehended, and it was determined to bring over a piano as clear evidence of the machine's capacity.

"Roosevelt Field" Honors Quentin

In memory of Quentin Roosevelt the new third field at Hempstead, L. I., has been named Roosevelt Field. It has had no name heretofore, as it has been completed but a short time.

Germans Use Fire Bombs

Paris.—The Germans during the last few days have been using in their air work a new type of inflammable bomb, combining great effectiveness with light weight. A single aeroplane, it is said, can carry 200 of these bombs.

The only way of fighting the fire caused by this new form of destructive weapon appears to be the isolation of the blaze, as pouring water on it is literally adding fuel to the flames on account of the chemicals of which the bombs are composed.

New Air Feat by Fonck

Paris.—Lieutenant René Fonck, according to an announcement made here on October 9, recently brought down four German aeroplanes within twenty minutes on the same day.

Fonck is now credited with seventy official victories, and has actually brought down 109 German machines.

Sold Guynemer's Glove

Lieutenant Bagues, at a Liberty Loan concert in the Metropolitan Opera House on October 9, as a last touch of sentiment, auctioned off a glove of the famous "ace," Guynemer, given by the airman to Mme. Purbau. The glove brought $1,250,000. The Travellers' Insurance Company and National Biscuit Company combined to buy the trophy.

Provisional Wing at Park Place Is Named for First Flying Surgeon

The home of the Second Provisional Wing at Park Place has been officially named Ream Field, in commemoration of the first flying surgeon of the Air Service, the late Major William R. Ream.

Notification of the new designation, decided upon by the Director of Military Aeronautics, was received at the field October 1 and read to the officers.

Major Ream was flight surgeon of the British-American "flying circus," which started from Indianapolis for St. Louis August 24. He was killed that day when his machine, piloted by Lieutenant Wesley Benner, fell 150 feet, the engine having stalled.

Major Ream's home was at San Diego, Cal.—*Talespins.*

Rickenbacher Gets Two More Planes in Big Air Battle

With the American Army Northwest of Verdun.—October 4 was not one in which conditions were ideal for aviation. At no time was the visibility good, but it was not so bad as to prevent operations by pursuit planes, which set out early upon their task. So active, in fact, were the airmen that the day was the busiest the airmen have had since the Meuse-Argonne offensive started.

It was hardly daylight when the aviators began operations. Soon a squadron of five Americans fought a battle with seven German machines near Fleville, in which the Americans brought one of the enemy down. Later in the morning three German aviators were reported to have been brought down by anti-aircraft guns, while in the afternoon four others were reported down within the American lines from similar means.

The Germans attacked American balloons along the front repeatedly. In most instances the anti-aircraft fire drove off the enemy planes. In a number of instances pursuit planes protected our balloons from the Germans.

On Thursday evening Eddie Rickenbacher brought down two German aeroplanes. He finished the first quickly and then tackled the second.

Lieutenant J. C. Vaseonoelos, of Denver, was the star of the day on Friday, although he brought down only one aeroplane. He was engaged with Rumpler and Fokker and shot down the latter west of Apremont. The lieutenant returned to the aerodrome with scores of bullet holes through the wings of his machine.

Just before nightfall eight American pursuit planes encountered more than twenty-five enemy machines beyond the lines while on a balloon shooting expedition. Though the Americans had accomplished their mission, when they ran onto the big German squadron a fight followed which lasted more than fifteen minutes, but when it was concluded five of the enemy planes were downed and all but one of the American squadron were on their way home, safe.

To Increase Balloon Personnel

The War Department authorizes the following:

Owing to the increased demand from the American Expeditionary Forces for balloon crews, the Balloon Corps of the Army is to be increased 25,000 men and 1,200 officers. It now numbers approximately 11,000, all ranks. Authority has been obtained by the Air Service from the General Staff to induct men of draft age and to transfer officers from the other branches of the service. This increase will create many vacancies in the grades of colonel, lieutenant-colonel, major, captain and lieutenant. Enlisted men and civilians who apply for officers' examinations will be required to take the cadet course of from three to five months, and training camps for this purpose will be conducted this winter in the South and on the Pacific Coast. The schools already established for this purpose are located at Old Point Comfort, Virginia; San Antonio, Texas; and Arcadia, California, near Los Angeles.

In addition to the important rôle played by the balloon in the control of artillery fire, it is now being used with infantry, a caterpillar mount for the winch by which the balloon is controlled having been successfully used on the front. This portable winch makes it possible for balloon companies to even keep up with infantry advances for observation and direction of attack.

In addition to the opportunities for immediate promotion, officers who join the balloon service will receive the benefit of flying pay when they actually do the work of observers and make flights in connection with army operations. Flying pay is 25 per cent of the base pay of an officer.

W. K. Vanderbilt Dined by Flyers

Paris.—William K. Vanderbilt was presented on October 4 with the rosette of an officer of the Legion of Honor at a banquet given him as Honorary President of the Lafayette Escadrille, in the founding of which he aided. The presentation was made by Jacques L. Dumesnil, Under Secretary for Aviation.

American Ambassador Sharp, ex-Premier Viviani, Brigadier General Patrick, U. S. A., and members of the escadrille were present.

Major Edmund L. Gros, Chief Liaison Officer of the American Aviation Service, an organizer of the escadrille, and Captain Thereault, its original commander, were highly praised for their work in founding and organizing the Flying Corps.

Each member of the escadrille present was given a service ribbon and a silver clasp in the shape of an Indian head, the emblem of the escadrille.

Work of American Balloon Companies on French Front

The War Department authorizes the following:

An American officer of the Division of Military Aeronautics, just arrived from overseas, reports that in the beginning of the recent offensive one American balloon company, with about 170 men and its equipment, was in Chateau-Thierry three hours after the infantry had occupied the place. It had a balloon up the following morning five miles beyond the village and was observing for American artillery with a complete line of communication established.

Another balloon company, a few hours behind the first, nevertheless got into action quick enough to bring down an enemy plane with a captured machine gun, and for the service rendered on this occasion was cited in the French Army orders. For this exploit each member of the company hereafter has the privilege of wearing a green and white cord looped over the right shoulder of his uniform.

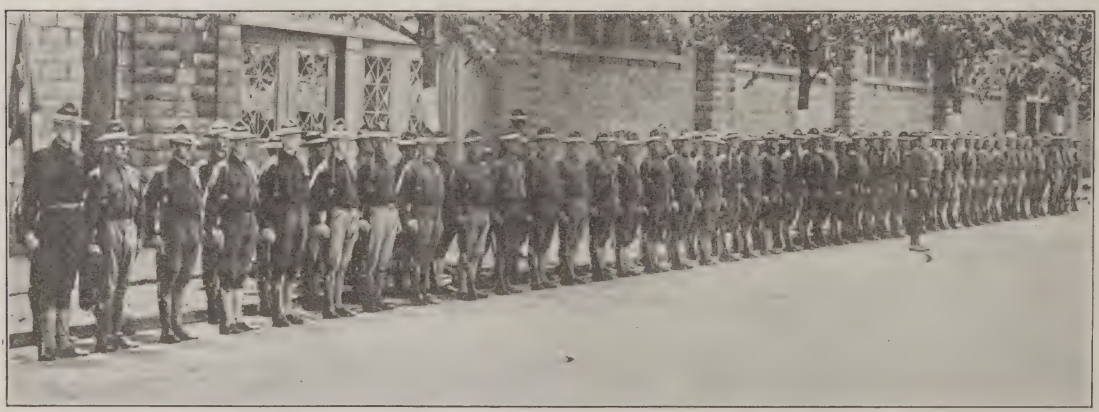
On one edge of a wood, about fourteen acres in area, another American balloon company in this sector was so heavily shelled that it had to haul down its gas bag. In a remarkably short time, however, it had transferred its equipment to the other side of the forest and went on making observations uninterruptedly. The officer said that this forest had been used by the Germans as an ammunition dump and that this balloon company had so many souvenirs that an order had to be issued to prevent the men from loading their souvenirs in the trucks, otherwise there would have been no room for the balloon equipment.

This officer reported American balloons, manned by American crews trained in this country, on the line and doing good work. The balloon crews were becoming proficient in parachute jumping. In this, he said, there was plenty of action all the time. He said that the American balloon companies favored putting two men in a balloon basket rather than one, as was the custom with the French and English.

Need More Aviators

The needs of the fast-moving program of the Air Service, today more than 100 times greater in respect to personnel than it was when war was declared, require a number of additional men, according to Colonel Shields, Acting Executive of the Division of Military Aeronautics. Irrespective of status in the draft, the Air Service has been reopened for induction of mechanics and of candidates for commissions as pilots, bombers, observers, and balloonists, after having been closed, except for a few instances, for the last six months.

In announcing the opportunity for service in the aviation section, officials disclosed the completion here of twenty-nine flying fields, 1,200 de Haviland planes, 6,000 Liberty motors, parts for the first heavy night bombers, 6,600 training planes, and 12,500 training engines. Civilians have not been given an opportunity to qualify as pilots since last March. During last Fall and early Winter a reservoir of more than 6,600 prospective fliers, accepted by the examining boards, had been built up, but this has since been gradually drawn off through graduation.



Student Aero Squadron at Camp Dick, after one week's training

NOTHING MORE GRATIFYING TO THE NATION THAN TO KNOW THAT THE AIRCRAFT INDUSTRY CAN SAY: "UNCLE SAM, WE ARE HERE!"—*Governor Charles S. Whitman of New York.*

GOVERNOR WHITMAN and Mrs. Whitman were among the earliest advocates of aerial preparedness. By his addresses, and communications to the Aero Club of America, Governor Whitman advocated speed in developing substantial Air Forces. Mrs. Whitman, it will be recalled, was one of the first hundred American women to fly. Even Miss Olive Whitman, the charming little lady shown in the photograph by her little brother, contributed to the campaign for aerial preparedness and for the aerial coast patrol. In 1915 she christened the flying boat "N. Y. N. 1," which was presented to the New York Naval Militia by Mr. Glenn H. Curtiss, through the Aero Club of America. This gift, and other contributions from patriotic people, made it possible to train 300 aviators at private expense which were taken over by the Army and Navy and were the first American aviators to go overseas when war was declared.



Mrs. Charles S. Whitman has been very active in war work and State Organizations. She is connected with the following organizations:

Aerial League of America (Honorary Member), Aviation Committee, National Special Aid Society, American Red Cross Canteen Service for Albany, Camp Upton Community Hall Committee, Central Christian Mother's Union, Citizen's Committee for the Conservation of Children of America During the War, City Federation Hotel (stockholder), Committee for the Protection of French Soldiers Reforme No. 2, French Aerial Warfare Committee (Honorary Member), Infant Welfare Station, Little Mothers' Aid Association, Militia of Mercy, National Aeronautic Committee, National Child Labor Committee, National League for Women's Service, National Security League, New York State Conference of Mothers, New York State Committee on Women in Industry of the Council of National Defense, New York State Congress of Mothers and Parent Teachers Associations (Advisory Board), Red Cross (Kenwood Branch), Salvation Army War Work Committee, Seaside Home for Crippled Children, Soldiers' and Sailors' Club, Stage Women's War Relief, United States Navy League, Vacation Ass'n of the Civic Federation, War Camp Community Service, Woman's Christian Temperance Union, Woman's Liberty Loan Committee, Women's Homeopathic Hospital Unit, Women's Overseas Hospital, Y. W. C. A. War Work Council (Honorary Chairman N. Y. State). Received medal from the Patriotic Committee of New York City Federation of Women's Clubs.

Governor Whitman is Honorary Member of the Aero Club of America, Honorary Member of the Aerial League of America, and of innumerable national and state organizations.

Governor Whitman always believed in the future of aeronautics, and did everything in his power to foster aeronautic progress. In the pre-war days, when even the value of aircraft for military purposes was generally denied; Governor Whitman appreciated the value of aircraft and urged the building of American Air Forces at every opportunity.

It was his valuable and hearty encouragement that helped so greatly to organize the First Aero Company of the New York National Guard in 1915-16, which resulted in giving fifty-four (54) aviators to the United States Army.

When Mrs. William H. Bliss gave $10,000.00 to the Aero Club of America to purchase the first aeroplane for the New York National Guard, and contributions for the organizing of an Aero Company, Governor Whitman and Mrs. Whitman did everything in their power to assist this important development—just as they have done everything in their power to assist the organization of the Naval Aviation Section of the New York Naval Militia.

When the United States entered the war, the United States Army and Navy were able to get at least two hundred (200) men, well trained in aviation, who had been trained at private expense, through the efforts of the Aero Club of America and with the hearty support of Governor Whitman and Mrs. Whitman.

The AIRCRAFT TRADE REVIEW

A. E. J.

Agrees to Build 100 Planes Daily

Toledo, Ohio.—John N. Willys, president of the Curtiss Aeroplane Company, announced here today that he has closed with the Aircraft Board the biggest plane contract ever entered into in this country.

At a conference in Detroit, Willys contracted to turn over one hundred planes a day from March 1 on, provided the Government furnishes motors and other equipment.

Hartzell Walnut Propeller Company Opens Dayton Office

The Hartzell Propeller Co., of Piqua, Ohio, announces that Mr. H. B. Wise, their sales manager, has opened an office in the Mutual Home Building, Dayton, Ohio, to facilitate their intercourse with the various aircraft departments located in Dayton and the Middle West.

Self-Starting Device for Aircraft Motors

Milwaukee.—A starting device for heavy duty engines, designed several years ago by Nels A. Christensen, a noted inventor and engineer of Milwaukee, principally for application to motor fire apparatus and similar purposes, has been refined by him to suit the requirements of aircraft. Several hundred hydroaeroplanes in use at the navy aviation camp at Great Lakes, Ill., have been equipped with the starter. Mr. Christensen personally superintended the installations and made numerous practice flights to demonstrate the efficacy of the apparatus. He is president and general manager of the Christensen Engineering Co., 816 First National Bank Building, Milwaukee.

Planes Coming From Cincinnati

Cincinnati.—The Overmeyer Airplane Mfg. Co. has bought three acres of land at the West End and will at once begin the construction of a plant for the manufacture of aeroplanes. It will begin with three large contracts from the Government for war service and will be kept busy on Government and war work during the period of war, but the plans of the projectors are to manufacture aeroplanes for commercial and private use following the close of the war. E. C. Drury, of Philadelphia, is interested in the company.

Aeroplane Plant for Chicago

Chicago.—The Illinois Mfg. Association is negotiating for the erection of an aeroplane plant here.

Olds Will Make Liberty Engines

Lansing.—The Olds Motor Works will soon start production on its initial order of Liberty engines. The first lot of 2,000 kitchen trailers is expected to be delivered during this month. The production of passenger cars is slowly being diminished, and the plant will be entirely on war work by January 1.

Flight Tests of Caproni Plane

Washington.—Flight tests of an American built Caproni aeroplane equipped with three Liberty engines are being held by the Bureau of Aircraft Production. A Caproni plane of this type arrived here October 2 at Bolling Field from Hazelhurst Field, Mineola, L. I., and left the next day for Dayton. This Caproni is one of a few built in United States Government factories for test by American aviators and engineers. The tests are now being made in flights from various fields and will continue to be made until it is decided whether or not to put this particular type of plane in quantity production.

Daily Liberty Output Averages 278

Detroit.—The production of Liberty engines in the several plants that are carrying on this work is rapidly increasing, and during the month of September the total average daily production reached 278. It is expected that during the month of October the total output will touch 3,000 complete engines.

The Ford Motor Co. is the first plant engaged in this work to exceed a production of 100 complete engines in any one day; on September 30 120 engines were turned out. This number is increasing daily. Several of the plants, namely, Lincoln, Ford and Nordyke & Marmon, exceeded their August estimates.

Wilson Made Curtiss Vice-President

Buffalo.—At the monthly meeting of the board of directors of the Curtiss Aeroplane & Motor Corp., Charles Wilson was elected a director and vice-president in charge of production. Mr. Wilson is president and general manager of the Wilson Foundry & Machine Co., Pontiac.

Bomber Makes 143 M. P. H.

Washington.—A de Haviland 9 plane equipped with a Liberty engine flew from the McCook Field, Dayton, Ohio, to Bolling Field, Washington, D. C., with no stops in 3 hr. 5 min. The actual flight from Dayton to Washington was 2 hr. 5 min. The distance between the cities is 430 miles with the time of flight 143 m. p. h. The journey was made by Caleb Bragg, civilian pilot, attached to the Engineering Department of the Bureau of Aircraft Production. An engineering officer was the passenger. The pilot traveled by compass at a high altitude and reported no difficulty in holding the course. The plane left for New York. From there it goes on a non-stop flight to Dayton.

Quantity Liberty Engine Production Reached

Washington.—The output of Liberty aeroplane engines is fully up to expectation and has reached quantity production. Aeroplanes are now going ahead rapidly and are being shipped in trainload lots daily. These statements were made by W. C. Potter, Acting Director of the Bureau of Aircraft Production, following his return from an inspection of the factories turning out the planes and engines.

Licenses for Experimental Flight to Be Submitted to Army and Navy

Washington.—Applications for flying licenses to conduct experimental flights must hereafter be submitted to the proper Army and Naval authorities before being filed with the Joint Army and Navy Board on Aeronautic Cognizance, Building D, Sixth and B Streets, Washington, D. C.

Applications should be made either by individuals or aeroplane companies making new types of nay aeroplanes to Capt. N. E. Irwin, U. S. N., Director Naval Aviation Division, New Navy Building, Washington, D. C., and for flying army aircraft to the Technical Section, Division on Military Aeronautics, Dayton.

Personal Pars

Horace N. Trumbull, advertising manager of the SKF Ball Bearing Co., of Hartford, Conn., has entered the Reserve Officers Training Camp at New Haven, Conn.

Mr. Byler Advertising Administrator

Robert C. Byler, for nearly four years advertising production man for the SKF Ball Bearing Co., of Hartford, Conn., has been appointed advertising manager of the SKF Administrative Co., of New York City, and will direct the advertising of the SKF Ball Bearing Co., of Hartford, the Hess-Bright Mfg. Co., of Philadelphia, and the Atlas Ball Company of the same city, all of which are controlled by the SKF Administrative Co.

Until arrangements are made in New York City, Mr. Byler will remain with the SKF Ball Bearing Co., of Hartford, Conn.



A De Haviland "four" on exhibition during the recent 3800 mile Western Flight. Lieut. Col. C. K. Rhinehardt, Commander of the First Provisional Wing is shown in the pilot's seat. Night flying lights on the top wings and dummy bombs in the bomb racks, are shown



Women in the Aircraft Industry. Women working on wing manufacture in an American aircraft factory

The First Annual Banquet of the Y. M. C. A. Aeroplane School

The first annual banquet of the Y. M. C. A. Aeroplane School was held in the Oak Room of the Hotel Martinique on Sunday evening, October 6. About one hundred of the students of the school were assembled on this occasion and enjoyed the excellent banquet which was provided and listened to the interesting speeches and talks made by the guests of honor. Mr. Charles Kinsell was toastmaster and introduced the speakers with appropriate remarks. Mr. Charles W. Crossman, the manager of the school, spoke first, and he told of the remarkable growth both in numbers of students and in the equipment which they had provided. He further stated they had 42 instructors and nearly 700 students.

Mr. Crossman gave particular credit to the assistance which the Aero Club of America had rendered both in enabling them to secure motors and apparatus for teaching, as well as aeroplanes which had been donated by the Standard Company and Mr. Irenee du Pont. He stated they had about twenty motors and ten machines.

The next speaker was well known to many of those present and represented the Aero Club of America, Mr. Augustus Post, its Secretary. Mr. Post told the members of the school of the rapid development of aeronautics, and described some of the larger machines and gave the listeners a vivid description of Captain R. W. Schroeder's sensations when he broke the world's altitude record at Dayton, Ohio, and flew to a height of 28,900 feet. He also described the rapid development of the Aerial Mail Service, and from his experiences in the past gave his predictions for the future development of commercial aeronautics and the marvelous achievements which could soon be looked for in this field of aerial navigation.

Captain Oliver J. Gagnier, R. A. F., was the next speaker, and he told about his training in the R. A. F. in Canada and gave some of his experiences at the front. He gave the men a realization of the importance of the work of mechanics in connection with aviation and told how much depended upon their work in keeping the motors in perfect condition. Captain Gagnier represents the Provost Marshal of the British Recruiting Mission to the United States and has seen fighting at the front and has flown all types of British machines.

Other speakers were Mr. Samuel Ecker, formerly Assistant District Attorney; Mr. Adrian Van Muffling, the Chief Instructor of the Aviation Engine Department, and Mr. H. C. Brokaw, the Superintendent of Education.

Les Terribles

(Written exclusively for AERIAL AGE.)

Indians, lumberjacks and farmers from the Northwest made up the bulk of the 32nd division of the American Expeditionary Force in France. They were deployed north of Soissons, with the French army of Gen. Mangin.

The particular job that fell to their share was first, to break the German hold on the Bois Meuniére, which they did after six vain attacks. Then they were told to take and hold the village of Ciérges—and this they did, after it had changed hands nine times. Later they fought for four days along the Soissons railway. And in consequence they received—individually—many medals, and, collectively, the nickname from the French brothers of the "Les Terribles"—The Terrible—which they prize much more.

There is a division in this country that has orders to deploy on all fronts from September 28 to October 19, to take every village and hamlet, to fight along the railways, and not to let any dollar escape.

It's not a division, either, but an entire army, the A. L. B. B.—American Liberty Bond Buyers.

You are enlisted—don't forget that. So go to it! Put it across with the same fighting spirit that animated the "Indians, lumberjacks and farmers" of the 32nd!

"Les Terribles"—pretty fine nickname, eh? Upstanding and red-blooded-like? Why not earn it on the Fourth Loan?

Aero Carnival at Garden City

Arrangements were completed on Oct. 5th by the U. S. Air Service to stage what will be the biggest aviation carnival ever held. It is being organized by the First Provisional Wing, U. S. Air Service, Garden City, L. I., Col. Claude K. Rhinehardt, commanding, and will be held at Belmont Park on Saturday, October 26th.

Numerous aero squadrons from the various flying fields and more than 100 aeroplanes of many different types are expected for the huge exhibition. There will be athletic field games, in which flying cadets and enlisted men will compete. There will be solo flying, air stunts, scout plane races, battle-formation flying, motorcycle side-carriers' dispatch races, etc.

The proceeds will be turned over to the National Aeronautic Committee, which is working in association with the War Department Commission on Training Camp Activities and is the only committee recognized by the Commission in aviation work.

Mrs. Charles A. Van Rensselaer is chairman of this committee and Mrs. Clinton Gilbert, treasurer. The funds realized from the carnival will be used for the purchase of athletic equipment, bands' instruments, etc., for our overseas squadrons and training fields in this country, and a portion of the proceeds will be turned over to the committee's fund to provide swimming pools to the Southern training fields. The National Aeronautic Committee is doing excellent work in supplying athletic equipment in a manner that is meeting with the approval of General Kenly, Director of Military Aeronautics, and other high officers of the Air Service.

More than 207 squadrons have been supplied by this committee and 22 flying fields already equipped. However, much more equipment is needed to supply the thousands of men in the Air Service with sporting goods and musical instruments, and the proceeds of the forthcoming meet unquestionably will supply many more equipments.

The carnival is to be a popular-priced affair and an enormous attendance is expected. It will enjoy the patronage of society people and all of the leading Metropolitan Clubs. Numerous features will be added to the program as its organization progresses.



An ingenious mounting of the wing skeleton which makes handling easier and facilitates production



Class in gas engine construction at the Ground School, University of Texas

1,000 Homers Flew Here from Capital

New York.—The War Department released 1,000 pigeons near the Union Station in Washington on September 29 for a flight to New York. The following Sunday 3,000 will be liberated for a similar test. The flights started at 9 A. M., the birds being set free by men from Washington Barracks, under the direction of Major Frank Griffin, head of the pigeon section of the United States Signal Corps.

The first flight is known as the "futurity flight," and the pigeons, under six months of age, were brought from New York Saturday night. They were expected to fly approximately 1,500 yards a minute.

The purpose of these flights is to increase or exercise the "homing" instinct of the birds. In the regular army work a flight such as these is never made, but the birds are released one or perhaps two at a time, with messages.

Travel by Aeroplane

In a recent opinion from the office of the Judge Advocate General, officers travelling by Government aeroplane may draw expenses at the rate of four cents a mile, which is the rate of mileage allowed where the government furnishes transportation by prairie schooners, dog sleds in Alaska, and buffalo carts in the Philippines. The allowance for travel on trains is generally seven cents a mile. The distinction is made, not because aeroplanes are less modern than trains and therefore classed with dog sleds or prairie schooners, but because customarily there are only two methods of transportation used in the service, "train" or "otherwise." Aeroplanes fall in the latter class.

This decision settles a doubt raised in a former opinion that because the aeroplane as used in Military Service was not a vehicle, but an instrument of war, there was no authority for the payment of individual expenses of those using it for travel. Major General Wm. L. Kenly, Director of Military Aeronautics, made the point that although aeroplanes are employed for combat and other war purposes, the use of the aeroplane in the army as a means of conveyance was of constantly increasing importance.

He maintaained that this use was two-fold. First, in the theatre of operations, in connection with troops. Second, outside the theatre of operations, in the transportation of officers travelling without troops, on permanent change of station or temporary duty. In the first case, travel would be performed by aeroplane as it would be by horse, automobile, or other means, and no mileage would accrue. In the second case, travel would be performed by aeroplane in lieu of railway, and mileage, at four cents a mile, should be allowed.

The chief reason for such travel, as maintained by General Kenly, was its expediency. When aeroplanes were available, he believed, they should be used, if only for the sake of practice. There would be no additional expense to the Government in using available aeroplanes for travel, he held, nor any diversion of the time of pilots from their duty. At the same time travel could be accomplished far more quickly than by train, even on short trips, whether for change of station, temporary duty or purposes of inspection. If no mileage was to be drawn for such travel, officers would themselves have to bear the expenses, and if, for this reason, they avoided travel by aeroplane, the result in the long run would be loss of time and loss of opportunity for the full development of the use of the aeroplane.

The point was also made that there was no requirement known where travel must actually be performed by railway to entitle an officer to mileage, and examples were cited to the contrary, found in the Alaskan, Philippine, and Western Service, where, when railroads were not available, mileage had been granted for travel performed by other means of conveyance.



The Handley Page bomber "Langley," equipped with Liberty motors, constructed by the Standard Aircraft Corporation

THE ORGANIZATION IN CHARGE OF AIRCRAFT PRODUCTION FOR THE ARMY

THE organization in charge of producing the aircraft for the Army has, so far, been an organization which had nothing to do with making up the size of the aircraft programme. The duties of this organization have been, and still are, only to carry out programmes as they are made, producing the aircraft as fast as they possibly can be produced.



Second Assistant Secretary of War John D. Ryan, who has just returned to America after an extended trip in England and France

This organization has been, and still is, in the peculiar position that it may be blamed for small production due entirely to outside causes, such as: (a) the smallness of aircraft production; (b) changes in aircraft programme ordered by the authorities overseas; (c) delays due to reaching a decision on the types of aeroplanes to be built; (d) failure to supply newly discovered needs, created by developments in the progress of the war, etc., etc.

Any one of these causes is sufficient to create the impression that this organization is inefficient, when, as a matter of fact, the organization may be most efficient and every one in the organization may be of the very best available.

It has been so in every one of the Allied countries. The organizations in charge of aircraft production have always suffered, the measure of their suffering being decided by the extent of the success on the part of the Germans in the air or in dropping bombs on London or Paris or Venice. The public will not accept justifications or explanations for failure to prevent the Germans from being successful in the air.

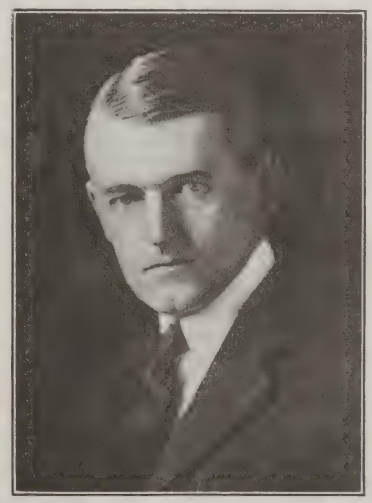
When the situation is analyzed, and it is realized that the country would suffer regardless of whether there is justification or not, the public and press can hardly be accused of being too severe.

The same may be true when hundreds of manufacturers are kept working at only part of their manufacturing capacity, although aircraft and equipment are needed in larger and larger quantities. The manufacturers can hardly be blamed for criticizing and the public and press for sympathizing with them.

And yet, in many cases in the past, the organizations in charge of aircraft production were seldom fully responsible for delays and for smallness of production. But that did not save them from the condemnation of the public and the press. In England, from 1915 to the end of 1917, it became so that every time the Germans dropped bombs on London or British soil, or British troops suffered at the front because the British Air Service was not sufficient to maintain absolute command of the air, the press and public would demand the resignation of somebody in the Aircraft Board.

The British authorities connected with aircraft production finally came to the conclusion that as they had to bear the responsibility, and no justifications or excuses were accepted, they would insist on having all the power necessary to make and carry out their own aircraft programme independent of any other organization. This brought about the organization of the British Air Ministry—and solved the problem most completely. The British public and press have not had any serious complaints since. The Air Ministry did make an aircraft programme large enough and, being free to act and having an independent organization, it developed the Royal Air Forces on such a tremendous scale that it provided the aircraft and aviators needed in the supremacy in the air on the British front as well as to protect British soil from German aerial attacks.

The officials in charge of aircraft production in the United States are, in this work, the Bureau of Aircraft Production,



W. C. Potter, Assistant Director of Aircraft Production

and it has the co-operation of a great many able officers of the division of military affairs, some of whom are: Major General William L. Kenly, director Division of Military Aeronautics; Colonel F. R. Kenny, executive officer; Colonel C. G. Brant, Colonel H. H. Arnold, Colonel W. E. Gillmore, Colonel T. H. Bane, Colonel M. F. Davis, Colonel Arthur Woods, Colonel C. G. Edgar, Colonel E. Lester Jones, Colonel A. L. Fuller, Colonel C. H. Shields.



Major-General William S. Kenly, Director of Military Aeronautics

The above mentioned officers and scores of other officers and men in their staffs, make a formidable array of efficient men, and any one in close touch with them knows that they and their organizations are capable of carrying out an aircraft programme ten times as large as the present aircraft programme.

A great many of them know that the only "safe" programme is the programme which permits building all the aircraft and motors that can be built, and as fast as they humanly can be built, and that so long as there are manufacturers working at only part of their capacity, everything is not being done that should be done. They also know that the public will hold them responsible if we fail to to produce sufficient aircraft to maintain absolute mastery in the air next spring—to do which may require tens of thousands of different types of aeroplanes.

Everybody Waiting for Mr. Ryan to Return

Everybody is waiting for Second Assistant Secretary John D. Ryan to return from overseas, and everybody hopes that following his return there will be adopted

(*Continued on page 323*)

DAYTON—AVIATION CENTRE OF THE NATION

By HOWARD EGBERT

STRICTLY speaking, Dayton assumed the aerial leadership of the nation ten years ago.

More specifically it was on one particular afternoon, May the sixth, of the year 1908.

The traditions of aeronautics credit an enterprising young newspaper reporter, safely hidden behind the foliage of a street overlooking the Sand Dunes near Kitty Hawk, North Carolina, with having made the discovery that Dayton had earned the right to leadership. When Orville Wright and his brother Wilbur made their first successful flight in a heavier-than-air machine a decade ago, Dayton suddenly became conspicuous among the cities of America. Until that day the world thought Dayton was capable of making only cash registers. Then a new star appeared in her firmament.

It was almost a week later before folks in Dayton knew their city had become internationally famous. The community at that time had about 85,000 people and a diversified lot of industrial activities. Some people were skeptical about the news. They couldn't quite grasp the fact that two fellows "following around a bicycle repair shop" had enough brains and "get up and get" about themselves to give the world its first heavier-than-air flying machine.

Some folks wouldn't believe the news until Wilbur Wright some time later actually flew over the city. His aged father, a retired United Brethren minister, and his sister, Miss Catherine Wright, had enough faith in the two boys to know that if they said they had invented a heavier-than-air flying machine, they had. The world a little later on acknowledged it. Princes and peasants in a dozen countries of the old world saw the "impossible" accomplished and thus Dayton's place in the sun became assured.



The Air Building, Dayton, headquarters of the Aeroplane Production Department and the Aircraft Experimental Department

It was Lord Northcliffe who, with prophetic vision, first saw the possibilities of this modern Dayton becoming the "air metropolis of the world." I quote his own words, just as he delivered them one afternoon in October last year, in the midst of an address in Dayton, when he conferred upon Orville Wright, the only remaining brother of the pair which had perfected the first heavier-than-air machine, the Albert Medal, England's magnificent tribute to the genius of the man. It was characteristic of Orville Wright that he thanked Lord Northcliffe for the honor, refused to make a speech and sat down quietly while 5,000 of his fellow townsmen cheered themselves hoarse in acclaiming him its hero and neighbor.

Lord Northcliffe, unlike some prophets, has lived to see his prediction completely fulfilled.

Dayton has assumed a commanding position in international affairs. Over the Western Front Dayton-made aeroplanes, the De Haviland 4's, hurl death and destruction to the Hun. Some of the men who are driving these machines are Dayton-trained pilots and gunners, from the Wilbur Wright Flying Field and Armorer's School, a short distance east of Dayton. The experimental work on these machines has been largely carried on at the M'Cook Experimental Field, within the city limits, while Dayton mechanical brains and genius have assembled the planes and Dayton pilots have been the first to drive them ten thousand feet into the clouds for their maiden-trip into the air.

Dayton is a war city. Witness its growth, if you will. Within the last two years the population has increased from 140,000 to nearly 185,000, a striking evidence of the development. Practically all of this increase is credited to the entrance of war workers of various kinds. One entire factory in the city is giving its entire output of crackers and hard bread to the government; the Dayton-Wright Airplane Company, with its one-story brick and concrete plant, 1,000 feet long, the largest building of like construction in Ohio, employs 6,000 men and women, day and night, turning out aeroplanes, the while operating a secondary plant with 500 workmen at Miamisburg, a few miles southwest of the city.

Dayton is a city of 1,000 smokes. Day and night its great engines of industry hum to the tune of Mars. The great National Cash Register Company, where once the world's output in cash registers was made, is given over entirely now to

(*Continued on page 292*)

AERONAUTICS LEAD DAYTON LIBERTY LOAN PARADE



In the recent Liberty Loan Parade in Dayton, the interest in the whole event was dominated by the aeronautical exhibits arranged by the Department of Military Aeronautics and the Dayton Wright Airplane Co. The first Wright biplane was enthusiastically received all along the line, and great interest was evinced in the German machines shown, and in the latest type of American machines



View of the Dayton-Wright Airplane Co.'s factory

the making of aeroplane parts. Lights from hundreds of plants working by night, speak eloquently of the feverish haste with which the city goes about its task of furnishing the weapons of warfare for the soldiers of the republic "over there".

It is related that Orville Wright not so very long ago, in an interview, declared that the use of the aeroplane for winning wars, was the furthermost thought in his mind and the mind of his brother Wilbur. As a matter of fact the two brothers in the light of current history of their beginnings, did not seem to have any par-



Orville Wright, the pioneer, about to make a flight in a de Haviland with H. M. Rhinehardt



Robert Patterson, vice-president and General Manager of National Cash Register Co.



H. E. Talbott, Jr., president Dayton-Wright Airplane Co.



J. H. Patterson, president National Cash Register Co.



George B. McCann, secretary-treasurer Dayton Engineering Laboratories Co.



Harry G. Carnell, vice-president National Cash Register Co.



H. E. Talbott, president Dayton Metal Products Co.



George Egeter, treasurer National Cash Register Co.



Frederick B. Patterson, vice-president and secretary National Cash Register Co.



Thomas P. Gladdis, treasurer Dayton-Wright Airplane Co.



Orville Wright, Miss Katherine Wright and Lord Northcliffe, photographed on the occasion when Lord Northcliffe presented Mr. Wright with the medal of the Royal Arts Society of Great Britain

ticular idea in mind in building the first heavier-than-air machine, other than to develop a scientific principle which, in their own mind, could be speedily and succesfully solved. "The thought of using aeroplanes for bombing defenseless cities and killing women and children never entered our minds ten years ago, when we were perfecting our first machine," Orville Wright said.

But the keen observer of events, William Hohenzollern, Master of Potsdam, saw far into the future that bright afternoon many years ago as he stood before his castle gate in Germany and saw the Wright flying machine gracefully soaring over his estates. His mind became inflamed at once with a desire to use this mechanism to further his own selfish ends.

Orville Wright can tell you better than I can, how "William the Withered" stood appalled at the accomplishments of that Dayton-made machine; how his eyes glistened and his heart throbbed as he pierced the clouds of the future and saw the world at his feet, shackled by the power of monster aircraft that would win for him conquests that even his well-trained armies could not hope to win.

Dayton's reputation as the air metropolis of the world was first established in the Old World, which has always been ripe for scientific achievements and eager to bestow upon its men of learning and development, as well as upon men and women of the young republic of the western hemisphere, tributes of interest and appreciation. While Europe was acclaiming the Wright brothers' accomplishment as the greatest of modern times, practically nothing was heard of it in America and very little in Dayton, because the Wright brothers, following their initial flights abroad and later at home, went into seclusion and set about to perfect the thing they had started.

The world war brought Dayton into the forefront once more.

The first stroke was the building of the Wilbur Wright Flying Field, at Fairfield, five miles east of Dayton. This plant was erected, completed and occupied in less than six months' time and formally opened in July, 1917, with Major A. R. Christie as commandant. From its very beginning it assumed the work of training students in the art of flying and since its opening more than 5,000 fliers have come in and gone out, either overseas or to more advanced courses in other fields in America or France. The field comprises 2,500 acres and was leased by the government from the Miami Conservancy District, an organization which came into existence following the disastrous flood of March, 1913, which swept the Miami Valley in southern Ohio with a property loss of $200,000,000 and claiming more than 400 lives.

The field, despite reports and discussions to the contrary, is located on ground sufficiently high to protect it in time of flood; the engineer's estimate shows the post stands 20 feet above the flood level of 1913, a level newly established for high waters. Draining difficulties early developed and had to be rectified, and improvements were constantly made until in the fall of 1918 the flying school was abolished and in its place an Armorer's School and Testing Field was established. The field is now used for these purposes and is meeting every demand along these lines. Major Thomas Duncan, U.S.A., is commandant at the post.

The Wilbur Wright aviation field very naturally attracted considerable attention to Dayton, being one of the foremost aviation posts in the country and having adjoining it the General Depot of supplies for all aviation fields in the middle west.

The M'Cook Experimental Field came into existence a number of months later and was located in the northeastern end of the city. It comprised thirty acres and offered a suitable spot for experimental work. Colonel J. C. Vincent, one of the inventors of the Liberty motor, came to Dayton and established his headquarters, superintending all experimental work on the motor and giving his personal attention to a development of this mechanism.

Colonel Vincent has since resided in Dayton and has been foremost among the aviation celebrities who have become a part of the army of workers and leaders in this branch of the service here.

The chief objection to the M'Cook Experimental Field has largely been its size. Many army and aeroplane men have contended the field is not properly located, nor of sufficient size to carry on experimental work of the size required by the government.

The Dayton-Wright Aeroplane Company owns and controls two flying fields at Moraine City, south of Dayton, both capable of handling any demands and requirements made upon them by the continually increasing business at this plant.

The crowning feature of Dayton's triumph was the selection of the city as the national headquarters for the work of the experimental and production service of the aircraft department. For months men closely identified with the work of this department had been housed in several buildings of the city. This, very nat-



Miss Della Dohner, Hand Mill Department of Dayton-Wright Airplane Co., shown operating a mill which cuts slots in aircraft nuts, five in one operation

urally, was not a systematic way of doing a great work and as the result the government finally took over a lease on the newly completed ten-story office building of the Dayton Saving and Trust Company located in the very center of the city. More than 40,000 square feet of office room is available for the departments coming under the direction of the aircraft production and experimental bureaus. The removal of the technical headquarters to Dayton brings more than 500 persons who were previously engaged in Washington and scores of highly trained men in aeronautics have come to Dayton to take up their residence and pursue the duties which have followed in the wake of an ever increasing aeronautical programme for the United States government.

Industrially, Dayton has carried its share of the responsibility for the manufacture of aeroplanes. Three concerns are at present devoting practically their entire plants to making aeroplane parts—the National Cash Register Company with 5,800 employes; the Maxwell Motor Company with 1,100 employes in this particular branch of federal service; and the Dayton Metal Products Company with 4,300 employes. In concrete figures this would mean that eliminating from consideration the 5,500 employes at the Dayton-Wright Airplane Company at Moraine City, nearly 12,000 persons are directly engaged in making aeroplane parts for the government in Dayton. The Dayton Engineering Laboratories Company (familiarly known to the trade as The Delco), is making all the ignition features for the Liberty Motor, which is now so vital a part of the American-made aeroplanes, and thus 3,000 more men and women are directly concerned in the matter of aeroplane equipment, in Dayton.

Figures like the ones quoted above give in a way some comprehensive idea of the man-power and woman-power, too, (because women by the thousands are doing their share in shops and aeroplane plants to win this war by aeroplane).

Much of the work of furnishing the parts for aeroplane construction is turned out by the plant of the Dayton-Wright Airplane Company, located at Miamisburg, where several hundred persons find employment. Since I am writing more particularly about the work for and in behalf of the aeroplane industry in Dayton, I need not attempt to cover the work of hundreds of industrial plants in the city which are contributing with their more than 35,000 workmen to the various kinds of war work in course of preparation; this work would include the making of tanks, lenses for government use, shells for this and allied countries, etc. Dayton is a war city and it has no time for any other consideration until after the war is won.



A view of Wiring Department, Dayton-Wright Airplane Co.



Address by C. F. Kettering, Suggestion Contest, April 27, 1918. Employees from all plants assembled at Plant No. 1, Dayton-Wright Airplane Co.

Ten years have passed—momentous years in the history of the world, since Orville and Wilbur Wright first gave to the world their first aeroplane; a crude sort of machine as compared with the great De Haviland 4's which skim the skies over Dayton today. Not so very long ago Orville Wright was taken through the Dayton-Wright Airplane Company plant and given his first ride in the modern bombing machine made there. He soared to dizzy heights under the guidance of a skilled pilot from the aeroplane concern, and when he alighted, it is recorded that he was so amazed at the wonderful progress that had been made with flying machines since that eventful day at Kitty Hawk, N. C., that he found words inadequate to express his surprise.

Dayton has never lost its interest in the aeroplane. The years that have intervened from that eventful day when Wilbur Wright first rode over the city in his newly designed heavier-than-air machine, have failed to dim the interest of the community in the progress and development of aeronautics. Hundreds of men whose names are associated with the air missions of a half-dozen nations, have come to Dayton and stood amazed at the progress the city has made in aeroplane development and the magnitude with which things move along. Scarcely a train pulls into Union Station that does not bring a celebrity to one of the flying fields or the technical headquarters of the aircraft board of the nation. Men come in and go out and the public hears nothing of their visit, so silently and without publicity does the program go forward.

But the greatest point of activity has not yet been reached in Dayton. Contemplated enlargements of many plants and increased demands from the government point the way to an even more tremendous service.

The people in Dayton still think the Wright way to Berlin is the right way to win the war.

THE PERSONNEL OF THE AIR SERVICE IN DAYTON

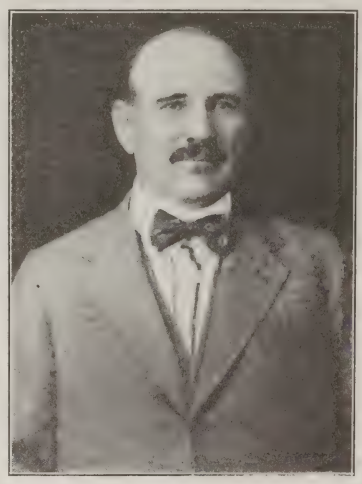
BY HOWARD EGBERT

IT becomes a rather difficult thing for the average mind to comprehend the field of activities in aeronautics as it spreads out over Dayton and immediate environs. The swift moving ships in the air, thousands of feet above a hustling, business community, tell us nothing except that man has succeeded in mastering a machine heavier than air and is flying. Orville and Wilbur Wright did that much ten years ago, and the field has increased so immeasurably since that hour of the Wright brothers' triumph at Kitty Hawk, N. C., that there really is no way of comparing the two periods in the development of aeronautics in America.

If you walk past the Air Service Building in Dayton, a towering structure of modern design, you scarcely get the inspiration, because it is on the inside of this building where hundreds are at work, away from the curious eyes of the passers-by that the work is done. Telegraph keys are bearing news and instructions and information from all over America and from the fields of France. Brilliant minds selected from many professions are at desks, figuring, dictating, deciding, experimenting and consulting, the one with the other. The genius of engineering and production match each other in this air building. These two departments dove-tail in their efforts.

Central control, generally conceded to be the business way of handling any enterprise successfully, finds its highest fulfillment in the National Air Service Building in Dayton.

First and chief, then, of the men you would probably meet, were you to start in from Washington for a survey of the situation, would be Newton D. Baker, Secretary of War. Secretary Baker is a busy man. He has his hands full continually, twenty-four hours of the day, directing the affairs of his department. He needs men about him who are skilled in special lines; who can relieve him of some of the responsibilities of his office. Therefore, when it came to handling the aeroplane situation (admittedly as essential an element as can possibly enter into this winning of the war), Newton D. Baker picked John D. Ryan, successful in business, possessing a keen brain for service and production. Mr. Ryan became the Director of the Air Service and Chairman of the Aircraft Board. You would probably meet both Secretary Baker and Director Ryan, who, by the way, is also assistant secretary of war, on the run. While you paused to witness the speed and rapidity with which these men work, because their business requires speed and



C. W. Nash, Assistant Director Aircraft Production, in charge of Engineering and Production

rapidity, you would run across W. C. Potter. Now Mr. Potter has been aptly designated by the press and he is known in the aeronautical work as John D. Ryan's right hand man. He is Director of Aircraft production. You will have to step some to keep up with W. C. Potter and he instills this same spirit in the minds of those who work for him. Production is his middle name, and it is his office to see that fighting ships for the armies overseas are kept constantly on the move. When production lags Mr. Potter throws on a little more steam and then production increases.

The Assistant Director of Aircraft Production, in charge of engineering and production in the Air Service Building at Dayton, is C. W. Nash.

Your visit has brought you to Dayton. If you have thought business was booming before, you are impressed the more with this thought, once you visit the Air Service Building.

Uncle Sam has picked the best, when he made up his air service personel. You are doubly impressed with this thought, once you gain admission to some of the private offices of the men who are doing the work in Dayton.

Three distinct divisions are at work now in the Air Service Building—the Engineering Division, the Production Division, and the Technical Section of the Division of Military Aeronautics. Each in its way co-operates with the other. Lieut. Col. J. C. Vincent, one of the two men credited with having developed the world marvel—the Liberty Motor, is Chief of the Aeroplane Engineering Division. The field of activity of this division extends in a particular way over the McCook Experimental Engineering Field, which is located within the Dayton city limits. Here a huge force is constantly at work. Well equipped laboratories are located here. Aeroplanes of many types and designs go through the "third degree" test here. Major H. E. Blood is chief of the Business and Military section in this division.

At the McCook Experimental Field Major H. C. Marmon is Chief. The Engineering Executive is C. H. Skinner. Captain H. H. Blee is in charge of the technical publications and library department. The field manager is Caleb Bragg, daring air pilot and formerly as well known in the automobile racing game. Bragg's record trip from the McCook Field to Washington, D. C., in two hours and 57 minutes in an aeroplane excited no end of curiosity and interest several weeks ago. The McCook Field organization long since proved its efficiency for service and has elicited favorable comment from the government in Washington.

Colonel T. H. Bane, who is Chief of the Technical Section, Division of Military Aeronautics, occupies with his departments, the two floors of the Air Service Building nearest the top. The Wilbur Wright Test Feld, located at Fairfield, east of Dayton, reports to him. It is his organization that tells the Engineering Division what type of aircraft the army needs. It tests aeroplane devices that experts develop and decides which shall be produced for the army. Once these devices and aircraft types are decided upon, the scene shifts to the Production Division which produces them.

The Master Records and Changes are kept on file at the Air Service Building in Dayton. This has been found a master stroke of business genius and has justified its introduction as a secure and safe administrative measure. As Chief of the Production Engineering work in the Air Service Building a civilian is found, J. F. McClelland, while under his jurisidiction



Lieut. Col. J. G. Vincent, Chief of Engineering, Airplane Engineering Division



Major H. E. Blood, Chief of Business and Military Headquarters, Airplane Engineering Division



Major H. C. Marmon, Chief of Experimental Engineering Department, McCook Field, of the Airplane Engineering Division



J. F. McClellan, Chief of Production, Engineering Dept. of Airplane Engineering Division



Col. T. C. Bane, Chief of Technical Section of the Division of Military Aeronautics

is found various and diversely important offices, each having in a particular way to do with the development of the work in this division.

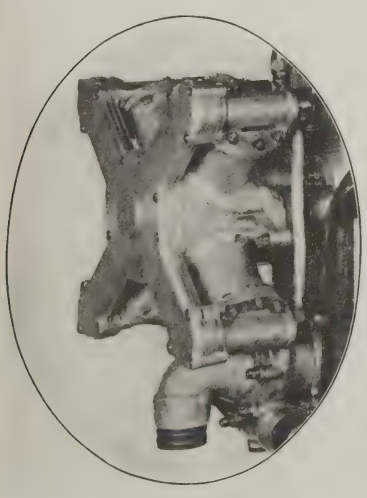
C. W. Nash, Assistant Director of Aircraft Production, in charge of engineering and production, is a busy man. If you don't think he is, try to see him some day at his offices in the Air Service Building. The chances are about 50 to 1 you will find he is in Buffalo, or New York or Washington or in some of the cities where production needs hustling up a bit to keep things moving overseas. Most of his time is consumed in keeping the wheels moving in the way of hastening production.

Mr. Nash was well selected for this post. His success as an industrial leader spoke eloquently of his fitness for any work that required skill and business acumen. His biographers always start with C. W. Nash and the Durant-Dort Carriage Co., in Flint, Mich. That was a good many years ago, when carriages were less of a curiosity than they are now. Along about 1909 (dates aren't of any particular value when you are writing about successful men) C. W. Nash became president of the General Motors Co., a combination of industries that proved one of the greatest ever conceived in America. It was while serving as head of the Nash Motor Co. that Mr. Nash was called into federal service. He responded without argument, even though he knew he was yielding a good paying business and a successful one. If the country needed him, his business didn't need him—this was the principle under which he planned to enter actively into government work. He has served with eminent distinction in his work for Uncle Sam. What greater tribute could you pay a man than simply that?

I must not, in passing, neglect to call attention to a thing I hastily mentioned previously—that of central control. The esentiality of this thing has not been overlooked in the organization of the Air Service, and we see it particularly emphasized in the operation of the various departments in Dayton. There is no such thing as discord here. Things have to "hitch" under the expert system employed. No one goes outside his field of activity, but these fields of activity co-operate and co-ordinate in such a masterly way that failure is negatived everywhere.

Men have been selected by the government for its air service with more than ordinary care. The general tendency has been to command the services of experts. The aeronautical division of the army development has already proved its worth. Results count most of all. The tales that come to us from overseas, telling of the briliant exploits of American airmen, send a thrill through the bodies of red-blooded Americans.

Few stop to consider the tedious path that has been trod in developing these air conquering machines that have all but pushed the German pilots out of the skies. The thought comes to us that, out of experiments, conferences, hazardous tests and even from the work-bench of the skilled workmen have come these mechanical birds that shall blaze the way for Yankee infantry and Yankee guns to the very nest of German trickery—Berlin.



The Liberty Starter

THE LIBERTY STARTER

THE Liberty Starter is an air motor and compressor in one. While acting as a starter it runs as a four cylinder air motor, cranking the aeroplane engine through a train of gears inclosed within its transmission.

At the end of the transmission is a final drive that connects direct to the crankshaft of the engine. This drive runs continually at engine speed and operates a small pump which furnishes pressure for the gasolene feed. See cut. After starting the engine the Liberty Starter automatically disengages and remains so until needed for further use either as a starter or compressor.

In order to keep an adequate air supply in the tank the starter is engaged as a compressor by pushing a button on the control valve while the aeroplane engine is running at low speed.

When engaged the engine must be speeded up to 1,200 to 1,400 R.P.M's. At 230 pounds pressure the compressor automatically disengages. There are over nine hundred of these starters in use on planes in this country, and the U. S. Mail Service is installing them wherever possible.

Now the Liberty Starter is ready for Foreign Service. It has been thoroughly tested and in every instance has shown itself the best type of aeroplane. First, it is light, weighing but 30 lbs.; second, it is compact, measuring 8" long; third, it is efficient, cranking the aeroplane engine at 150 R.P.M.'s or more and replenishing its own energy in 30 seconds, less time than any other device known, and finally, it is simple, as there are no pipes leading to the aeroplane engine, this leaves the engine in its natural state. The tank weighs 12¼ lbs., making the complete outfit 49 pounds.

THE ENGINEERING AND BUSINESS GENIUS BACK OF THE CURTISS AEROPLANE AND MOTOR COMPANY

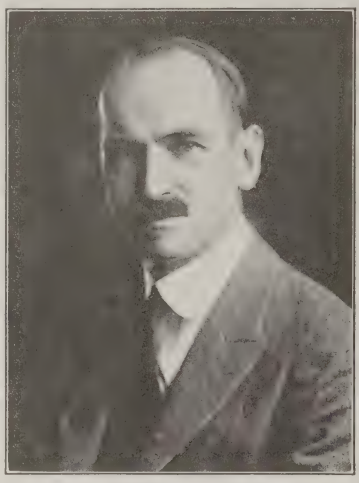
WE are enabled this week to give short biographical sketches of some of the men back of the Curtiss Aeroplane & Motor Company, one of the largest contract holders working with the Bureau of Aircraft Production.

John North Willys

There are two men in the automobile industry whose names and personality are as familiar to the boy and the man on the Atlantic seaboard as they are to the man and boy on the Pacific coast. One of these two men is John North Willys, the president of the Willys-Overland Company of Toledo. For many years, Mr. Willys has been esteemed as one of the most progressive automobile manufacturers. His production methods have set the pace in many respects in that enlargement of our national, social and industrial life the ever-increasing use of the motor car has brought.

Mr. Willys has recently been elected the president of the Curtiss Aeroplane & Motor Corporation as a result of the combination effected between the Curtiss Aeroplane & Motor Corporation as a result of the combination effected between the Curtiss forces and the Willys-Overland interests. The result is no less important to the immediate production of the thousands of aeroplanes now needed, than it is to the assured pre-eminence of this country in the manufacture of the flying machine the United States gave the world. There is represented in the combination a linking of the aeroplane's development in which Glenn H. Curtiss has been the leader, with the command of markets for raw materials and the enormous production facilities Mr. Willys has made possible.

Mr. Willys was born in Canandaigua, N. Y., in 1873. He had his first business experience in the bicycle industry. He conceived the idea then of reaching markets for manufacturers who were unable to reach them on their own initiative. His success as an automobile manufacturer has been based on that idea—the creation of the markets in all corners of the world with the production at home to meet the demands. After leaving Canandaigua, Mr. Willys went to Elmira and there bought the Elmira Arms Company. The automobile was barely out of the experimental stage when he organized the American Motor Car Sales Company, with headquarters in Indianapolis. In the fall of 1907,



Glenn H. Curtiss, the pioneer, still helping Uncle Sam to "put it over"

he assumed the management of the Overland Automobile Company of Indianapolis, and a few months later, in the winter of 1908, he had acquired control and assumed the presidency of the company.

That was the start of the tremendous business which now is known as theWillys-Overland interests. Markets were created. The name Overland was made as familiar as the name of the local daily newspaper. In October of that year, Mr. Willys had acquired the Marion Motor Car Company of Indianapolis, and in April, 1909, he purchased the Pope-Toledo plant in Toledo, Ohio. From that time the Overland headquarters have been Toledo. In a very few years Mr. Willys was a national figure in finance and an industrial leader of commanding force, controlling a score of industries. Certainly a series of successes measuring large for a man who is only in his forty-fifth year.

He is fond of all outdoor sports, being particularly interested in automobiling, golfing and yachting. He is a member of the leading social and sporting clubs of Toledo, and for several years has been a member of the Aero Club of America and the Society of Automobile Engineers. Mr. Willys is married and has one daughter.

Henry Manning Root

Mr. Henry Manning Root, Assistant Comptroller of the Curtiss Aeroplane & Motor Corporation, was born in Buffalo and was educated in the Buffalo Public Schools and Colgate University. He did excellent work for the International Harvester Company from 1901 to 1911, and from 1911 to 1916 he conducted a business in public accountancy. He is the First Vice-President of the Buffalo Aircraft Club and has been vitally interested in aeronautics for a number of years.

Charles B. Wilson

Mr. Charles B. Wilson is a Vice-President and the Production Manager of the Curtiss Aeroplane & Motor Corporation. He was born in Warren, Ohio, and practically his entire career has been spent in factory management positions. While with the Diamond Match Company, he designed special machinery of great value, and during his eight years' general superintendency of the Olds Motor Works of Detroit and Lansing, he gained very much valuable experience. Later he became Vice-President of the Ferro Foundry & Machine Company of Cleveland. When he disassociated himself with the Ferro Company, he went to Pontiac and organized the Wilson Foundry and Machine Company. He was sub-



James E. Kepperley, Vice President and General Manager, Curtiss Aeroplane & Motor Corporation



W. W. Moss, Comptroller, Curtiss Aeroplane & Motor Corporation



H. M. Root, Assistant Comptroller, Curtiss Aeroplane & Motor Corporation



Clifton Reeves

sequently invited by Mr. Willys to join the Curtiss Company as Special Production man, and while he is undertaking this work at Buffalo, he still retains his interest in the Wilson Foundry and Machine Company, which is now under the management of his brother, Mr. David Wilson. Mr. Wilson is a big man physically and mentally, and he is making a very definite impression in his new associations in Buffalo.

Fay Leone Faurote

Mr. Fay Leone Faurote was born at Terre Coupe, Indiana, July 26th, 1881. His father is cashier of the Niles City Bank of Niles, Mich. The ancestors of the Faurote family on the paternal side were from the French Huguenots, and on the maternal were English and Scotch. The early members were noted to have fought in all our wars, with the exception of the Mexican. A number of the progenitors were identified with railroads and other early transportation interests. They were early settlers in New York and New Jersey, later moving into the states of Michigan, Ohio, and Indiana.

Mr. Fay Leone Faurote received his education at the Niles, Michigan, high school, from which institution he graduated in 1899. In 1903, he received the Degree of Bachelor of Science in Mehcanical Engineering, at the University of Michigan, and finished his schooling with a business course at the Lansing Business College.



Fay Leone Faurote, Publicity Director of the Curtis Aeroplane & Motor Corporation

His first occupation with the commercial world was in a retail grocery establishment, at which he remained for a period of ten years. He was also an assistant to the city engineer before he took his university course. After Mr. Faurote took his degree, he worked through the shops of the Olds Motor Works as an apprentice, from which he was advanced to draftsman and assistant experimental engineer, and in 1904 he was appointed the advertising manager of the corporation. He held this position until 1908, when he resigned to take the important office of advertising manager of the E. R. Thomas Motor Co. of Buffalo, N. Y., and that position he holds at the present time.

Mr. Faurote has contributed largely to the literature regarding the automobile. He is the author of "Busy Man's Text Book on Automobiles" and "The How and Why of the Automobile," two very valuable works, and considered by "those who know" to be the best and most complete works yet issued on their respective subjects. He is also the author of "A Boy's Text Book on Gas Engines," which has had an enormous sale. Mr. Faurote is a prominent writer of many technical and automobile subjects. Independent of his extensive duties, as mentioned, he found time to be the instructor of the Detroit Motor School while in that city, and is now identified with a School of Advertising in Buffalo.

As advertising manager of the Curtiss Aeroplane & Motor Corporation, and assistant secretary of the Aircraft Manufacturers' Association, Mr. Faurote is doing constructive work for aeronautics.

Charles Matthews Manly

Mr. Charles M. Manly, Chief Inspection Engineer of the Curtiss Aeroplane & Motor Corporation, was born in Staunton, Va., in 1876. He is the son of Charles Manly, D.D., President of Furman University, Greeneville, S. C., from 1881 to 1898. His elder brother is Capt. John M. Manly, Head of the Department of English, Chicago University. His younger brother, Basil M. Manly, is at present Economic Editor of Scripps-McRae newspaper Syndicate, Washington, D. C.; on temporary leave serving with Federal Trade Commission.

Mr. Manly has been Assistant in charge of Smithsonian Institution to Dr. S. P. Langley, in development of aviation from 1898 to 1905. He is Vice-President and Chief Engineer of the Manly Drive Co., of New York City. He was Consulting Engineer, British War Office, in 1915.

He is a member of the Society of Mechanical Engineers, Society of Automotive Engineers, Aero Club of America, Buffalo Engineering Society, Cosmos Club, Washington, D. C.

Mr. Manly is joint author with Dr. S. P. Langley of Volume 27, Smithsonian Contributions to Knowledge, entitled "Memoir on Mechanical Flight."

Mr. Manly has patented some thirty or more mechanical devices in the United States and foreign countries pertaining to power generation and transmission.

Mr. Manly took charge of Dr. Langley's work in aviation at Smithsonian Institution, June, 1898, carrying on the construction of a man-carrying aeroplane which he had undertaken for the Board of Ordnance and Fortification of the War Department and continued in charge of this work until it ceased, from lack of funds, in December, 1903. Continued aviation research work from then until further lack of funds caused complete stoppage of aviation work at Smithsonian Institution in 1905.



Charles M. Manly, Chief Engineer, Curtiss Aeroplane & Motor Corporation

W. W. Moss

William Ward Moss, on February 9th, 1918, was elected a vice-president and comptroller of the Curtiss Aeroplane & Motor Corporation. For two months before his election he had served the government as examiner for the war credits board at Washington, D. C. To his new tasks, highly important in the country's war programme Mr. Moss has brought the genial enthusiasm, the same driving energy and capacity which in a short span of years had won him recognition among the bankers of the south.

Less than thirty years ago, Mr. Moss began his business career. It was shortly after his graduation from the Chester Academy in 1889 that he went to work for the Chester National Bank at Chester, Pa. From that year until 1898, Mr. Moss remained with the Chester Bank, winning promotions regularly in his chosen field. In 1898 he became the cashier of the First National Bank of Media, Pa., and five years later his ability was recognized in his election, 1903, to the presidency of the

(*Continued on page 302*)



Charles B. Wilson, Vice President and Production Manager, Curtiss Aeroplane & Motor Corporation

TEN YEARS OF HALL-SCOTT

By JAMES G. STAFFORD

OF all the startling changes in the job of making war, as we of to-day know it, the most remarkable is undoubtedly the wide use of aircraft in all purposes of attack and defense. Aircraft were scarcely beyond the stage of the aerial acrobat when the war began in August, 1914. To-day they are depended on as the eyes of the army. Upon the accuracy of the observer's reports on high, depend the timing of attack, the control of the artillery, the movement of a million men. It has come to be the most relied upon arm of the raider over the enemy's lines, and the means of disturbing his troop concentrations, industrial centers, and interior producing areas.

An Epochal Four Years

There were few in either America or Europe, when the war began, who conceived the use to which aircraft would be put. Few, who dreamed of its rapid development in the short four years since the first shot was fired at Belgrade. Consequently manufacturing facilities were few, and meagre in the extreme. All were inadequate, as contrasted with those available for the manufacture of other forms of war material. Practice, design, engineering problems were yet unsolved, or only beginning to be understood.

Successful Engine Builders for Ten Years

Aeroplane engines have been built and furnished to successful flyers for aeroplanes for more than ten years by the Hall-Scott Motor Car Company, of San Francisco, California. This concern had been engaged in this business for six years, when Europe was first deluged with its present bath of blood and fire. Hall-Scott powered planes had broken records for endurance, speed, altitude, and generally satisfactory performance and had been used extensively by Allied governments, before the United States entered the war. Our own Army and Navy Departments had tested its engines, and had found them satisfactory.

Began Building in 1908

Thus, when E. J. Hall, now Col. Hall, U. S. Aviation Service, in charge of motor work in two big factories on the fighting front in France, built his first eight cylinder "V" type engine back in 1908 for a man named English, who wanted to use it in a helicopter, it marked the establishment of the first all American aeroplane engine building business. That business has gone forward always a pace ahead of demands, until to-day its originator, chief engineer, and designer is the nation's chief dependency in the perfection of the Liberty engine.

Liberty Engine Embodies Hall-Scott Practice

It was Hall-Scott practice in all essential details, incorporated by Col. Hall in the Government's super aeroplane engine—The Liberty "Twelve"—in an unselfish effort to serve the nation in its emergency. It was Hall-Scott experience, personified in the modest unassuming, hard working Chief Engineer of the Hall-Scott Motor Car Company—Col. E. J. Hall, himself—that piloted the development of that 12 cylinder Liberty engine through its initial designing, and made possible the perfected machine of to-day. It is that same personality, modest, quiet, almost timid, sternly opposing publicity, avoiding the focalized glare of the limelight, that is solving the nation's aeroplane engine building problems in France.

First Overhead Valve Engine Hall Built

Hall-Scott was first incorporated as a company to build railroad motor cars. Previous to the time the company was organized, Bert C. Scott was Secretary of the Yreka Railroad, operating in Northwestern California, and had been engaged in searching the country for a self propelled railroad motor car. He had been unable to obtain one throughout the East. Returning to San Francisco without the necessary equipment he told his trouble to Col. Hall from whom he had purchased one of the latter's famous "Comet" racing cars with a Hall built overhead valve engine, which ran away with everything on the track and road in those early days of automobiling. Together they planned and developed the now familiar motor driven passenger car of the railroads. It proved such a success the two formed a partnership for manufacturing them. That is why the concern is known as the Hall-Scott Motor Car Company.

Busy on Aeroplane Engines

Considerable time elapsed before any orders were received for these motor cars. Meantime, the factory and plant at West Berkeley, California, was kept busy night and day with orders for aeroplane motors. Quite a few of the engines were sold to local aeroplane builders.

Chas. K. Hamilton came to San Francisco, in 1910, and soon became an enthusiastic Hall-Scott engine user. His first Hall-Scott engine was later turned over to John Frisbe, for use in making the Belmont Park-Mineola (New York) flight, which was considered a big feat at that time. These flights, and others by Captain Thos. Baldwin's exhibition flyers helped establish the Hall-Scott engine's reputation, which soon extended across the water, to Europe, and reached the Orient.

Los Angeles Meet Hall-Scott Powered

More than half of the planes which participated in the Second International Aeroplane meet at Los Angeles in 1912 were powered with Hall-Scott engines. The many remarkable feats of that wonderful affair were made possible by the perfection of engine functioning, already attained by the Hall-Scott power plants.

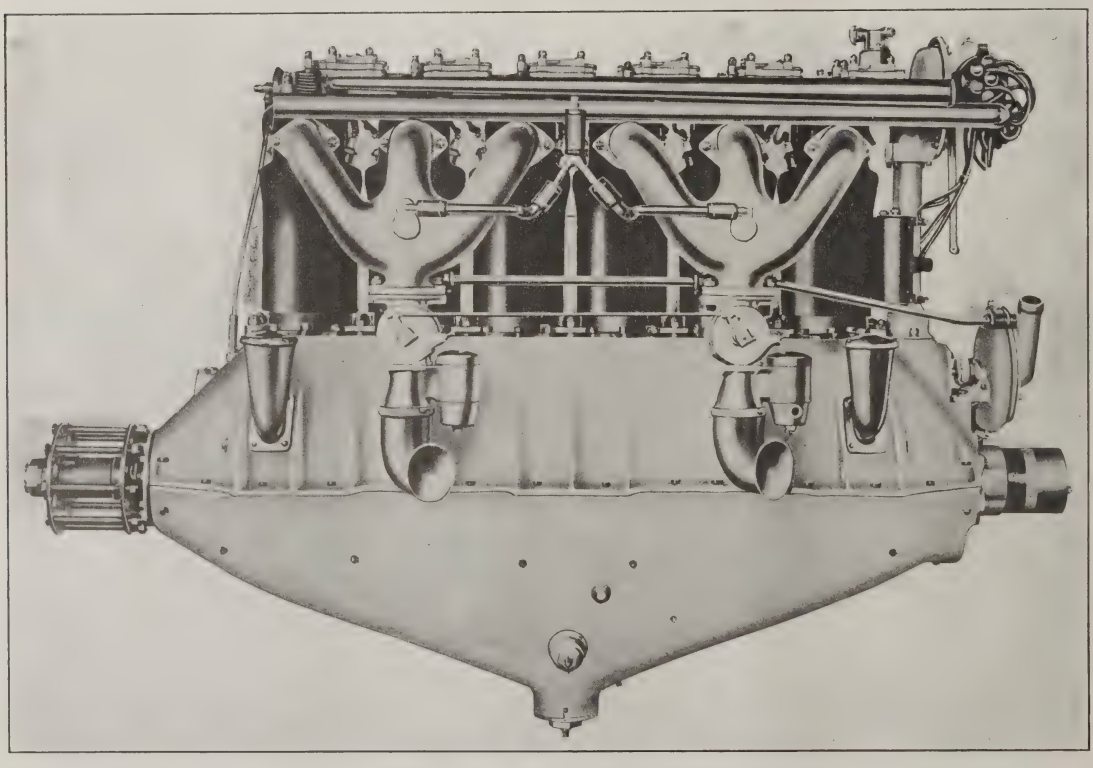
At that time the factory was turning out about fifty aeroplane engines per year—quite a large production as viewed in the light of those days. Continued improvements in the earlier engine types were being made by Col. Hall. The company finally built a larger type engine than any theretofore attempted. It was an eight cylinder, "V" with 5 inch bore, which was used by Glenn L. Martin, in competitive U. S. War Department trials at San Diego, in September, 1912. Notwithstanding some reports to the contrary, Mr. Martin and his Hall-Scott powered plane, was the only one who successfully passed all of the required tests. These trials cost the Martin Company and the Hall-Scott Company about $25,000.

Standardizes on Mercedes Type Engine

Up to that time the Hall-Scott company had expended more than $37,000 on the 8-cylinder "V" type engine, when on the return from San Diego of Col. Hall, it was decided this type engine was not a satisfactory proposition, he advised discarding it entirely, and the building of a verticle six cylinder engine of the Mercedes type.

Russia Orders Three Hundred

Completion of this engine, and tests before the Automobile Club of America in New York City,



The new L-6 six cylinder Hall-Scott motor, showing the intake side, with the interchangeable steel cylinders. In recent tests it developed 212.6 h.p. at 1666 r.p.m. It weighs 502 pounds.

and in actual and thorough flying tests in the Martin planes and in the Sloan plane, designed by C. H. Day, proved it was such a remarkable success, that an order for three hundred was placed with the Hall-Scott Company by the Russian Government. These were manufactured under the mos rigid Government inspection at the West Berkeley plant, and completed with deliveries in full thirty days ahead of the contract date. This was the first actual war order received by the company. It was really the only concern in the United States in a position, with the perfected engine, the engineering organization, and the completely equipped factory, to accept such an order, and carry it through on schedule.

Large Sums Into Experiments

Improvements in this original six cylinder type engine, increasing its horsepower rating from 130 to 160, adding improvements and refinements, through the reduction in weight per horsepower, etc., called for additional expenditures of large sums in experimental work. The company also built a 4 cylinder equipment, which was adopted and proved satisfactory for primary and advanced training plane work.

Expanding Factory Facilities

The plant at West Berkeley, where Col. Hall and B. C. Scott began manufacture of aeroplane engines, as a partnership, in March, 1910, soon expanded with the demands for the Hall-Scott engines. The company was incorporated on Feb. 8, 1914, with a capital stock of $100,000. It was and remains a close corporation, with E. J. Hall, B. C. Scott, and L. S. Scott as the sole stockholders. It started with a paid up capital of $23,000. Its first dividend was paid last year, all previous earnings having gone into experimental work, equipment, and improvements. The plant at West Berkeley, California, is now actually worth, with stock on hand, $1,000,000.

Out With New Six-Cylinder Engine

To-day Hall-Scott has brought out a new six cylinder aeroplane engine that marks another big step in design, and also in Hall-Scott progress. It is distinctly in line with the best thought of the day as regards aeroplane power plants. Announcement of its new "L-6" type, six-cylinder 200 horse power engine was made early this year by the Hall-Scott Motor Car Company. Government tests were completed this summer, and those, together with comparison with tests records of their earlier types of six-cylinder engines of the



Col. E. J. Hall, of the Hall-Scott Motor Co.

A-5 and A-5a Models, point to the fact that the new L-6 type is almost the ideal for either single or twin motored planes.

Accepted for Navy Department

The L-6 engine tested by George R. Ross, government inspector at the West Berkeley, California, plant of the company, developed 212.6 H.P. at 1666 R.P.M., and weighed 502 pounds. This is equivalent to 2.36 pounds per B.H.P. Inspector Ross passed the tests as satisfactory, and purchased the engine for the Navy Department, for which he was acting. Notable points of comparison, marking the advance of the L-6 type, contrasted with the A-5 and A-5a, which developed at best only 160 H.P. is found in the weight. In the L-6, it is 2.36 pounds while with the A-5a, which developed at best only 160 H.P. it is 3.75 pounds. Much of this reduction in weight is of course possible through the substitution of steel cylinders.

Uses Steel Cylinders

Due to the increased strength of the steel cylinders, interchangeable, throughout the entire series of Hall-Scott engines, it is possible to have higher compression pressure, and higher thermal temperatures. Considering the greater volumetric efficienty of this engine, the fuel consumption of .55 pounds per h.p. hour, is no greater than in the older type engines.

Ideal Engine for Twin Power Plants

Planes powered with this L-6 engine in duplicate, or even as a three engined flyer, seem to offer the solution of the easily operated, controlled, and efficient flying craft. With either engine alone there is power enough to maintain a remarkable speed, and with the perfection in design of aeroplanes, such as attained already in such flyers as the Loughead flying boat, which is powered with two A-5 Hall-Scott aeroplane engines, little difficulty in control is experienced in case of one only being used. With two such engines in operation such a heavy plane as the Loughead flying boat is capable of considerably more than 100 miles per hour.

Most Logical for Reserve Power

The twin engined plane is far more dependable as a bomber, or as a mail carrying plane than any single engined plane of whatever type. There is always a power reserve for extra speed, when necessary. In the case of disablement of one engine while in the air, the plane can continue flying until either its mission is accomplished, its mail delivered, or a suitable landing place reached, where repair work can be done. With two power plants of ample size, such as furnished by the L-6, 220 H.P. Hall-Scott aeroplane engine, an almost indefinite life for the engines is assured, because neither would be flown with wide open throttle, as is the case with many of the single engined planes. These in order to maintain speed, and climbing ability, must be run at wracking engine speed. It is said this use of only two-thirds or three-quarters of the engine throttle, and consequently engine power, is the secret of the long life of the German aeroplane engines, as contrasted with the remarkably short lived Allied Engines.

AIR DIVISION DISCOVERS WEALTH OF SURPLUS AND UNUSED MATERIALS

The war Department authorizes the following:

The Division of Military Aeronautics has turned up since August 6 a surplus of supplies worth $10,000,000 and its examiners have not yet finished their task. These supplies already listed include typewriters, motor cars, motor trucks, oil, lumber, wood, iron, and steel working machines, motorcycles, building material, aeroplanes, and about everything in the accessory line from screw eyes to stove bolts.

The official name of this system, which has begun to conserve supplies, is the Surplus Inactive Supplies Service, Purchase and Storage Branch, Purchase, Storage and Traffic Division of the General Staff. It has branches in most all bureaus of the War Department, the object being to utilize duplicate supplies purchased through the unavoidable lack of organization in the emergency and rush at the beginning of the war. These surplus supplies, as fast as they are found, are listed and through a system of trade, transfer and sale either put to use in the department or sold in the public market.

Within its own division, since August 15, Military Aeronautics has sent out lists of 1,200 different surplus items, including more than 50,000 separate units, amounting in value to over $3,000,000. Each of the seventy-five branches in this division was asked what articles, if any, it wanted, and so far 532 orders for over 30,000 separate units at a value of $750,000 has been returned calling for some of this surplus material. The work of transferring this material from those who do not want it to those sub-divisions who do is now under way, and this readjustment will continue until the total supply of all branches is reduced to stock on hand sufficient for three months in advance.

Already the Division of Military Aeronautics has turned over to the Surplus Inactive Supplies Service of the General Staff property amounting to $2,087,341.35 which none of its own branches could use. Some of the larger items on this list were 150,000 gallons of oil worth $75,000; 417 typewriters valued at $25,000; 200 tons of hay valued at $3,000.

Another and different class of surplus supplies now being inventoried for turning over to the Surplus Inactive Supplies Service of the General Staff includes parts for 3,500 French Gnome aeroplane motors listed at the time they were ordered in this country by the French High Commission, $10,500,000, but which now must be sold as junk for from $25.00 to $120,000 a ton. There are 2,000 tons of these motor parts. This motor was at one time one of the most popular motors in France, but now, owing to the rapid advance in design and construction, the type is becoming obsolete. Very few of these motor parts are finished. Some are yet in steel billets; some are finished as high as 90%; some as low as 5%; some have been boxed and sent across seas. All will now have to be scrapped. Eventually they will be paid for by the French Government, the money to buy them having been advanced by the United States.

With these Gnome motors will go 300 Penguin training planes worth $750,000, a type that is now obsolete, and 128 L.W.F. aeroplanes worth approximately $1,427,000. In this collection will also appear 1,500 J.N.1 aeroplanes valued at $9,000,000 but now obsolete, and 500 additional motors valued at $750,000. It is hoped, however, to utilize these 2,000 motors as engines in submarine chasers and coast patrol boats. The 1,500 planes may also be utilized if a suitable engine is ever developed for them.

Among other surplus material found by the Division of Military Aeronautics and immediately put to use was 4,500,000 feet of ⅜ inch rope. The present demand for rope is exceedingly great and specifications were changed in order to take advantage of this "find." Three-eighths inch rope was substituted for ¼ inch rope required and the 4,500,000 feet put into equipment for squadrons overseas, effecting a saving in this instance alone of $75,000.

Another consignment of goods located and immediately put to use was 500 pairs of field glasses worth $37,500. This was found in a supply depot at Omaha. Other emergency supplies to the value of $75,000 were discovered in this same station and immediately shipped overseas.

At the Middletown, Pennsylvania, depot, 9,000 gallons of "dope," a preparation for wing fabric in aeroplane construction and worth $47,500, was discovered and immediately put into use.

Other surplus supplies located included seven carloads of iron, steel, and wood working machinery found in a supply depot at Hampton, Virginia. In one of these cars was a wire testing machine badly wanted in France. Incidentally, 5,000 steel drums wanted for oil containers were discovered in private storage. While they were not the property of the Government, nevertheless they were put into immediate use and the owner paid for them afterwards.

Another saving made by these conservation officers was due to the fact that electric batteries deteriorate rapidly when packed in bulk, becoming practically worthless for issue after two months' storage. In the past it has apparently been the custom to purchase these batteries in great quantities. The price paid was 40 cents apiece. Conservation officers on August 27 found at the New York Supply Depot 150,000 of these batteries and it was estimated 75,000 of them, costing about $30,000, would be practically worthless when the time came to use them. Manufacturers have now been instructed to ship these batteries in bulk directly overseas only upon emergency order, which will insure quick transportation and quick use, and will, it is believed, eliminate about 90% of the battery losses and trouble.

(*Continued from page 299*)

Virginia-Carolina Trust Company of Norfolk, Va. The next year Mr. Moss became the president of the Citizens Bank of Norfolk. Four years later, in 1908, Mr. Moss left the Citizens Bank to become the senior partner in the firm of Moss & Moss, Bankers, of Norfolk, Va., and for nearly ten years he worked assiduously, increasing the success and the prestige of that banking house.

In December, 1917, Mr. Moss left his home in Norfolk to give the government the benefit of his banking experience and in Washington he was an examiner for the war credits board. He was acting in that capacity when he became an executive officer of the Curtiss Aeroplane & Motor Corporation.

Mr. Moss is a veteran of the Spanish-American War. During the years he lived in Pennsylvania, he had served five years in the national guard of that State. When war with Spain broke out Mr. Moss gave up his business interests to serve as a first lieutenant of the Sixth Pennsylvania Volunteer Infantry.

Two of his sons are now with the colors. Robinson M. Moss is a student aviator in the United States naval forces. James A. Moss is in active service in France with the mosquito fleet of the United States Navy. Mr. Moss has six children. One daughter is married, Mrs. S. T. Northern, and her home is in Baltimore, Md. And there are two grandchildren who are the special pride of the family.

Mr. Moss was born in Chester, Pa., October 26, 1869. There his mother lives now. He attended the public country schools and prepared for the Chester Academy at Oak Grove school in North Chester, Pa. He is a member of the Penn Club of Chester, Pa., the Virginia Club, of Norfolk, Va., and the Norfolk Country Club.

Clifton Reeves

Clifton Reeves was born in Tuckahoe, Cape May County, New Jersey, September 8th, 1876. He attended the public school of Tuckahoe and took a special course at the School of Commerce of the Wharton School of the University of Pennsylvania, in 1911 and 1912. At the age of 14 he built a stationary engine that attracted the attention of the officials of the Reading Railway, which afterwards led to his becoming an apprentice in the Baldwin Locomotive Works. From there he was made one of the Master Mechanics of the Reading System.

Subsequently he invented, patented, and built the so-called Reeves Engine that has proven its mechanical superiority in many of the largest industrial and public service plants in New York, New Jersey, Pennsylvania, Delaware, Maryland, and District of Columbia, as well as in many cities in the West, and it is also in service at Princeton University, Cornell, and elsewhere. It was selected by the Pennsylvania Railroad, in competition with all the other engines in the United States, for work in the East River tunnels, and was used there exclusively. It is in use also in a number of government vessels for lighting and similar purposes, and is in service in the District of Columbia Filtration Plant and in the Torresdale Filtration Plant of Philadelphia, the latter the largest institution of its kind in the world. Mr. Reeves, individually, designed these engines. He is the President and General Manager of the Reeves-Cubberley Engine Company of Trenton, and the President of the Reeves Foundry Company, of Trenton.

He organized the Manufacturers and Employers' Association of Trenton, which was afterwards merged with the reorganized Chamber of Commerce; was a Director of the Trenton, Lawrenceville & Princeton Railway during the course of its construction and until the time of its taking over by the Johnson interest; Secretary of the Trenton Association of Machinists and it was in recognition of his fairness in the settlement of a machinist strike in Trenton, in which his company was involved, that he was selected by Secretary Wilson as a member of the Board of Conciliation, of the Department of Labor. His work there speaks for itself, but special mention should be made of his connection with the threatened strike of the traffic clerks on the New Haven Railroad and his activities in connection with the settlement of the Westinghouse strike in Pittsburgh, involving some 86,000 men. The approval of Mr. Reeves' appointment to the Conciliation Board was evidenced in the widespread publicity it received throughout the country, particularly in the technical journals and more important trade papers.

He was appointed, in 1914, by Governor Fielder, of New Jersey, as a member of the Board of Trustees of the School of Industrial Arts, in Trenton, succeeding the late Judge Garrett D. W. Vroom, for which institution he wrote sometime ago an article on the value of industrial training that was widely copied and commented on throughout the country. He is a member of the American Society of Mechanical Engineers; of the National Civics Association; of the Masonic Fraternity (32nd degree); the Engineers Club; the Rotary Club and a Trustee and Deacon in the Central Baptist Church, in Trenton.

He married Miss Elizabeth Hunt, of New Hope, Pa., and has one son, Norman Reeves.

THE ST. LOUIS AIRCRAFT CORPORATION

Mr. A. J. Siegel is the President of the Huttig Sash & Door Company of St. Louis and also the President of the St. Louis Aircraft Corporation of this city.

The St. Louis Aircraft Corporation has a contract with the United States Government for the manufacture of aeroplanes, and the Huttig Sash & Door Company are making all of the wood parts and doing the minor assembling, while the St. Louis Car Company, also of St. Louis, are doing the assembling of the fuselages.

The Huttig Sash & Door Company is one of the largest woodworking plants in America. It has a floor space of very nearly 500,000 square feet and the plant covers a ground area of seven acres. The company was organized in 1885, and ever since has been engaged exclusively in the production of the most perfect millwork possible to manufacture. Consequently the plant was especially well adapted to the manufacture of aeroplanes in a prompt and accurate manner, and the work of making aeroplanes has been carried through by the St. Louis Aircraft Corportation, the Huttig Sash & Door Company and the St. Louis Car Company in a most efficient way.



A. J. Siegel, President Huttig Sash & Door Co. and St. Louis Aircraft Corporation

In the manufacture of aeroplanes there was one big item that had to be considered, and that was obtaining men who were familiar with the production of the article. The organization of the Huttig Sash & Door Company was highly efficient, and in consequence the production of aeroplanes was not delayed but went right ahead from the very start and has kept up to a very satisfactory figure. In the plant they are employing women on various parts of the work of making aeroplanes. They have proven efficient in that they are very painstaking, very earnest and take especial pride in turning out nice work.

Mr. A. J. Siegel is a director in the Third National Bank of St. Louis and Vice-President of the Manchester Bank of St. Louis. He has given a great part of his time, thought and energy to war activities, such as the Red Cross, Y. M. C. A., Knights of Columbus, and the sale of Liberty Bonds. Mr. Siegel is also chairman of the St. Louis district of the War Service Committee, Millwork Industry.

AEROMARINE DEVELOPMENT A MONUMENT TO INGLIS M. UPPERCU

THE Aeromarine Plane and Motor Company of Keyport, New Jersey, a division of the Detroit Cadillac Motor Car Company of New York, is one of the pioneers of aircraft manufacture. It is one of the few companies equipped for quantity production at the time this country entered the war. Specializing in seaplanes, this company has made an enviable record in the manufacture of single and double pontoon hydroaeroplanes and flying boats.



Inglis M. Uppercu, President of the Aeromarine Plane and Motor Company

The officers of the company and the workmen in the Aeromarine plant are justly proud of the fact that more machines have been turned out there per man-power than in any other aircraft factory; that Aeromarine machines are in continuous service, and that not a single life has been lost through faulty construction.

It was in 1908, the year the Wrights astounded the world by their flights at Fort Myer, that the seed of the Aeromarine company was sown with the formation of the Poland Aeroplane Company of Newark. Inglis M. Uppercu, president of the Aeromarine Plane and Motor Company, financed the Boland concern, and it was Mr. Uppercu who furnished the money, the courage and the enthusiasm during all those lean years that followed, in which the government offered no encouragement to aircraft manufacturers. During this time the laboratory work was continued, along with plant enlargements which enabled the Aeromarine company to place at the disposal of the government a large and efficient plant equipped for quantity production at the time such plants were needed most and sadly lacking in number.

In ten years the enterprise in its evolution has expanded from a wee laboratory to one of the best appointed and equipped plants of its kind in the country. Every device for testing strength of material, testing the strength, power and durability of motors are installed. The motor testing room is acknowledged one of the best in the world.

The plant is ideally situated on Raritan Bay with a water frontage of 3,200 feet and a splendid flying field. It is ten miels from Sandy Hook and eighteen miles by water from New York City. To the Naval Training Station at Bay Shore it is fifty-two miles, and forty miles to the Mineola flying field, which has enabled the aerial delivery of training machines to these stations of machines built at the Aeromarine factory, a potent factor in the speed-up program of this country's war work.

From the time of its inception the company has built its machines in their entirety, including engines and propellers, though in filling war contracts the machines have, of course, been from government specifications. But despite the press of war orders the laboratory work has never been allowed to lag, with the result that the Aeromarine company has produced two engines, known as the "B" type and "L" type, that compare favorably with the best motors of foreign and American manufacture.

The Aeromarine company was eliminated from participating in the manufacture of land machines early in the war as a direct result of the superiority of the Aeromarine pontoons and the general efficiency of the Aeromarine type hydro-aeroplanes. The Navy Department placed orders that precluded any attempt to manufacture the M I army machines, which had successfully passed the government tests.

Like all aircraft manufacturers, the Aeromarine company was retarded through changes in specifications during the earlier days of the war, but for more than a year there has been a steady delivery of machines to the Navy Department. It may be said that the Aeromarine company was more fortunate in respect to changes in oontracts and specifications than the majority of the manufacturers.

The weight of the Aeromarine hydro-aeroplanes in relation to lifting power of motors with which they were equipped offered a distinct advantage for training purposes which won distinction in the Navy Department. These machines were not subject to weather conditions, leaving the water under any and all conditions, which made continuous training possible at the naval training schools, a factor of vast importance in the curriculum of naval training.

The history of the company is one of tragedy, romance and perseverance of a nature that rarely enters into the prosaic life of mechanical industry. The first product, a tail-less, rudderless machine without wing warps, was flown successfully in the fall of 1908. This model, designed by Frank Boland and built by Mr. Uppercu and Joseph Boland, was controlled by jibs and elevator. Two years later, in a model embracing the same principles, Frank Boland lost his life in a flight at Trinidad, following a series of successful demonstrations in various countries of Central and South America.

Following the death of Frank Boland years of laboratory work followed in which land and



Charles F. Willard, Chief Engineer

seaplane development progressed. This period was marked by costly experimenting with various types of machines and engines.

Before the Aeromarine company received its initial order from the government Mr. Uppercu decided to change the location of the plant to a site where unlimited expansion would be possible, and the Keyport location was selected. At no time since the first building at Keyport was completed has there not been more structures under way, but with the best effort to keep pace with the demands of production it has been necessary to purchase or rent buildings elsewhere.

Mr. Uppercu was one of the few who saw a future for aircraft manufacture in this country and he is one of the most enthusiastic regarding the future of the industry for a product designed for commercial and pleasure purposes. It is that faith that actuated him in continuing laboratory work in all departures of land and sea machines, in constructing permanent buildings and the purchase of land sufficient to meet all needs of the future.



Two views of the interior of the Aeromarine factory at Keyport, New Jersey



CHARLES HEALEY DAY,
CHIEF ENGINEER AND DESIGNER.



HARRY BOWERS MINGLE,
PRESIDENT.



DANIEL L. MEENAN, JR.
TREASURER.

THE STANDARD AIRCRAFT CORPORATION—BUILDERS OF BOMBERS

FROM the Standard Aircraft Corporation's factory at Elizabeth, New Jersey, have come during the past few months the first examples of American constructed bombing machines. On July 4 was launched the first Amercian-built Caproni, a biplane, equipped with three Liberty motors. On July 6 was launched the first American-built Handley Page, also a biplane, equipped with two Liberty motors. Both machines were built by the Standard Aircraft Corporation. In both cases the tests were successful and we can anticipate that in the near future bombing machines of these types will be turned out in large numbers, and that America will truly begin to be a substantial help to the Allies, aeronautically, just as we have been of great assistance to the Allies in connection with land operations.

The Launching of the Caproni

The final test flight of the Caproni biplane and the handing of the machine over to the Government took place at the Government Aviation Field at Mineola, Long Island, on the morning of July 4th. There was no formality about it. The plane had had its engines installed at the aviation field and when this had been completed and the engines tuned up, Lieutenant Gino, who met his death only a few days later, stepped into the plane and took her into the air for its final test. The machine had been tested several times previously. The performance of the plane is said to have been entirely satisfactory both to the builders, the representatives of the Italian firm, and to the representatives of the Government. The figures as to height and speed are not available at the present time.

Major Tappi, head of the Italian aviation mission to this country, and Major Falchi, of the Italian air forces, represented their country at the experimental flight. Mr. John D. Ryan, Director of Aircraft Production, and General William L. Kenly, Director of Military Aeronautics, and Colonel H. H. Arnold, W. C. Potter of the Aircraft Board, Captain Harvey of the administrative staff of the Mineola aviation field, and Majors Rhinehart and Canady were present at the launching. Captain Hugo d'Annunzio and Lieutenant Belloni represented the Caproni company. Commander Briggs represented the Britsh Government.

Alan R. Hawley, president of the Aero Club of America, said:

"The success of the first American built battleplane is one of the most important steps forward in the building of our air fleet."

In connection with the flight, a cablegram was made public, which was recently received by the Italian mission from Captain Fiorello La Guardia, Congresman from New York, who joined the American aviation forces and is now in Italy. Captain La Guardia appeals for the dispatch to Italy of raw materials for the building of aircraft. After expressing his good wishes for the success of the Italian mission he says:

"Please urge the American Government to send to Italy raw materials with which to build aeroplanes. The new type of Caproni war 'plane is a powerful machine, and its success has been proved in the flight from Turin to Rome, in which I participated. Give us raw materials and we will build thousands of aeroplanes here, and our American boys can whip the enemy off the map."

The Launching of the Handley Page

The giant Handley-Page, with a wing spread of 100 feet and driven by twin Liberty motors of 400 horsepower each, took the air at 4:30.

Without its cargo of bombs, the machine weighs 9,000 pounds, or four and one-half tons, and to drive it requires fuel consumption of approximately sixty gallons an hour. The Liberty motors are in an armored compartment on either side of the fuselage. In addition to its bombs, the machine also mounts two light Browning machine guns, which can be fired from any desired angle.



Benjamin L. Williams, of the Standard Aircraft Corporation

The pilot was Lord William Semphill, of the British service, and the man who sat in the machine gunner's seat forward was Major General William L. Kenly, U. S. A., Chief of the Department of Military Aeronautics in Washington. The others in the aeroplane were Captain E. T. Waller, of the Canadian Army; Captain E. L. Austin, of the Royal Flying Corps; Young B. Dawkins, an official of the Standard Aircraft Corporation, and an official moving-picture photographer.

Christened "The Langley"

The aeroplane was christened in honor of Longley by Mrs. Harry Bowers Mingle, wife of the President of the Standard Aircraft Corporation.

After leaving the ground at 4:30 the plane made three wide circles, climbing higher each time. It landed at 4:52. Colonel Semphill said it reached a height of 3,500 feet and maintained an average speed of ninety miles an hour.

The "launching" and test were preceded by a luncheon at the plant, to which several hundred guests were invited. Secretaries Daniels and Baker were invited, but were unable to attend. Benedict Crowell, First Assitant Secretary of War, represented the War Department. Senator J. J. Frelinghuysen of New Jersey and Senator Charles S. Thomas of Colorado also were present.

Columbia Aviator Cited for Bravery

Paris.—Columbia University's Paris bureau on October 4 got news of an exploit by Lieutenant C. L. Nelson of the class of 1916, who distinguished himself in the St. Mihiel offensive. Between the 12th and the 14th of September he brought down a sausage balloon, which fell in flames in a wood inside the German lines. The wood shortly afterward was captured by Americans and the destruction of the balloon authenticated.

Another day Lieutenant Nelson went out with his French escadrille of eight planes. They were attacked by sixteen planes of the "tango circus," formerly led by Baron von Richthofen. Every man of the enemy squadron was an ace.

Our escadrille lost one plane, while the enemy lost three, of which Nelson bagged one. When the fight was over his observer was shot through the leg. Nelson himself escaped with a whole skin, but with a bullet hole through the back of his boot and twenty-one bullet-holes in his machine. Despite this he descended safely within our lines. The fight lasted fifteen minutes, or "about as long," said Nelson, "as one cares to spend in a single scrap with boches."

As a reward for this achievement the whole escadrille was cited and got the Fourragère. Lieutenant Nelson was individually cited for the Croix de Guerre, and both he and his observer were recommended for the Cross of the Legion of Honor.

DEVELOPMENT OF THE WRIGHT-MARTIN COMPANY

THE Wright-Martin Aircraft Corporation, who have been manufacturing Hispano-Suisa motors for the French and British Governments for some time, have recently been forced to enlarge their working space to a great extent. They have been allotted a very important part in the aerial programme of all the Allied armies. At the present time they are standing behind very materially larger orders than was the case a year ago. At that time they were working well up to capacity. The company is making every effort to live up to and exceed the programme of deliveries to which they have committed themselves, at the request of the Government. So well were they carrying out their schedule that they were only three days behind in their deliveries up till July. The congestion of freight movements and the movements of troops and such things of paramount urgency played havoc with the company's well-arranged plans so that they are now about thirty days behind their schedule. After the receipt of General Pershing's cable asking for motors at once, the Wright-Martin company have committed themselves to the task of not only keeping up production, but to repair the damage to the schedule, so that before the expiring of the present contracts the final motor will be delivered on the original date set.

The Wright-Martin company now have a factory in Long Island City which will ultimately employ 10,000 to 15,000 men. In their plant at New Brunswick, N. J., at the present time there are employed over six thousand men. Wright-Martin have added the name of the Franklin Motor Car plant to the already long list of plants making parts for the Hispano-Suiza. The Pierce-Arrow Company are also in the Hispano-Suiza field, under the guidance of Mr. Geo. H. Houston, who is the backbone of the Hispano-Suiza programme in the United States.

The Hispano-Suiza motor added to its many laurels a few days ago when a plane equipped with a 300-h.p. Hispano-Suiza motor broke the hitherto existing world's record for altitude. In discussing the motor, one of the officials of the Wright-Martin Company said: "The ideal plane for the Hispano-Suiza motor has not been designed yet. The motor is the "Roamer" of the aeroplane field. It is built primarily for speed and lightness, and for that reason a great many of the Allied 'Aces' prefer the Hispano-Suiza in their bullet-like scouts; for that reason every French Ace uses a Hispano-Suiza motor in his Spads." As a truck horse is lost when it is put upon a rack track, so is a race horse all but useless when it is asked to move a heavy truck. So it is with the Hispano-Suiza motor. Why should a Hispano-Suiza, which will drive a plane at 145 miles per hour on the level be wasted on a heavy bombing plane when it would be of so much more use in a light, fast, fighting scout?"

THE HASLER REVOLUTION CIRCUMFERENCE AND CUTTING SPEEDS INDICATOR

A NEW revolution circumference and cutting speed indicator is being placed on the American market now by Harrah & Co., 42 Cliff Street, New York, as agents for the Hasler Co., of Bern, Switzerland.

The novelty of the instrument consists in its mechanism, the instrument operating without winding or by means of magnetism. Clockwork in the interior of the instrument automatically sets the indicating mechanism when the instrument is started and releases the same after three seconds. During this period the indicating mechanism is in direct communication with the driving shaft of the instrument, thus providing an exact record in a shorter unit of time than it would be possible with tachometers based on the centrifugal or magnetic principle.

The instrument is anti-magnetic, which permits its use freely in electric power stations.

The driving shaft can be rotated in either direction, the instrument registering any number of revolutions up to 10,000 with equal accuracy. On account of its mechanical construction the instrument is independent of the variable stresses of the springs or friction of the bearings, and can be pressed firmly on the moving body without affecting the time element.

It is not affected by vibration or temperatures, and the pointers remain at the figures arrived at until reset.

The instrument has a black circle of figures for reading revolutions, and a red circle for reading cutting speeds and yards per minute.

TITANINE DEVELOPMENT



Mr. E. G. Davis, American Manager of Titanine, Inc.

Titanine, Inc., is an American corporation, organized to manufacture Titanine formulas in America under license of the Titanine, Ltd. The latter is one of the largest manufacturers of dope in England, and has supplied about twenty per cent. of the dope used by the Allies during the war. To this company the aeronautic industry is indebted as Titanine was the first to manufacture a non-poisonous and non-inflammable dope. It is the invention of T. W. H. Ward, S. E. Groves, and Dr. J. G. Ward.

The American corporation has a large, well-equipped plant at Union, New Jersey, which is under the management of E. G. Davis, who recently came from the Titanine, Ltd., of England, to take care of the production in this country. Mr. Davis has made great strides in getting his American plant into production, and announced last week that he is now ready to furnish, in addition to Titanine dope and Planoline fireproofing sōlution, clear wing varnish and identification paints for insignia in red, white, blue, black, admiralty gray; khaki varnish and dope resistant paint. Four grades of dope are ready to be supplied, one of which is made from material not conserved by the government.



Mr. T. W. H. Ward, the inventor of Titanine

WOODWORKING MACHINES FOR AEROPLANE PARTS

THE manufacture of aeroplanes in this country created a demand for a number of special machines to make the necessary woodwork. While some of the aeroplane structure could be made on the standard machines, there are parts of such peculiar shape and design that it necessitated the making of special fixtures or equipment to use in connection with the standard machine.

In the early stages of aeroplane production there was a call for a machine that would shape a particular part of the aeroplane, called the strut. The only method of making these struts up to that time was to work them out by hand, which not only took considerable time, something like two to four hours for each strut, but it required a skillful workman to finish them to the measurements specified by the designer.

To meet this request of the aeroplane builders, many manufacturers of woodworking machines tried to develop and build a machine that would produce these parts automatically. Realizing the fact that a fixture or equipment that could be applied to a standard woodworking machine, with which many woodworkers were familiar, would appeal to the aircraft manufacturers, Baxter D. Whitney & Sons, Winchendon, Mass., manufacturers of woodworking machines, designed a jig, or fixture, for a double spindle shaper. While this jig, or fixture, was original (a basic patent has been granted on this feature), it proved its efficiency from the beginning. With the use of this fixture many leading manufacturers have been able to produce struts at a rate which, three or four years ago, was considered impossible; in fact, the capacity of this machine is only limited by the endurance of the operator.

The only preparation which the stock required was cutting it to the proper length, planed to an even thickness, and sawed to the proper width. The surplus stock was then removed by the band saw, after which it was brought directly to the shaper, and when through with this operation it was of the proper shape and size and practically ready for the fittings. As the wood was worked with the grain, it had a surface equal to the surface left by the cabinet planer, which required a minimum amount of sanding.

The success of the Whitney Company in developing this machine prompted them to supply a demand for a machine which would cut the lightening holes on the aeroplane webs. The old method required a number of operations, such as boring with a bit a hole through which a jig saw could be inserted, and the balance of the cut being made with a jig saw and afterwards smoothed or worked to size on a spindle shaper.

By designing a machine on which the spindles (equipped with a special top and side cutting tool) are raised and lowered by foot power, the number of operations on these aeroplane webs was reduced from three (3) to one (1) operation. This machine, simple in design, embodying no new features except perhaps a new application, has proved to be one of the most economical and efficient tools used in the manufacture of aeroplane woodwork.

This class of work required a machine on which the cutters ran at extremely high speeds, which could only be obtained by means of a motor, the rotor of which is mounted directly on the spindle. By this method of driving the spindles, a speed of 10,000 R.P.M. can be maintained, while it is not practical to try to maintain such high speeds on the belt driven shaper.

Another machine made by the Whitney Company used in aeroplane work is the toothing machine. By passing the sections used in the making of aeroplane propellers through this machine at a rate of 100 feet per minute, a toothed or combed surface is produced that makes better glue joints and more of them in less time than any other method.

In addition to the machines this company makes for the working of wooden aeroplane parts, they also manufacture a cylinder grinding machine that is especially designed to do the internal grinding or finishing of Liberty motors.

INSIGNIA PRESCRIBED FOR AIR SERVICE

OFFICIAL specifications regarding uniforms, insignias and hat cords to be worn by enlisted men in the Air Service have come from the office of Director of Military Aeronautics, Washington, D. C. Attention is called to the regulations which specify that all enlisted men, including candidates for commissions, will wear as a part of their uniforms the blue shoulder cap as described in Special Regulations previously issued and which read as follows:

"Enlisted men of the Air Service shall have a navy blue cap let in at the sleeve head seam and extending down the sleeve 5½ inches from the point of the shoulder. All men as hereinafter specified will wear the insignia as described:

"A four-bladed propeller with center 3¾ inches from point of shoulder embroidered in white; the propeller to be two inches in diameter, two of the blades horizontal and the other two vertical; three-quarters inch above the top tip of the vertical propeller a figure showing the number of the squadron to which the man belongs, one inch high and embroidered in white.

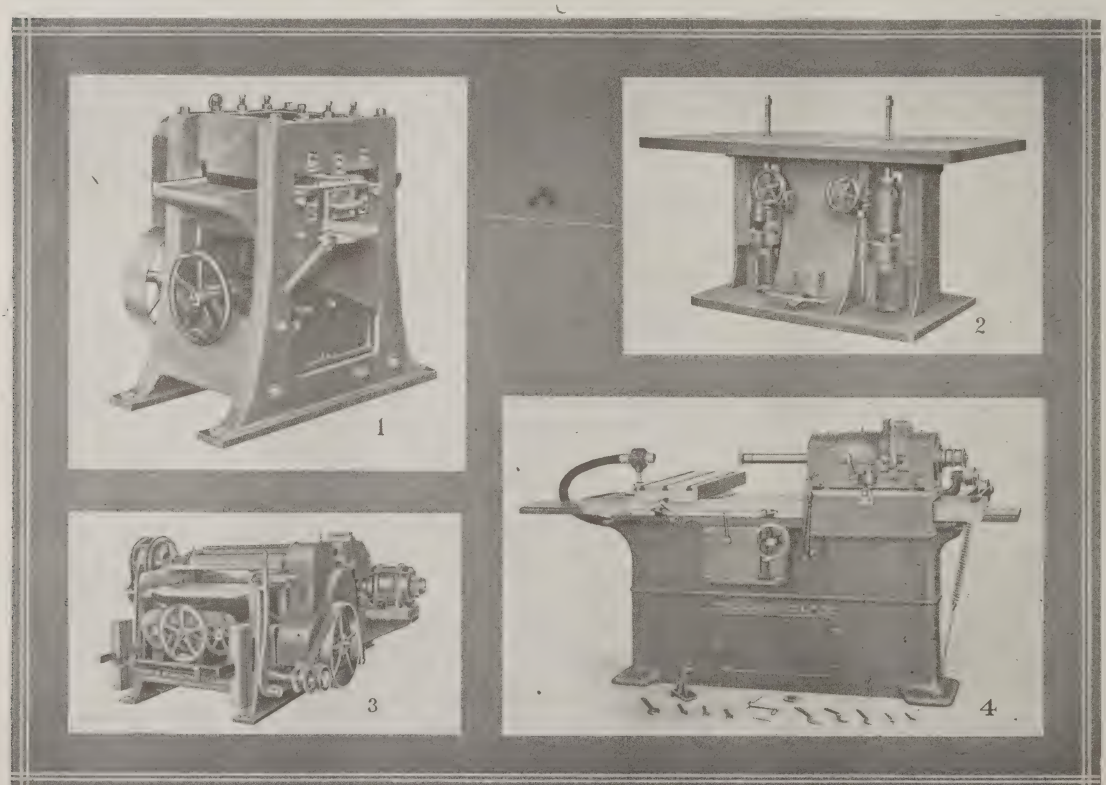
"Aviation Mechanic—Same as above with embroidered circle added, inside of circle to be 1¼ inches from center of propellers, outside of circle to be 1⅜ inches from the center of the propellers.

"Enlisted Aviator—On same blue background shall be embroidered in white the insignia as hereinafter described:

"A pair of wings with a 5-inch spread with crossed propellers between them, each wing to be 1⅞ inches long and ⅞ inch high at the inner edge. Propellers to be one inch across. One-fourth inch above the top of the vertical propeller shall be embroidered the number of the squadron to which the man belongs in figures ½ inch high.

"In the case of candidates for a commission, under instruction in Air Service flying schools, the propeller only will appear upon the shoulder cap, no squadron number or other device to be added. There is no authority for the wearing by enlisted men of the Air Service of any sleeve insignia other than the blue shoulder cap above described, except the specified insignia of grade for non-commissioned officers, and the special chevrons for wounds and war service.

"The hat cord to be worn by all enlisted men of the Air Service, including candidates for commission, will be green piped with black."



1—Grinding machine for aeroplane cylinders. 2—Double surfacer for planing aeroplane woodwork. 3—Double spindle shaper for aeroplane struts. 4—Toothing machine for propeller blade stock.

LT. RALPH E. de CASTRO, ASSOCIATE EDITOR OF AERIAL AGE, CITED FOR BRAVERY

WORD has been received that for the second time he has been recommended for promotion and for the French War Cross for bravery in the aviation service abroad.

Lieutenant De Castro, who has been at the front since last July, has been mentioned in an official communication from the headquarters of the First Aero Squadron, United States Air Service, to the commanding general, First Army Corps. The communication reads:

"On September 7, 1918, Lieutenant De Castro, pilot, and Lieutenant A. E. Easterbrook, observer, First Aero Squadron, were sent on a photographic mission covering a strip of fifteen kilometers, eight kilometers inside the German lines. Fifteen pursuit aeroplanes were available as protection, but the mission was undertaken with but four. Attacked by fourteen enemy machines, they nevertheless continued their mission until almost cut off from the rear. An attack followed, in which one pursuit machine of their protection was brought down. Lieutenants Easterbrook and De Castro returned with the mission partially completed.

"On September 12, 1918, Lieutenants De Castro and Easterbrook were given photographic mission to perform during the attack of the American forces at the St. Mihiel salient. Because of the intense aerial activity they were unable to get pursuit machines as protection and volunteered to perform the mission unaccompanied by protection. Notwithstanding the low-hanging clouds, they penetrated four kilometers into the German lines, and at an altitude of 400 meters exposed eight plates successfully. While engaged in photography they were attacked by four enemy machines, but succeded in completing the mission after fighting off an attack.

"On September 16, 1918, while engaged in taking oblique photographs, they were forced to dive into the German lines to avoid collision with another Allied plane, which suddenly dived on them from above. Under intense anti-aircraft fire and machine-gun fire from the ground they regained their altitude of 800 meters and exposed seventeen plates on the territory behind the lines of German observation balloons, gaining pictorial information of the utmost value."

Describes His Experience

In a letter to his brother, Allen, Lieutenant de Castro describes his experiences:

"In the first place a colonel from the General Staff came to the field in person and ordered some pictures taken, eight or ten kilometers in the German lines, on a strip about 25 kilometers long, the ground to be covered twice, and forty plates to be exposed. I took it somewhat in the nature of a compliment when the job was handed to me, for it was quite a difficult task. Difficult to read the map correctly, so as to find exactly the place and—if I may say so—a job calling for alertness and a little nerve.

"I made arrangements with a chasse squadron on our field to give me a protection group of 12 Spads; to meet me at an altitude of 3,500 meters—about 14,000 feet—over our field. I attained my altitude, but after waiting around about twenty minutes, was joined by only four machines. Of course I had a perfect right to come down, but as my observer was willing I thought I could take a chance also, so we hiked out for the lines, crossing them at 4,000 meters, still climbing. I reached the near end of the strip of country we were to photograph, and told Easterbrook to go ahead. He ducked down in the cockpit and started his pictures, when, woe to me, I saw some Huns below us coming up for all they were worth—two groups of three, and one of two, and far back of us and above us four more.



Lt. Ralph E. de Castro

"So I acquainted my observer with the facts, and told him to go ahead while I kept my eyes on the Huns. They surely did think they were foxy, because the further in I went the further back they went, trying to get around me and cut me off, getting between us and our lines, so that the four overhead could jump us first, and they could keep us from getting out. Then suddenly the four above dived down shooting. I waited no longer, but nosed my machine over and hit it out for our lines at about 150 miles an hour, losing altitude all the time. I guess the Huns never saw such speed in their lives, because I walked right away from them. That's all there is to the story, except, unfortunately, that one of the Spads was brought down.

"We brought the pictures home and when they were developed and printed we discovered some beautiful new battery positions—just what the colonel was looking for.

"By the time you get this letter you all will have something more to celebrate. I can't tell you what, but Boche is going to have the stuffing kicked out of him very shortly, and believe me, if everything goes well it will be a most gorgeous job."

De Castro saw his first action during the fighting around Chateau Thierry. It was after a number of successful flights during the fighting at that place that he was first commended for promotion for his bravery and daring.

Although the application was denied at that time, De Castro wrote his friends that he would soon do something that would compel a promotion and advised them to be on the lookout.

In a newspaper dispatch dated October 3, De Castro is mentioned as one of the aviators in a squadron that dropped three tons of bombs on St. Juvin, causing serious damage. During the action the American airmen downed three Hun planes. De Castro is credited with sending one to earth in flames after shooting the wings off.

American Aviator Gets Seventh Foe

On the American Front in France.—Among the noteworthy feats of the French Aviation Service, which has displayed such wonderful activity during the Allied offensives, is that of Sergeant Major Edwin G. Parsons, who on September 29 shot down his seventh enemy machine.

After a close, long fight, the German machine crashed to earth inside the French lines.

Though he flies in a French escadrille, Parsons is considered here as an American ace.

Already holding the French War Cross, he now has been awarded the French Military Medal, one of the most coveted of French Army decorations. Parsons formerly belonged to the Lafayette escadrille, but did not transfer to the American Aviation Service.

With the American Forces Northwest of Verdun.—American aviators have been busy carrying out bombing attacks on Conflans, Longuyon, Audun, Dommary, Buxieres, Vigneulles, Chambley, Etain, Arnville and Grandpre. In one day they dropped thirty-seven and a half tons of bombs. Abileville, Gorze, Haydenville and Marcq also were bombed.

In twelve days' flying on this front thirty-four successful missions have been undertaken by the American aviators.

With the American Army on the Champagne Front.—During the American activities south of Romagne on October 9 seventy-nine Allied bombing planes passed southward, having bombed Buzancy and other railroad and supply stations behind the German lines.

American pursuit planes took an active part in clearing the air for the bombers, downing four Fokkers in the regions of Remonville and Aincreville. The bombers started out late in the afternoon in groups. After accomplishing their missions the groups met on the way back and passed over the American line in one flock.

New York Aviator Wins Unequal Fight

With the British Army in France.—A young American aviator distinguished himself in the recent great aerial activity over Belgium. He is Lieutenant Walter P. Chalaire, who at the beginning of the war was a reporter on a New York newspaper, and now is in a hospital in England with a bullet wound through his shoulder.

While attached to a British photographic group, Chalaire's machine and another went out over Ostend. On the way back he became separated from the other machine. Soon afterward Chalaire and his observer discovered a large group of German machines above them and another group below the tail of their machine. The enemy groups began a concerted attack.

Chalaire manoeuvred the machine, with the result that two enemy machines were seen to go earthward in a spin.

THE PANHARD—300 H.P. (DIRECT TYPE AVIATION MOTOR)

By E. H. SHERBONDY

THE Panhard Company have had in the last periods, a number of different types of aviation motor of novel construction and were amongst the very first motor firms to make use of steel cylinders, they having produced some steel cylinder motors in 1903, which practise was followed up in 1908 by the development of four sizes of aviation motors, steel cylinders, copper water-jacketed and employing a novel concentric valve construction. These motors were very well designed and built and were of very light weight.

In 1912 they produced a couple of V-type eight-cylinder motors of conventional form, employing cast-iron cylinders (*L-head arrangement*). The motor here described is designated as (V-12-J) and comprised of twelve cylinders, two rows of these set at an angle of sixty degrees from one another.

The bore is 115 mm. or 4.52 in. and the stroke is 170 mm. or 6 11/16 ins. The motor is operated either at 1,350 R.P.M. at which speed it gives 240 H.P. or at 1,700 R.P.M. at which speed it gives 340 H.P.

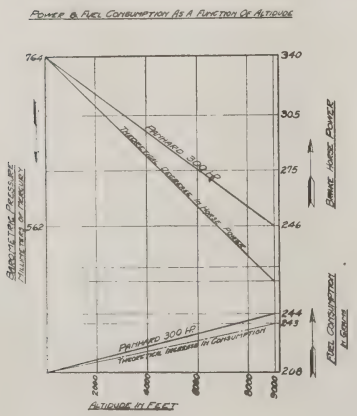
The cylinders are individual iron castings, with a single set of valves inclined at an angle of 30 degrees from one another and are operated by camshaft system, novel in form. The camshafts and excessory drives are by no means of bevelled and helical gear trains, as is now the accepted practise on aviation motors.

The camshaft is of novel form, having seven main bearings of very large diameter and disc crank cheeks. A forked-type of connecting rod is used of (I-beam section). Lubrication is fully forced and the oil pump is mounted exterior to the crankcase.

The Panhard type carburetors, equipped with the Panhard Automatic Compensator, are placed inside the (V) of the motor. Water circulation is insured by means of two centrifugal pumps, at right angles to the crankshaft and driven by means of spiral gearing. When the air starting system is provided, air being distributed to automatic valves in each cylinder, by means of a disc distributor plate, mounted on the propeller end of the camshafts.

The design of a motor in many particulars is unconventional, as will be seen by close persual of the accompanying drawings.

(Figure 1) is a section through the motor at right angles to the crankshaft.

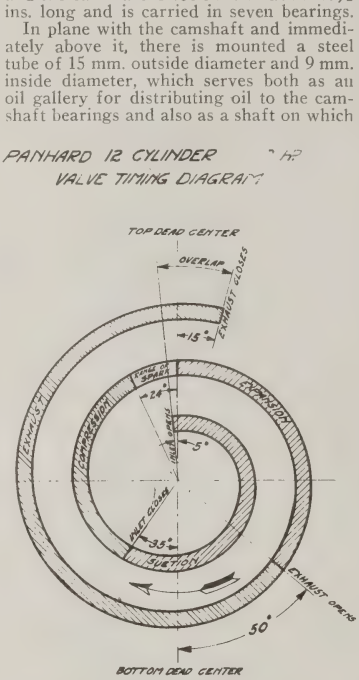


The Camshaft

The camshaft and rocker arm train are mounted in an aluminum housing which is attached to each of the cylinders by means of four studs. The camshaft is drilled straight through 15 mm. or 19/32 in. The outside diameter of the camshaft is 25 mm. or (1 in.)

The root diameter of the cams is 35 mm. and the camshaft is 850 mm. or about 33½ ins. long and is carried in seven bearings.

In plane with the camshaft and immediately above it, there is mounted a steel tube of 15 mm. outside diameter and 9 mm. inside diameter, which serves both as an oil gallery for distributing oil to the camshaft bearings and also as a shaft on which



the rocker arms are mounted, resulting in a very neat and compact valve operating gear. The oil leakage from the camshaft train is carried to the bevel far end of the shaft, through the bottom of the case and drains back to the crank chamber, through the distribution gearing.

Cylinders and Valves

The cylinders are of cast-iron, 115 mm. bore and are completely water-jacketed. Core plates being provided on the adjacent sides of the cylinders. The valve ports are 56 mm. in diameter, 2.2 in. The valves are 62 mm. or 2.4 in.

The cylinders are retained in the crankcase by means of eight studs per cylinder.

Pistons

The pistons are cast of aluminum, 90 mm. long and carry four cast-iron rings, 6 mm. wide or .24 in. and have six internal ribs. The skirt is drilled with six 12 mm. holes, for caring for excess oil.

The wrist pin is unusually small, only 20 mm. in diameter or .78 in. and is mounted 40 mm. from the bottom of the piston. The piston head thickness is 7 mm. —.27 in. at the bottom of the cylinders, there is provided aluminum splash cups to prevent over-oiling of the cylinders.

Connecting Rods

The connecting rods are 292 mm. center to center—11.4 ins. The web and flange thickness is 2½ mm.

The Crankshaft

The crankpins are 62 mm.—2 7/16 ins. diameter and the main bearings, of which there are seven—116 mm. 4.5 in. diameter and 40 mm. or 1.5 in. long and the hole through the shaft is 100 mm. straight through. The crank cheeks are circular —210 mm., 8.2 in. and are 10 mm. or .39 in. thick and are provided with annular grooves for carrying oil from the main bearings to the crankpins.

The Crankcase

The crankcase is split horizontally, the lower crankshaft bearing seats being integral with the crank chamber and a steel oil pipe is cast in this member for distributing oil to the seven main bearings and the crankpins.

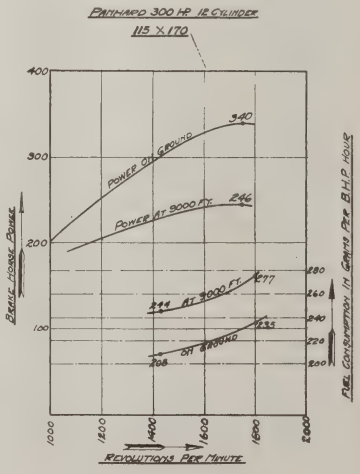
A very deep pressed aluminum oil reservoir is attached to the bottom half of the base. It is provided with a horizontal screen, separating the two (2) portions of the base.

The motor is supported by means of two steel cross tubes, 52 mm. or approximately .2 in. diameter and movement of these tubes in the crankcase is prevented by means of pinch bolts in the bosses, through which they attain a slightly higher efficiency than is attained with a normal motor.

In Figure 3 is given a timing diagram of the motor. The inlet valves open five degrees. The cylinder arrangement on a base is unsymetrical, owing to the fact that the cylinders are offset 20 mm. or .78 in. This offsetting results in decreased guide pressure and permits in ten degrees overlap from the valves, after the top dead center and close 35 degrees after the bottom dead center.

When tested on the ground these motors gave 340 H.P. at 1,750 R.P.M. with a specific consumption of 208 grams per H. P. hour or .452 pounds per H.P. hour.

At 6,562 feet altitude with barometric



pressure of 604 mm or 23.78 ins. the motor gave 272 H.P. at 9,000 feet altitude with barometric pressure of 562 mm. The motor gave 248 H.P. with a consumption of 244 grams.

The power of the motor is absolutely proportional to the density of the air drawn in and it gave 300 H.P. at 1,420 turns on the ground.

Aeroplane Apparently Stands Still While Soaring at Height of 5,000 Feet

Hovering over the city of Dayton like some huge bird with wings outspread but unable to make headway through the air, an aeroplane from McCook field was the magnet which drew thousands of pairs of eyes to it about 9 o'clock on Oct. 5. For fully 15 minutes the ship seemed not to move an inch, except in a steadily downward direction which was so slow as to be almost negligible to the vision of the naked eye. The pilot of the still craft was E. A. Johnson, a civilian flyer at McCook field.

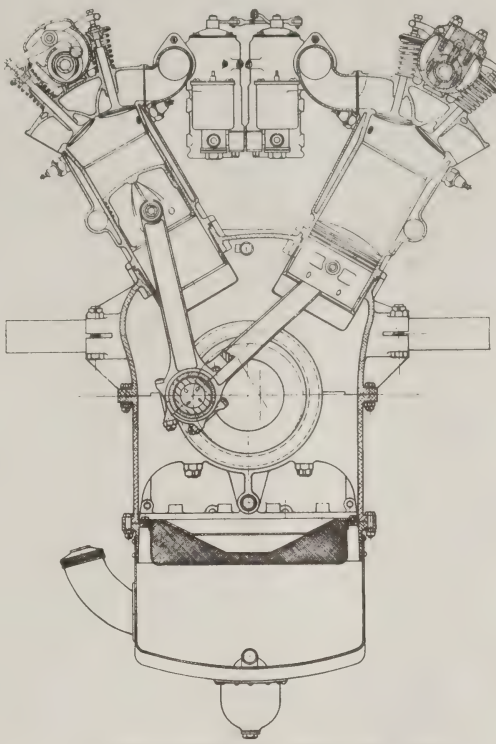
The effect of the machine's apparent stillness was produced by Pilot Johnson equalizing the power of his motor against the wind resistance which was particularly high at 5,000 feet, where he first began his stunt. This had the effect of bringing the machine to a standstill except for the natural fall which came with the gravity of the heavier-than-air craft. Even the gravity was minimized by the outspread wings to such an extent that fully minutes was required for the drop of 3,000 feet.

The particular skill in the stunt, as pointed out by expert flyers, was that of keeping the ship on even keel while suspended. The nose, being heavier than the tail of the machine would have sent it head down and a nose-dive would have resulted had not the pilot held the machine even.

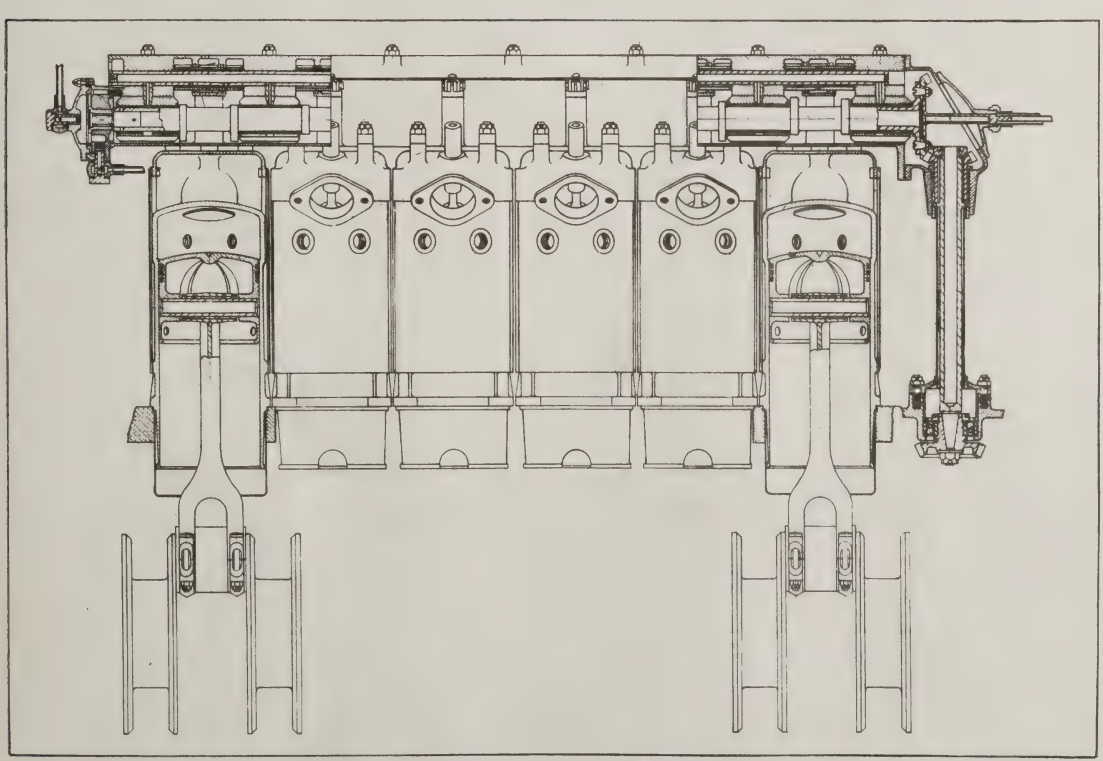
Second Provisional Wing Honors its Colonel

The officers of the Second Provisional Wing, U. S. Air Service, recently gave a dinner and dance in honor of their commanding officer, Lieutenant-Colonel S. W. Cook.

The Second Provisional Wing is made up of fully trained men and is operated identically as aviation units at the front. The entire wing is under canvas and ready to depart at any moment, with or without railroad facilities. It is composed of Corps d'Armee, bombardment and pursuit squadrons.



End view of the 300 H. P. Panhard Aero Engine



The 300 H. P. Panhard Aero Engine

THE LONDON ENEMY AIRCRAFT EXHIBIT

THE ROLAND CHASER D II

By G. DOUGLAS WARDROP

VERY frequently the Allied airmen encounter the Roland biplane in combat and consequently the machine on exhibit in London is of immense interest at the present time.

The dimensions of the Roland D. II are very small:

Span of upper plane.....8.90 m.
Span of lower plane.....8.50 m.
Length overall .....6.95 m.
Height .....2.95 m.

Its weight—827 kilogs.—with full tanks is slightly greater than that of the Albatros D.III chaser. The lifting surface being 23 sq. m., the wing loading is 36 kg./sq. m. (7.2 lbs./sq. ft.).

Fuselage

The construction of the *fuselage*, and its peculiar shape, merit special attention. Being built entirely of three-ply wood and covered with fabric, it is of the monocoque type, of oval section, and terminates at the stern in a vertical knife edge. The construction is excessively light, the framework consisting of very thin longerons running through the whole length of the body, the curves of which they follow. Rigidity is only provided by the ply wood, made in two halves joined along the middle of the top and bottom. The total thickness of the six layers is only 1.5 mm. From the pilot's seat to the tail there are only four formers of very small thickness.

Between the pilot's seat and the motor the *fuselage* forms a projection tapering upwards to form at its upper extremity an edge 0.11 m. wide, to which are attached the radiator and the top plane. The top plane is cut away to accommodate the radiator. This arrangement of an upward projection of the body itself takes the place of the *cabane*. On the lower part of *fuselage*, and built integrally with it, there are the rotts to which the two halves of the lower plane are attached. At the rear the tail skid, of wood with a shoe of metal, pierces the *fuselage*, and is supported on a projection of ply wood similar to that employed on the Nieuport.

The pilot is placed very high, and has in front of him two wind screens, one on each side of the central structure carrying the upper plane. The view in a forward direction being thus divided would appear to be inferior to that obtainable in other types of machines.

Planes

The planes are of trapezoidal plan form, of unequal span, without stagger and dihedral angle, but with a sweep-back of 1.5°. The chord, which is uniform, is 1.45 m. and the gap 1.34 m. The ribs are at right angles to the leading edge. As the inter-plane struts are secured to the spars over the same rib, it follows that in the front view the struts do not come quite in line. The spars of the upper plane, which are of spruce, are spaced 0.83 m. apart, the front spar being 0.13 m. from the leading edge. The ribs, of which there are 12, are of I section with flanges of ash. They are spaced about 0.37 m. apart. In the middle of each interval there is a false rib running from the leading edge to the rear spar. In each wing there are four compression members in the form of steel tubes 25 mm. diameter. These tubes are evenly spaced, the distance between them being 1.30 m., and are braced by 3 mm. piano wire. Between the front spar and the leading edge there are two tapes running parallel to the spars and crossing alternately over and under consecutive ribs. Two more tapes are similarly arranged between the spars. Certain corners are stiffened by reinforcement by ply wood. Each of the upper planes carries an *aileron*, which is not balanced and of equal chord throughout. A strip of three-ply wood, under the fabric, covers and protects the hinge fixed on the rear spar. The *aileron* measures 1.82 m. in length and has a chord of 0.42 m. Its leading edge is a steel tube of 30 mm. diameter. The *aileron* cranks are operated, as in the Nieuport, by two vertical tubes. In the left top plane is mounted a petrol service tank. Openings in each of the halves of the top plane accommodate the radiator. The upper planes are attached direct to the highest portion of the *fuselage* by means of special bolts resembling somewhat those used on the L. V. G. C. IV.

The lower planes are constructed in much the same manner as the top ones. The spars are similarly arranged and are consequently the same distance apart. In each wing there are 10 ribs, of which nine measure 0.01 m. and the last one 0.025 m. Between the ribs are false ribs measuring 10 mm. The internal wing bracing is the same as that of the top plane, but the distribution of the four steel tube compression struts (of which one is 20 mm. and the other 25 mm.) is somewhat different. From the first to the second is 1.17 m., from the second to the third is 1.13 m., and from the third to the fourth 1.11 m. The lower planes are attached to wind roots built integrally with the fuselage. The angle of incidence is 4° at the second rib and 3° at the seventh. The inter-plane struts are in the form of steel tubes 0.025 m. diameter, stream-lined with a wood fairing which brings their depth to 0.09 m.

The Tail

The shape of the tail can be seen from the plane view of the machine. The fixed tail plane is built of wood, while the two elevator flaps are constructed entirely in metal.

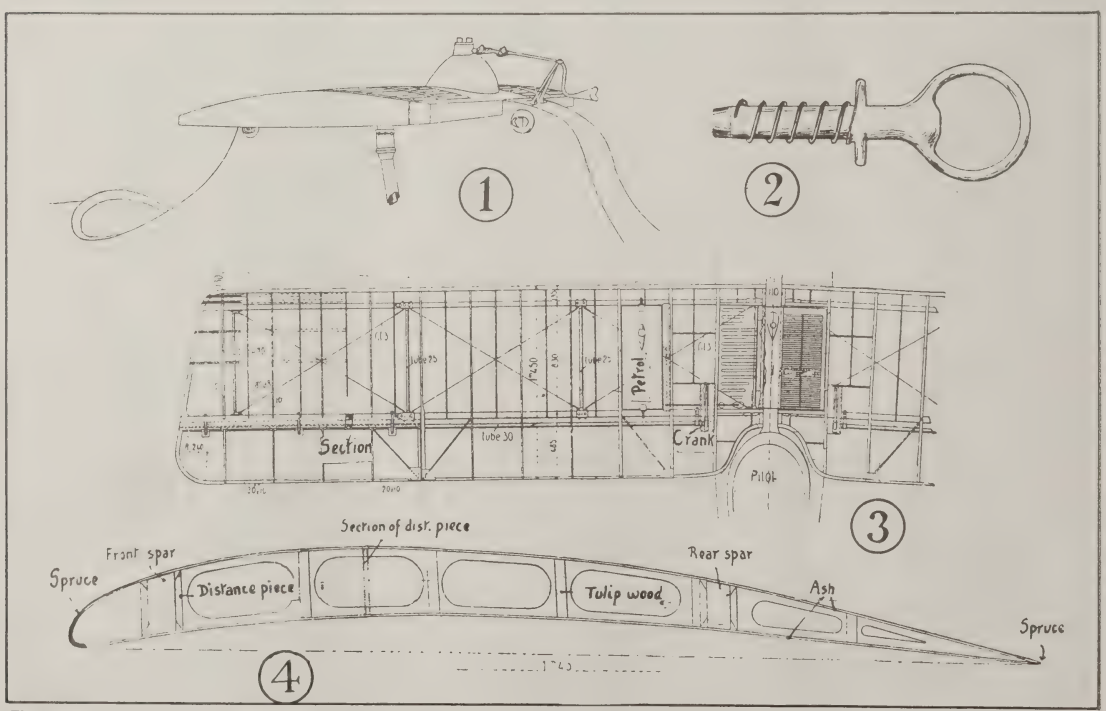
A note should be made of the attachment of the tail plane to the body. The leading edge of the tail plane is hollowed out, and into the hollow space thus formed fits a piece of wood which runs across the *fuselage* and the ends of which project 0.50 m. on each side. Further rigidity is given to the structure by two stream-line tubes running from the tail plane to the rudder hinge on the vertical fin. The rudder, which is roughly rectangular with rounded corners and has a forward projection for balancing, is built up of steel tubes, while the fin, which is made integral with the body is of three-ply wood.

The elevator cables, which are attached to a central crank lever, are enclosed inside the body except for the last meter or so from the stern.

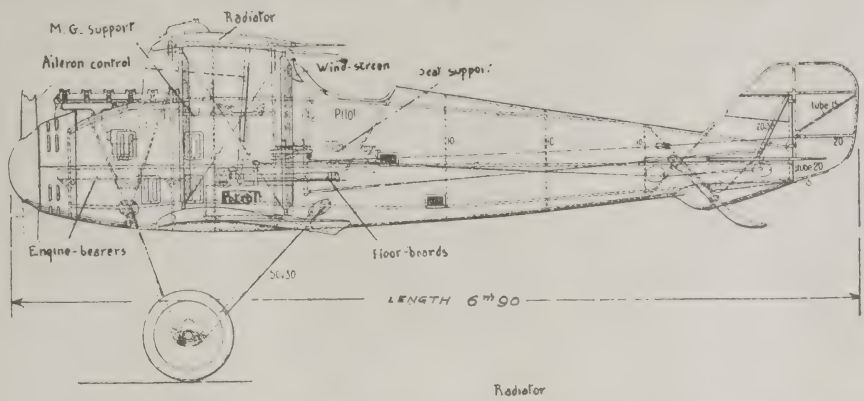
Engine

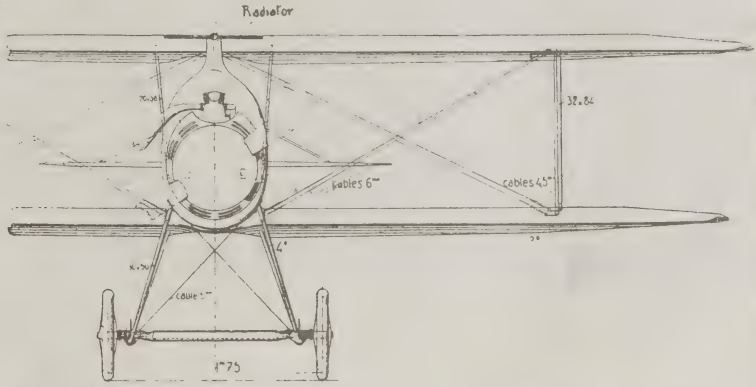
The engine fitted on the Roland D. II is a 160 h.p. Mercedes six-cylinder vertical engine. The exhaust collector is nearly horizontal, and is placed on the starboard side. In addition to the gravity tank in the top plane there is a main gasoline tank measuring 70 x 70 x 25 under the rudder bar. The airscrew having been smashed it has not been possible to iden-

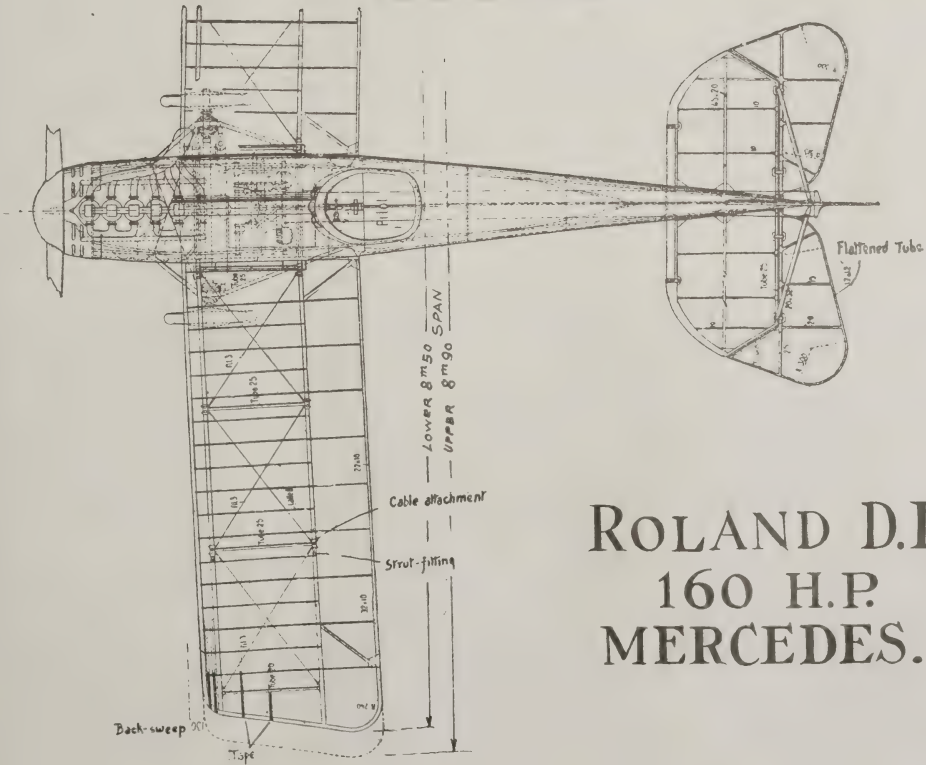
(*Continued on page* 312)



The Roland DII chaser. (1) Diagram of "bump" supporting top plane and radiator. (2) Quick-release bolt for attaching main planes. (3) Upper plane. (4) One of the main plane ribs







ROLAND D.II.
160 H.P. MERCEDES.

The Roland Single-seater Chaser D.II. Plan, side and front elevations to scale

tify it. It had its boss enclosed in the usual "spinner."

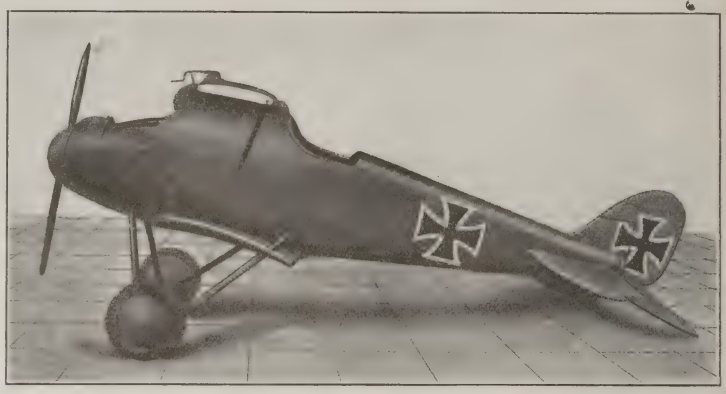
Armament

Two fixed Spandau guns are operated by the motor. They are mounted one on each side, and do not project through the *fuselage* covering until just at the extreme front.

Undercarriage

The undercarriage is formed by two pairs of Vee struts, braced diagonally by two crossed cables. Their attachment to the *fuselage* occurs at two sloping formers. The axle, which is placed between two cross tubes, is enclosed in a stream-line casing. The track is 1.75 m. The wheels measure 760 by 100. The shock absorbers are of rubber.

It has been said of the Roland D. II that owing to its light construction the *fuselage* is apt to get out of shape, and that it has a tendency to spin. As up to the present no test of this machine has been possible, our opinion can only be based on the testimony of our aviators. From this it appears that this machine, of new conception, must be counted among the best of German chasers. The Roland D. II single-seater enters still into the composition of certain enemy squadrons.





Side view of the Roland DII chaser

Starboard quarter view of the Roland DII chaser

LIBERTY WALNUT PROPELLERS AND THE MEN WHO ARE BEHIND THEM

WHEN in the course of present events we witness the adaptation of America's plants and products to the needs of the hour, especially when a great industry springs therefrom, we have the source for inspiration. Such a feeling of inspiration will come to any one who visits to-day the industries of George W. Hartzell in Piqua, Ohio, which is in the Miami Valley, where birth was given to Aviation by the Wright Brothers, of Dayton.

Piqua is located in the Miami Valley only a few miles from Dayton, the aviation center of the world, and there for many years George W. Hartzell has been in the lumber business, the Hartzell Walnut Lumber Mills being among the most prominent in the country. George W. Hartzell has been in the lumber business for thirty years; and the last fifteen years has specialized exclusively in walnut. Every carload, trainload, wagon-load of walnut logs that you will come across en route in the Miami Valley will very likely be found on inquiry to be destined for the Hartzell Mills at Piqua.

Realizing, when America became involved in the great war, the value of walnut in the manufacture of many things that the Government would need in its war program—and because of his knowledge and experience in everything pertaining to walnut—George W. Hartzell placed his experience and facilities at the command of the country. Here experience in walnut has turned out everything from steering wheels to gun stocks—but probably the most important item being a splendid Liberty Walnut Propeller for aeroplanes.

The Hartzell Walnut Propeller Co. is probably the only factory in the country that is to-day turning out solid four-blade propellers, which are more difficult to manufacture than the two-piece. In fact the Hartzell Walnut Propeller Company is one of the early pioneers in the propeller industry and they claim to be among the few propeller companies to-day who maintain an engineering department which is actually *designing* propellers.

A recent job of which they are most proud is the special propeller just designed at Piqua for Gallaudet. The chief engineer at the Hartzell plant, whose photograph accompanies this article, is Frederick Charavay, who came to the Hartzell Company following a long experience with the Wright-Martin Aircraft Corporation. Mr. Hartzell considers Mr. Charavay one of the foremost propeller designers in the U. S.

Robert N. Hartzell, a son of the founder of the Hartzell industries, is manager of the propeller plant, and both the quantity and quality of their production testify to the efficiency of his management.



Robert N. Hartzell, Manager



Harry B. Wise, Sales Manager



Frederick Charavay, Chief Engineer



Caquot observation balloons in flight at a balloon training school in the United States. These balloons are all American made, being modeled on the invention of Captain Caquot, of the French Army. Up till a short time ago the Caquot Model M was used by the British and French Air Services exclusively. The American manufacturers have made several improvements, however, and are now turning out the Model R Caquot. One of the chief differences is that the Model R has the safety valve in the bow of the balloon, while the Model M has it in the middle of the starboard side. The angle of flight is very well illustrated in this photograph, the normal angle being but several degrees above the horizontal. The balloon on the left is probably, judging from its flight angle, in process of being hauled down. In the old style kite balloons, and in fact in the case of the present day German Drachen balloons, the angle of flight very nearly approximated forty-five degrees above the horizontal. This, it can be easily seen, imposed a much increased strain on the cable and militated against the very necessary steadiness of the balloon for observation purposes. © Committee on Public Information.

GOODYEAR PERFORMANCES

E. E. HELM

THE recent performance of the Goodyear Airship D-12 in a 360-mile flight from the Goodyear Balloon Field, near Akron, to Dayton, Ohio, and return, not alone marked the first successful long-distance airship flight made in this country, but the accomplishment was noteworthy in that it is indicative of the possibilities of this important branch of our aeronautic service which has heretofore commanded but a small share of public attention because of the predominance of an almost unlimited aeroplane program. This journey of the D-12 which was the longest any American airship ever made with a definite objective, also brought to the public attention the part that the Goodyear Tire & Rubber Company of Akron has played in the development of aeronautics.

It was back in the summer of 1910 that the officials of the Goodyear Company decided to enter the field of aeronautics which was then in its infancy. At that time the wings of aeroplanes were covered with rubberized fabric, and the company sent two of its men to Europe to investigate and report on European methods of manufacturing aeroplane and balloon fabrics. Following this, in the spring of 1911, entered in a small way into this field, and from that time on it has developed both its experimental and manufacturing facilities until to-day this company stands at the front of American balloon builders. After the elimination of rubberized fabric in the construction of aeroplanes, Goodyear steadily devoted its attention to developing lighter-than-air craft of all kinds, and now is helping the Government, both in the making of airships and in the training of men to operate them for war purposes.

Goodyear's success in balloon construction is due primarily to the foresight of its officials; but playing an important part in the development of this industry were two young men especially well equipped for the work by reason of their educational attainments as well as their courage and initiative. These men are R. A. D. Preston, now a lieutenant in the balloon service of the U. S. Navy, and Ralph H. Upson.

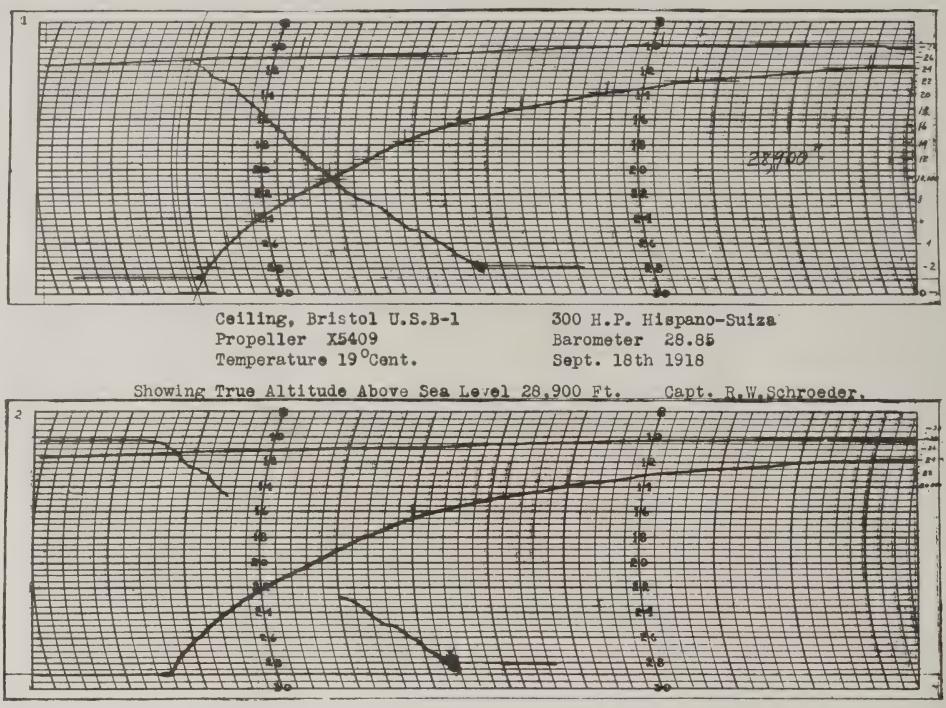
Around these men Goodyear built up its balloon business. They qualified as pilots early in their careers, and have studied and worked in every branch of the business, from making the fabric to piloting the balloons and airships. From this nucleus has been developed at Goodyear a corps of balloon experts second to none in the world.

It was in 1912 that Goodyear built its first spherical balloon, an 80,000 cu. ft. bag that gained world-wide fame as a winner of both the American National race and the International race. This balloon was designed and built by Ralph H. Upson, and was christened "Goodyear." In the summer of 1913, with Ralph Upson as pilot and R. A. D. Preston as aide the "Goodyear" won the American National race. This race was started from Kansas City, and there were twelve entries. In the fall of 1913, the "Goodyear," with the same crew, was entered in the great International race at Paris, being one of twenty starters. Here again victory crowned the efforts of those two intrepid young men and brought world-wide fame to them and to Goodyear. In July, 1914, just before the beginning of the war, the "Goodyear" again won the American National Race at St. Louis, with R. A. D. Preston as pilot. Thus Goodyear had two pilots eligible for the 1914 International race—Upson having already been selected to lead the American team on account of winning the previous International. The breaking out of the war, however, prevented any further competition.

The war brought new balloon problems, and Goodyear kept not only abreast, but a little bit ahead of the world's developments.

At the outbreak of the war The Goodyear Tire & Rubber Company was the only experienced manufacturer of rubberized fabric balloons in this country. The moment the Government balloon program was officially decided upon and Goodyear given a contract to build the first Navy Blimps, work was started on an immense hangar, hydrogen generating plant, and dormitories and other buildings for accommodating a large class of balloon students. Within two months after ground was broken, Goodyear was operating a balloon school and training student officers who were to be the nucleus to start the training courses at the six Naval Air Stations along the Atlantic seaboard as soon as their construction was completed. In May, 1917, the first complete airship made by Goodyear, the D-2, made a flight from Chicago to near Akron, with Ralph Upson as pilot and Herman Kraft as aide. This feat marked the practical beginning of airship construction and operation in this country.

From this time on the balloon industry at Goodyear has grown by leaps and bounds, until now huge airships flying about over the city of Akron and the surrounding country is a common sight. So too, the uniform of Uncle Sam's naval force is a familiar sight on the streets of the Rubber City, for Goodyear's balloon activities have made Akron the center of a naval colony.



Charts showing altitude curve of Captain Schroeder's world record flight

CAPT. SCHROEDER'S STORY OF ALTITUDE RECORD

By CAPT. R. W. SCHROEDER, U. S. A., A. S., Holder of World's Altitude Record

I HAVE been connected with Aviation since 1910, and during that time I have worked as a mechanician for some of America's leading pilots, and have gained a very valuable training. I was always a keen scholar and took every advantage to learn all I could, and I dare say that all my past experiences have been very beneficial to me in my efforts to establish a new World's Altitude Record. The last World's Altitude Record held by America was in August, 1911, when the late Lincoln Beachey made a climb to 11,000 and some odd feet at the big aviation meet in Chicago, Ill.

It is to be understood that, for military reasons, I am unable to give a more complete description of the improvements and changes which I made in the motor. However, I am proud to say that the motor was an American-built motor, as well as the carburetor and magnetos, and that the discoveries which were made in these experimental climbs are for the use of the United States Government.

In order to take an aeroplane to a higher altitude than any other pilot in the world, I found that it would require more than one or two attempts. I made three attempts. The first one took me to an altitude of 24,000 feet, the second to 27,000 feet and the last one to 28,900 feet; but now I feel cetrain that with a few changes and improvements, I can get to 30.000 feet or better.

Flew Five and a Half Miles High

The altitude reached is only 102 feet short of the highest mountain peak in the world, the great Himalaya peak, which is 29,002 feet high. Most people cannot stand high altitudes, and from 10,000 to 15,000 feet they bleed at the nose and ears. I had been to 12,000 feet at different times and experienced no difficulties. After being put in charge of the Testing Squadron at Wilbur Wright Field, my duties required me to go to the ceiling with all new types of high powered battle aeroplanes, which were being experimented with by the United States Government. (By ceiling, I mean the highest altitude that the aeroplane can reach. During these trips I would quite often go without the use of oxygen, and in time I discovered that I was becoming accustomed to the rare, thin air. However, I did not seem to be able to go above 23,000 feet at any time without feeling a sort of sleepy, tired, cross and hungry feeling, which I was unable to overcome except by the use of oxygen. Without the use of oxygen at these altitudes, I would feel that I was doing everything just right, and even if the aeroplane would get into some critical position and I could see when I looked down that the earth that should be underneath me was not there any more, but was way over on the other side of the machine, yet I believed that I was flying all right, and that my flying position was right, but the earth was in the wrong place. So after having these experiences, I decided that I would have to overcome these dangers, and the way I did it was to keep my mind on one thing; and that was, when the earth is in the wrong place, use oxygen. This I did, and found that it worked out very well.

Cold Great Handicap

The cold, thin air is one's great adversary. First of all, one must make a study of the performance of his motor at these high altitudes. This I did, and made the necessary changes each time before trying again. A very positive oxygen regulator and face mask should be used. These were unobtainable, for the sets I had previously tried out had failed to function above 21,000 feet. Furthermore, the face mask pressed so tight to my face that it interfered with the flow of blood and my face grew numb, so I used a rubber hose direct from the oxygen bottle, which I regulated with a valve on the bottle. The hose was placed in my mouth so that I could breathe air and oxygen at the same time. I also pressed my tongue against the end of the hose in order to tell if the oxygen was still

flowing. This method was very satisfactory, except that the oxygen bottle and the rubber tube gathered about a quarter of an inch of frost, which made it very unpleasant.

The following experiences and sensations I noticed during my flight were due to lack of oxygen. I took off at 1:45 p.m. Wednesday, September 18th, 1918, and made a steady circular climb, passing through clouds at 8,000 feet, 12,000 feet and 16,000 feet. While still climbing in large circles my goggles became frosted, making it very difficult for me to watch my instruments. The temperature at this altitude was 2 degrees below zero, Centigrade. When I reached 25,000 feet I noticed the sun growing very dim, I could hardly hear my motor run, and I felt very hungry. The trend of my thought was that it must be getting late, that evening must be coming on and that was the reason the sun was getting so dim. But I was still climbing, so thought I might as well stick to it a little longer, for I knew I could reach by ceiling pretty soon, then I would go down and, even though it were dark, I could land all right, for I had made night landings many times before; and so I went on talking to myself, and this I thought was a good sign to begin taking oxygen, and I did. I was then over 25,000 feet and the temperature was 60 degrees Centigrade below zero.



Capt. R. W. Schroeder who made the world record

As soon as I started to inhale the oxygen the sun grew bright again, my motor began to exhaust so loud that it seemed something must be wrong with it. I was no longer hungry, and the day seemed to be a most beautiful one. I felt like singing with sheer joy as I gazed about through the small portion of my goggles, which had no frost, due to a drop of oil which had splashed on them from the motor.

It was wonderful to see the very clear blue sky with the clouds thousands of feet below. The frost on my goggles bothered me very much. At times I had to remove my glove in order to put the warm palm of my hand on the glass to thaw the frost. I did this every few minutes so that I could take the proper readings of the instruments, which I marked down on my data pad. I believe that if my goggles had been better ventilated they would not have frosted. When I was about 27,000 feet, I had to remove my goggles, as I was unable to keep a steady climb. My hands by this time were numb and worried me considerably. The cold, raw air made my eyes water and I was compelled to fly with my head well down inside the cockpit. I kept at it until my oxygen gave out, and at that point I noticed my aneroid indicated very nearly 29,000 feet. The thermometer showed 62 degrees below zero, Centigrade. The lack of oxygen was affecting me and I was beginning to get cross, and I could not understand why I was only 29,000 feet after climbing for so long a time. I remember that the horizon seemed to be very much out of place, but I felt that I was flying correctly, and that I was right and the horizon was wrong.

His Motor Stops

About this time the motor quit. I was out of gasoline, the propeller stopped and everything was quiet, so down I went in a spiral. When I had descended to about 20,000 feet I began to feel much better, and realized that the lack of oxygen had affected me. I passed down through the clouds at 16,000 feet, and, as I remember, it was snowing from these clouds upon the next layer, some 4,000 feet below. I am not positive as to this, as I may have been affected by the lack of oxygen. I noticed as I descended that the air seemed to be very thick and stuffy, but very nice and warm.

During the entire trip I did not see the ground, from the time I went up through the clouds above Dayton, Ohio, until I came down through the clouds again at 4,000 feet above Canton, Ohio, over 200 miles from where I started.

I was lost, beyond a doubt, with a dead engine, over very rough country. I landed O. K. and broke the tip of my propeller, which was standing vertical, when I rolled into a depression in the ground. However, I did not nose over or do any other damage to the aeroplane or myself.

My hands and face were numb, my lips and four of my fingers were frozen, and required medical attention. Electrically heated clothing would have been very well used, but I dressed as light as possible to avoid the extra weight, as I had stripped the entire aeroplane of all unnecessary load. This was done to assist me in climbing.

Two barographs were arranged in the aeroplane, which recorded the climb on a small paper drum. I also had a thermometer out on the wing strut, which showed the temperatures. The two barograph papers and the temperatures were sent to the officials of the Aero Club of America, who called a meeting of their Board of Governors, and the result of their meeting gave me an official World's Altitude Record of 28,900 feet. The Club has sent notification of this record to the International Aeronautic Federation, and to the Pan-American Aeronautic Federation, so that the record will be recognized by all the aeronautic bodies all over the world.

Aerial League and Pacific Aero Club Elect Captain Lipsner Honorary Member

The Aerial League of America and the Pacific Aero Club have elected Captain Benjamin B. Lipsner, the Superintendent of the Aerial Mail Division, honorary member.

The communication from the Pacific Aero Club follows:

Captain Benjamin B. Lipsner, U. S. A.
Superintendent, Aerial Mail Division
Washington, D. C.
Dear Sir:

You are hereby notified that you have this day been officially made an Honorary Active Member of the Pacific Aero Club (no expense) as an expression of the high esteem in which you are held by this organization, and in consideration of the great work you have done in furthering the Aerial Mail Routes.

Very cordially yours
Pacific Aero Club.

Membership card enclosed

(Signed) Chas. F. Pond.
Rear Admiral, U. S. N., President.

Could End the War with Planes

Representative Reavis, who has recently returned from "Over There," having been under fire on the front with the American troops in the advance beyond Chateau Thierry, says the thing needed in France more than anything else is aircraft.

German machines are flying low and sprinkling American forces with murderous machine gun fire, in many cases without interference or opposition, except from rifles and revolvers in the hands of the soldiers. The Liberty motor in very limited quantities is now reaching France, but the failure to have sufficient aeroplanes in France has been disastrous in the extreme.

"Congressman Bland and I were with General Pershing when the report was brought in of the Alabama boy of F Company of a certain regiment of the Rainbow Division, who had brought down a Boche plane with his rifle. The general said, 'If that lad will just get four more, I will make him a ground ace.'

"If we can get sufficient aircraft and the transport of troops is maintained at the present rate, I have a firm hope that the war may be closed up by the fall of 1919."

THE CONTINENTAL KB-3T TRAINING TRACTOR

By John F. McMahon

Photos and Text Passed by Censor



THE Continental Aircraft Corporation's new training tractor KB-3T recently tested at Amityville, has come up to all expectations of the designer Vincent J. Buranelli. The short "over-all" length of this machine, 23 feet 4 inches, is noteworthy and characteristic of Continental machines.

Mr. Buranelli's chief object in designing the KB-3T was to produce a training machine that could be cheaply constructed. This has been accomplished by an extensive use of one-piece standardized fittings. Another point of interest is the distance between forward and rear struts, this arrangement does away with the usual bent steel brace in back of observer. A very complete list of measurements and weights are given which should prove useful in checking up with other machines.

General Specifications

Span upper plane	40′ 3″
Span lower plane	34′
Chord both planes	5′ 6″
Sap	5′ 4″
Stagger	6″
Length over all	23′ 4″
Height	9′ 3″
Net weight	1,340 lb.
Useful load	540 lb.
Gross weight	1,880 lb.
Motor, Curtiss	O X 100 h.p.
Speed range	45-75 m.p.h.
Climb in ten minutes	3,200 feet

Weights

Upper planes	118 lb.
Lower planes	102 lb.
Struts	30 lb.
Wires and turnbuckles	20 lb.
Fittings and bolts	18 lb.
Total	288 lb.
Fuselage	310 lb.
Seats upholstered	12 lb.
Stick controls and mountings	17 lb.
Dash with instruments	*13 lb.
Total	352 lb.
Ailerons	24 lb.
Elevators	16 lb.
Rudder	10 lb.
Vertical stabilizer	3 lb.
Horizontal stabilizer	19 lb.
Control cables	16 lb.
Total	88 lb.
Motor complete	390 lb.
Propeller	22 lb.
Radiator and piping	53 lb.
Gas tank and gauges	22 lb.
Exhaust pipe	16 lb.
Total	503 lb.

Landing chassis and incidentals = 109 lb.

Planes

The wing curve is Eifel 36. The planes are set with an angle of incidence of 2 degree-30′. Top and bottom are the same. The tips of planes are slightly rounded as is in general use on Continental machines. There is no sweepback, but a dihedral of 1 degree and a stagger of 6″. The upper planes are made in two main sections with a three-foot panel over the body. The lower plane is in two sections and attaching to the body. Wing beams are of "I" section and made of Douglass fir. The overhang is braced by a steel strut made of ⅞″ seamless tubing with a fairing of spruce.

The struts are of streamline section, the maximum 3¾″ x 1½″ occuring at the centre, and tapering in proportion to each end where it sets into a special strut socket. Flying cables are double 5/32″ in inner panel, ⅛″ outer panel, landing wires are single of the same sizes. Double drift and single trueing wires are used. All control wires are internal.

Ailerons on top planes only, and are 11′ x 1′6″. Where ailerons are attached, a bevel on the aileron permits the surface to be moved without a space occuring between aileron and wing.

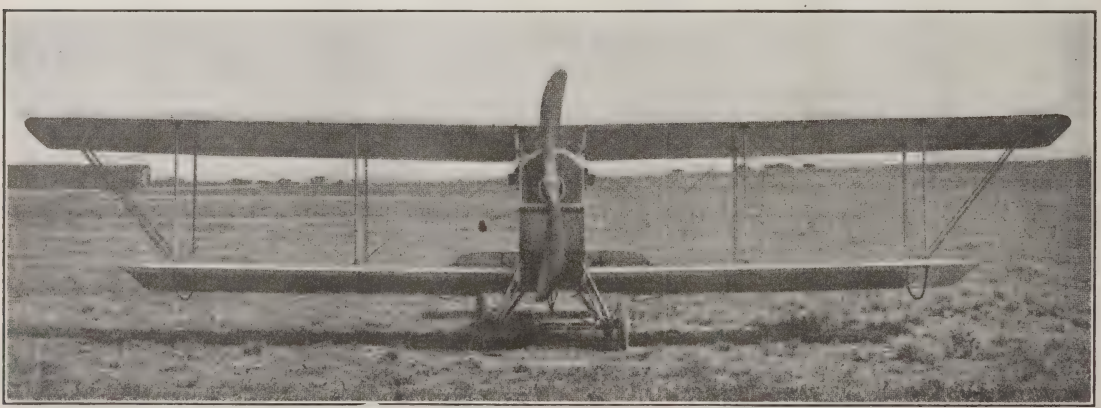
R. A. F. stitching is employed in attaching the fabric to the ribs. To finish four coats of "dope" and two coats of Valspar are used. A factor of safety of 7 is employed. The lift to drift ratio is 12.

Fuselage

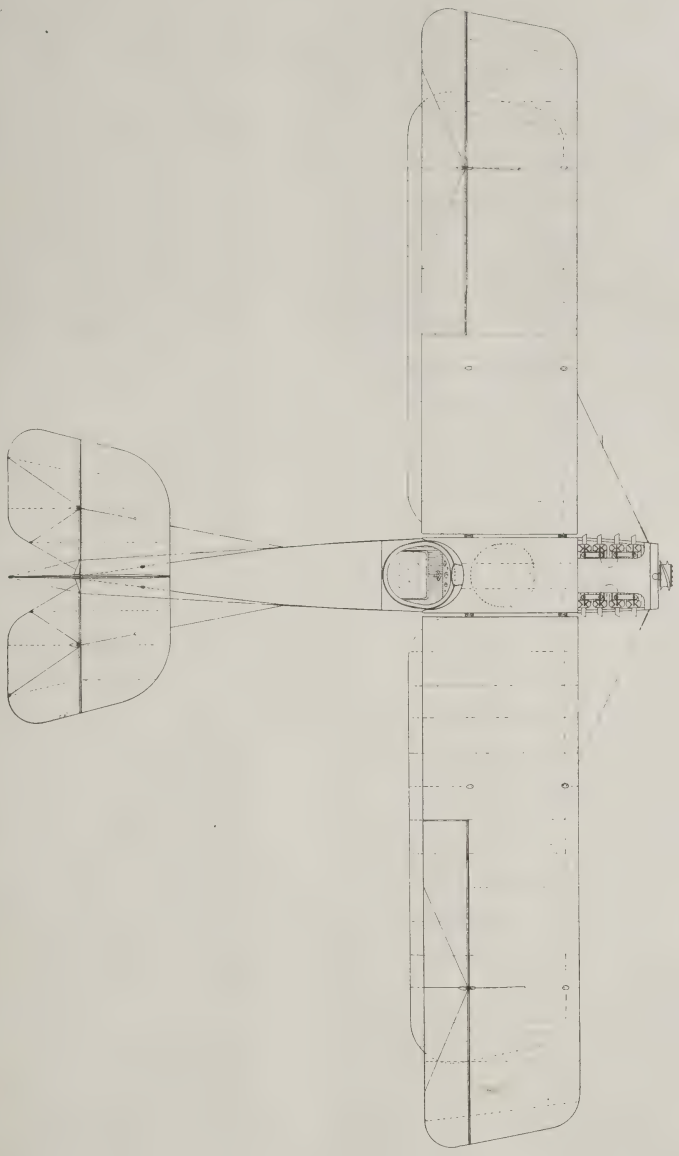
Fuselage longerons are made of ash in forward part and spruce in the rear and are 1½ x 1¼″. The engine section and to a point behind the passenger seat is covered with 18 gauge aluminum. This has doors for easy inspection of the gas and oil "shut offs", etc.

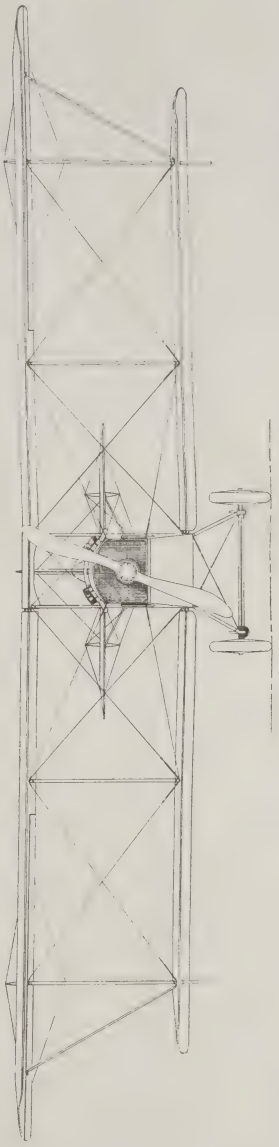
Top longerons are 10″ above the line of thrust. Cowling rises to a height of 10″ above the longerons. The engine is mounted on ash beams, with a special steel nose plate in front. The two seats are nicely upholstered and feel comfortable, which should assist in overcoming fatigue. The stick control, which is dual, is very light in weight and weighs, complete, only 17 pounds. A full equipment of instruments are mounted on the dashboard in front of the pilot.

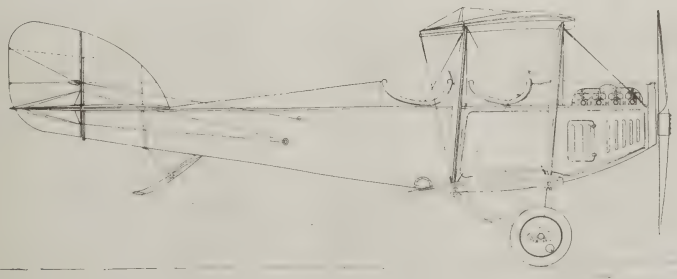
(*Continued on page* 345)



Front view of the Continental Training Tractor







THE CONTINENTAL
MODEL KB-3T 100 H.P.
TRAINING TRACTOR

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Chief Technical Section, Dayton, Ohio.
Note 3—Report to Prod. Eng. Dept., Dayton, O.
Note 4—Report to Dis. Mgr. A. P., Dayton, O.
Note 5—Report to Students Army Training Corps, Univ. N. C., Chapel Hill, N. C.
Note 6—Report to Students Army Training Corps, Univ. Mich, Ann Arbor, Mich.
Note 7—Report to Students Army Training Corps, Univ. Wisconsin, Madison, Wis.
Note 8—Report to Students Army Training Corps, Defiance College, Defiance, Ohio.
Note 9—Report to Aviation Gen. Supply Depot, Middletown, Pa.
Note 10—Report to American Wood Reduction Co., Kingsport, Tenn.
Note 11—Report to Dis. Mgr. production, 480 Lexington Ave., New York City.
Note 12—Report to Aviation Officer, 90 West Street, New York City.
Note 13—Report to Acceptance Park, Western Ave., Springwells, Detroit, Mich.
Note 14—Report to West Va. Pulp and Paper Co., Mechanicsville, New York.
Note 15—Take command at Aircraft Prod. Depot, San Francisco, Cal.
Note 16—Report to Aviation Depot, No. 1, 422 W. 15th St., New York City.
Note 17—Report to Southern Dept., Fort Sam Houston, Tex.
Note 18—Report to Tenn. Valley Iron and Railway Co., Collinwood, Tenn.
Note 19—Take command at Aircraft Prod. Depot, Los Angeles, Cal.

Special Orders Nos. 222 to 227, Inclusive

A

Andrews, Howard M.....EOT
Akin, Thomas B.....PWM
Armstrong, Max V.....TFT
Allen, Morton P.....PWM
Ashley, Thomas Woodbury.....SLA; CWT
Allen, Charles Madison.....EOT
Adams, Harold V.....PWM
Atwell, William B.....PWM
Aubke, Carmon Joseph.....SLA; PMT
Abels, Charles A.....CJW
Annin, Joseph P.....CUI; LHV; Note 1
Ailsworth, Richard E.....LHV
Adler, Elmer Edward.....CPA
Austin, William J.....CGC
Ayling, John Gray.....CPA
Adams, James S.....LHV
Ashby, William T.....TFT
Archer, Morris.....MJA
Anderson, Leland S.....RSD
Aurelius, Paul J.....RSD
Agar, William M.....Note 2

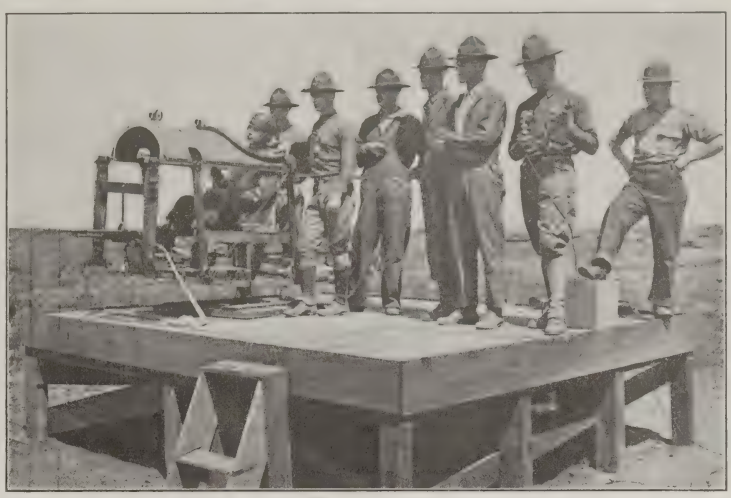
B

Barnes, Herbert T.....PWM
Barnes, Gerald K.....CJW
Brooks, John H.....CJW
Burbank, Wayne.....CJW
Broderick, William J.....CGC
Braun, Milton F.....TFT
Bush, Bradford S.....PWM
Burnett, Robert.....HHN
Biles, Kenneth Oscar.....SLA; EOT
Botts, Robert T.....EOT
Burke, Walter C.....CWT
Beaven, Joseph C.....LHV
Brandt, Alvin R.....TFT
Butterworth, Russell I.....GLC
Bartlett, Charles O.....GLC
Bruner, William D.....JLA; AAD
Boyce, Charles W.....CUI
Bourman, Charles A.....TFT
Bailey, Augustus O.....PWM
Bickford, George F.....PWM
Bonnell, Harry M.....PWM
Brenneke, Augustus M.....CGC
Bowers, Eugene.....SRC
Breese, Winfield S.....CGC
Barnard, William B.....CJW
Braman, Arthur H.....PWM
Blanchard, Henry McCoy.....SLA; EOT
Bower, Claire A.....CGC
Beck, Thomas E.....CWT
Bailey, Henry F.....CGC
Brainerd, Walter M.....CGC
Barrett, Arthur E.....CGC
Berkowitz, Ben.....CGC
Bone, Norfleet G.....CGC
Bartlett, Lowell W.....PWM
Billiter, Earl D.....PWM
Brown, John J.....PWM
Burns, Kenneth.....PWM
Baker, Lee A.....CGC
Bible, Dana X.....CGC
Bowden, William M.....CGC
Burger, Fairfax C.....PWM
Buswell Walter S.....PWM
Baxter, Marcus L.....EOT
Boerner, Eugene S.....EOT
Boushall, Joseph D., Jr.....EOT
Buffum, Frederick C., Jr.....CGC

Bailey, Carlton Lasater.....SLA; UTA
Bagley, Frank H.....PWM
Bankhart, Harry I.....PWM
Beale, Allen S.....PWM
Bennett, John J., Jr.....KST
Brown, Sewall.....RSD
Burke, Walter Clinton.....SLA; TMA
Brown, Oscar.....CPA
Burnam, Samuel Parkes.....CPA
Bagby, Howard.....CGC
Beaven, Joseph C.....CGC
Budd, Ogden D., Jr.....CAF
Brooks, Ivan Homer.....SLA; CWT
Brooks, John Henry.....SLA; ABC
Bloomer, Asa S.....CJW
Bishop, James Gillespie.....SLA; CWT
Brissell, Willard S.....CGC
Boxell, Earl F.....CGC
Bamberger, Raymond S.....DMA
Byrnes, James E.....CGC
Booth, John Valvin.....SLA; GLC
Bishop, James G.....RSD
Burleigh, Donald M.....CJW
Bradley, Francis M.....RSD
Beecher, John F.....KST
Boswick, John S.....LHV
Brown, Harry G.....LHV
Baldwin, Henry M.....PWM
Booth, Lyman.....TFT
Billman, Elliott.....CGC
Brenton, Walter.....CGC
Booth, Morrison.....CJW
Bennett, Frank P.....LHV
Brennan, Edward W.....LHV
Babcock, Edward Denison.....FLA
Bigelow, Joseph S., Jr.....FLA
Birmingham, Hugh J.....CJW
Bates, Lesley R.....CGC
Barrett, William J.....CGC
Buser, Albert E.....CGC
Best, Harvey G.....CGC
Brock, William A.....CGC
Breckon, Leslie S.....CGC
Blodgett, Charles L.....CJW
Becker, William Richard.....CPA
Bryan, William Harper.....CPA
Black, Alexander.....FLA
Bornefield, Harold Tansley.....FLA
Brew, George J.....FRF
Bronson, Tyler C.....FRF
Beauchamp, John H.....ADT
Bowles, Walter S.....GLC
Burrage, Albert C.....Note 4
Bartels, Edward Frederick.....SLA; Note 10
Blood, Frank L.....Note 16
Bolton, Edward D.....Note 6
Bagley, Harvey B.....Note 15
Bowler, Lawrence R.....Note 3
Bailey, James Ruskin.....FLA
Blockinger, Carl H.....Note 6

C

Chetlain, Frederick H.....PWM
Cooper, George W.....PWM
Craig, Alexander, Jr.....WFO
Cory, Wayne M.....GLC
Cecil, Eugene.....CGC
Choate, George F.....CGC
Crisp, Marshall C.....CGC
Crossan, Carroll B.....CGC
Corkville, John D.....PWM
Caulkins, Ralph M.....EOT
Canfield, Donald T.....GLC
Carpell, Otto C.....PWM
Chamberlain, Clarence D.....PWM
Coffee, John A.....PWM
Coles, Norman E.....CWT
Critz, Robert, Jr.....CGC
Crawford, Robert H.....CGC
Cochran, Edward R.....CWT
Chidlaw, Carol H.....EOT
Cundiff, Lawrence B.....LHV
Cheese, Charles B.....EOT
Cole, James B.....CFT
Clarke, Edmund M.....CFT
Caldwell, Philip Lord.....CPA
Christopher, Gerald A.....FLA; ELA
Carr, Harold Hibbard.....SLA; SAG
Clancy, Edwin M.....KST
Cousins, Ralph P.....HHN
Clark, Walter D.....PWM
Carter, Edward V.....CGC
Cavagnaro, James F.....CGC
Clark, Bruce.....EOT
Cooper, Edward I.....EOT
Coesfeld, Henry M.....CJW
Cook, Philip P.....LHV
Callender, Marshall C.....CAF
Callahan, Samuel M.....CGC
Carples, Bernard J. R.....CGC
Coles, Barry F.....CGC
Crawford, William Lee.....EOT
Crabtree, Lloyd W.....CGC
Chatterson, Marshall C.....TFT
Cochrane, Robert M.....TFT
Clark, George Lawson.....SLA; LDT
Clark, McKinley F.....CGC
Christensen, Ezra A.....PWM
Conway, Joseph C.....PWM
Calkins, Richard W.....PWM
Cook, Dean C.....PWM
Carmine, John W. S.....CGC
Caldwell, Frederick W.....CGC
Christian, Savias T.....CJW
Coffman, Lionel A.....CGC
Carlson, Arthur G.....CGC
Clawson, Harry O.....CGC



Training our aerial gunners at the School of Aerial Gunnery at North Island, Cal. The student is seated in an aeroplane cockpit. The whole fuselage sways at his slightest movement. He is here shown firing at a moving target. The machine gun is shown at his feet

Claghorn, James L.....GLC
Curtiss, Frederick W., Jr.....GLC
Carpenter, Russell Hand.....CPA
Christy, Lee Albert.....CPA
Christie, James Arthur.....CPA
Carey, Allan J.....CGC
Clark, Ernest.....CPA
Cumpston, Edward Henry, Jr.....CPA
Carlton, Henry F.....CGC
Chittenden, Gerald.....MJA
Grassweller, Frank H.....SRC
Cadien, Lee.....SLA; Note 14
Carples, Edmund L.....Note 8
Cappe, Benjamin H.....Note 6
Clifford, Albert G.....Note 6
Croen, Herman F.....Note 9
Comstock, Asa H.....Note 9
Carey, Homer F.....CGC

D

Dorner, Earle V.....CGC
Duke, Jack E.....LDT
Deadman, William W.....PWM
Donaldson, Howard Logan.....SLA; EOT
Dezendorf, Edward H.....SLA; FOB
Dawson, John C., Jr.....CGC
Dickinson, Roy W.....CGC
Duffield, John.....EOT
Dawson, Earle R.....EOT
Drake, Albert B.....EOT
Dennis, Fred Condon.....SLA; EOT
Dreby, Ernest E.....PWM
Dunford, Samuel W.....PWM
Dailey, Harry A.....UIU
Duthie, Robert D.....PWM
Dean, Alexander.....LHV
Davis, Clarence A.....CGC
Demarest, William C.....PWM
Donaldson, Harold Ruddell.....SLA; KST
Downes, Philip H.....PWM
Dujardin, Harold E.....PWM
Doherty, George J.....PWM
Dickinson, Clarence R.....HHN
Datson, Edmond Charles.....SLA; DAP
Druffner, Karl M.....TFT
Dupuy, Thomas F.....UTA
Devanny, Earl Hannum.....SLA; ELA
Day, Robert F.....LHV
Dunstan, Fred L.....CGC
Davey, Everett K.....CFT
Dwindell, Ralph M.....CGC
Devlin, George M.....EOT
Dimmick, Harold E.....CAF
Dillaway, Mansen M.....CGC
Devereaux, Walter B.....MJA
Doty, Merle B.....CGC
Dean, William Johnson.....CPA
De Forrest, John.....CPA
Dixon, Richard Hooper, Jr.....CPA
Davidson, Frank Gaines.....CPA
Dixon, Thomas Danforth.....CPA
Dresser, Burt s E.....SLA
Davis, Arthur O.....PWM



A French observation balloon winch mounted on a motor lorry. In this way the balloon, after ascent, can be towed considerably nearer the front than is possible otherwise. A balloon under fire in the air can also be shifted quickly this way



American aviators training for contact patrol on infantry liason work, somewhere in France

Darflinger, Lambert.....SRC
Diehl, Norval E.....RSD
Davies, Isaiah.....CPA
Dorr, Philip J.....Note 9
Dyke, Curtis E.....Note 9
Dunne, Vincent L.....Note 7

E

Edwards, J. Paulding.....DMA
Elliott, Park.....GLC
Evans, John M.....CUI
Easterling, Anthony M.....TFT
Ewing, Walter L.....WFO
Ehrlichman, Rudolph E.....PWM
Eilenberger, John T.....PWM
Eichelberger, Raymond T.....CGC
Eskind, Ernest.....CPA
Earle, Ralph.....FLA
Eggleston, Herbert C.....LHV
Eastman, Andrew J.....TFT
Eglin, Frederick L.....CPA
Elliott, John William.....CPA

F

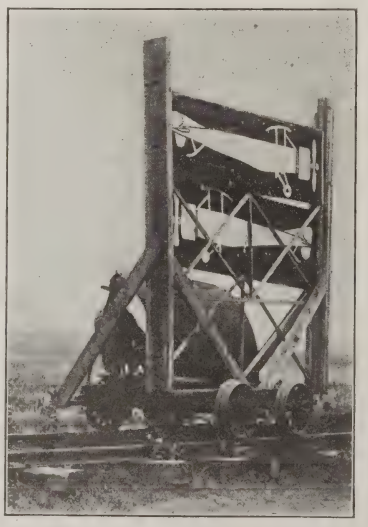
Fuller, Harlow M.....WFO
Foster, Robert H.....WFO
Frere, Henry B.....EOT
Flourney, William R.....CGC
Foster, Edwin B.....PWM
Fitzpatrick, Arthur.....CWT
Fuller, James E.....CWT
Frewer, John W.....LHV
Fleming, Donald L.....CWT
Foster, Ralph F.....PWM
Feltuberger, Ralph D.....CWT
Fernald, James G.....CGC
Farquhar, Guy L.....EOT
Fisher, Ewing B.....LHV
Fiske, Charles H., Jr.....FLA
Fort, Edwin H.....FLA
Farrar, Delwin B.....CGC
Farnham, Charles Van Orden.....SLA; GLC
Foster, Raymond W.....CGC
Fournier, Paul.....SMM
Feick, William.....PWM
Foxon, Roy D.....PWM
Freedard, William.....SLA; ABC
Field, William B. Osgood.....CPA
Fleming, Carl.....PWM
Frank, Philip R.....CJW
French, John Taylor.....SLA; Note 11

G

Gaylord, Paul C.....PWM
Gallup, Floyd H.....CWT
Gearish, Charles A.....CJW
Gardner, Kelsey B.....LHV
Glenn, Earl F.....TFT
Griffith, Frank L.....CGC
Gahman, Floyd.....CGC
Gordon, George L.....UBC
Gillespie, Eugene F.....PWM
Gibbons, Francis C.....CWT
Ganey, Daniel E., Jr.....PWM
Grayson, Forrest.....CGC
Graham, Charles F.....PWM
Greene, George G.....CWT
Gardner, Kelsey B.....CGC
Gardner, J. Francis.....PWM
Greene, Tom W.....PWM
Griffith, John, Jr.....PWM
Gibson, Frank H.....PWM
Grevenberg, Marion E.....PWM
Greenman, Fred W.....CGC
Guild, Paul C.....CGC
Guyton, Roy Altamont.....SLA; ELA
Glover, James Edward.....SLA; KST
Gray, Willard E.....TFT
Goodwin, William.....SLA; RSD
Guerin, Samuel Vincent.....SLA; ABS
Goddard, George W., Jr.....TFT
Galentine, Norman E., Jr.....CJW
Goldblatt, Benni.....CPA
Gillern, Maurice F.....CJW
Guyton, Roy A.....CWT
Goldberg, Louis.....PWM
Garretson, William V.....TFT
Graham, Harry.....MJA
Guest, David Porter.....PWM
Grimm, Alfred.....CPA
Gordon, Myron B.....Note 2

H

Hoffman, Jacob V.....WFO
Hyman, Walter R.....WFO
Hellenberg, Frederick W...DMA; CUI; Note 1
Haigh, Henry W.....PWM
Hoover, Chester A.....PWM
Hunt, Burton L.....GLC
Hartman, Harry B.....CGC
Humphrey, Arthur Field.....FLA
Heffner, Roy J.....SRC
Hutchins, William J. M.....FLA; CSO
Harding, Ray W.....CJW
Huntington, Ralph O.....CGC
Howard, Ernest F.....TFT
Hendrickson, Elmer Ludgwig.....SLA; DAP



Aerial gunnery at Taliaferro Field, Texas. Silhouettes of aeroplanes are moved across the range on a hand truck. The operator of the truck is protected by steel plates

Holmes, John W.....TFT
Hannum, George H.....DMA
Hearne, George M., Jr.....PWM
Hulbert, Lucius G.....PWM
Halle, Simon.....GLC
Hammond, Fred R.....TFT
Huffman, Charles R.....GLC
Holmes, James E.....CGC
Higbee, Walter F.....UBC
Haynes, Richard O.....PWM
Horrigan, Thomas F.....PWM
Hubbard, George G.....HHN
House, William R.....CGC
Haughawaut, John F.....CJW
Hazeltine, Richard G.....CGC
Hawks, Horace G.....CGC
Hovey, Willard Porter.....SLA; BST
Holway, Lowell H.....PWM
Hunter, John A.....CGC
Heller, Myron.....KST
Haslam, Reed H.....PWM
Haylor, John R.....PWM
Hamill, Howard E.....PWM
Hefron, Bernard M.....PWM
Holt, Harry C.....PWM
Harris, Hurshel Irwin.....SLA; GLC
Hayes, Martin Joseph.....SLA; SAG
Haynes, Roy Mason.....SLA; SAG
Harrison, Mitchell.....APR
Higgins, George Judson.....FLA; HHN
Hewes, Harry.....DAP
Hoare, J. Maurice.....PWM
Henderson, Rema J.....WFO
Hobbs, John E.....PWM
Harding, Paul C.....CJW
Hine, Harold Morton.....SLA; FOB
Harwood, Robert W.....PMT
Hodgdon, Melvin W.....SLA; DMA
Harper, Waitland C.....LHV
Harter, Earl C.....LHV
Hayes, Charles I.....TFT
Hoyt, William K.....EOT
Hansell, Don M.....RSD
Hennessey, James R.....RSD
Hunter, Daniel F.....RSD
Houlton, Raymond C.....LHV
Hooper, Arthur U.....CGC
Heine, Henry W.....GLC
Hussey, Clyde L.....SLA
Hampton, Stanlee R.....RSD
Hendricks, Adolph.....CUI
Hickman, Cecil R.....CGC
Horton, Russell B.....CGC
Houston, Sam.....SRC
Heller, William B.....Note 13
Holmes, Wayne M.....Note 2
Hoddick, Alvin C.....Note 6

I

Irwin, Charles I.....CJW

J

Jenkins, Paul Walton.....SLA; DAP
Junkins, Albert B.....GLC
Jackson, Samuel D.....CWT
Jaques, Gordon Fravel.....FLA
Johnson, Frederick Charles.....FLA
Jordan, Herbert Wilson.....SLA; KST
Jones, Clifford E.....CGC
Johnson, Elmo Grover.....FLA
Jordan, James Bumer.....SLA; FOB
James, Roy P.....LHV
Jarmuth, Douglas.....CGC
Joyes, Morton V.....Note 19
Joy, Henry M.....Note 2



An American Aero Squadron in France (French Official Photo)

K

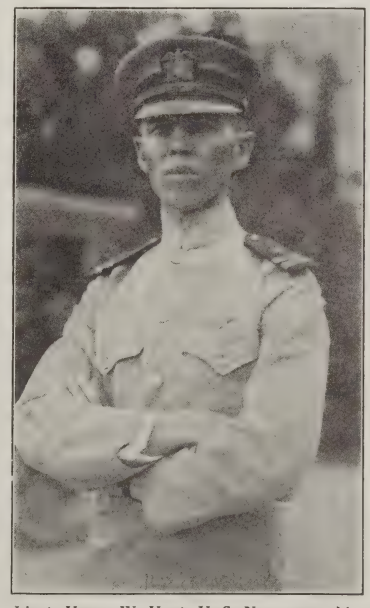
Kirk, Harris C.....PWM
Krieger, Robert J.....PWM
Kerin, Anthony J.....GLC
Kunkel, Fred E.....SLA; DMA
Kramer, Emanual.....PWM
Kern, John T.....PWM
Knickerbocker, Harry C.....PWM
Kinberg, William O.....DMA
Krug, Frank W.....PWM
Kelly, John L., Jr.....UIU
Koenig, Theodore J.....UIU
Knoche, Frederick E.....CGC
King, Ivan R.....LHV
Kron, Elias H.....DMA
Kiesewetter, Edward W.....CGC
Kahl, Charles A.....CRI
Kayser, Allan J.....TMA
King, William T., Jr.....CGC
Kirksley, Guy.....PMT
Keily, Thomas Leo.....SLA; CRI
Kelly, Bernard E.....CGC
Kurtz, John W.....CJW
Knight, Louis R.....MJA
Kreger, Henrly L. F.....PWM
Keller, Clarence K.....CGC
Keefe, Robert J.....CPA
Keenan, Walter M.....CPA
Kolloch, William Gregg.....CPA
Keeler, Horace B.....CJW
Knight, Lloyd W.....CJW
Kaynor, Warren Fox.....CPA
Kelley, Joseph J.....PWM
Kinnear, James S.....RSD
Kerr, Robert W.....RSD
Kinne, Harold O.....RSD
Kinnear, Lawrence W.....PWM
Kerr, Spencer H.....Note 2

L

Lowe, Robert E.....GLC
Lederer, Lewis G.....CUI; LHV; Note 1
Lenkerking, Louis T.....PWM
Looram, Lucian A.....PWM
Lintz, Roy P.....PWM
Lohman, Sylvester M.....PWM
Leighninger, Robert E. H.....CGC
Linnan, Luke E.....PWM
Levy, Edward J.....RSD
Lloyde, Robert K.....ABC
Lowstuter, Edward T.....CGC
Lea, Curry.....CGC
Langmead, Harry W.....TFT
Lytle, Lory R.....TFT
Long, Bartlett G.....CJW
Lavethal, Ruby.....CGC
Lowry, Edward B.....CGC
Leonard, Edgar W.....CGC
Lewis, William.....KST
Leonard, Leonard Rich.....SLA; KST
Leitner, Clarence W.....PWM
LeRoy, Philip Newbold.....FLA; CRI
Lanfall, John Tollefson.....FLA
LeBoutillier, Sidney Pierre.....FLA
Longood, Eugene A.....CFT
Lockhart, Frank.....TFT
Lydiard, Maynard Frothingham.....SLA; FOB
Larkin, George R.....CGC
Lachmund, Harry G.....CGC

M

Mennines, Michael.....WFO
Maloy, John S.....CWT
Maher, Raymond J.....CWT
Myerscough, Joseph M.....BFT
Milburn, Eugene Bliss.....FLA; DAP
Morrissey, Merle F.....TFT
Mason, Edward J.....PWM
Morrison, William Robert.....FLA
Miller, Max B.....PWM
Moore, Samuel M., Jr.....DMA
Mosier, Orton Boyd.....SLA; VBW
Moynihan, Frederick M.....PWM
Markley, John W.....CGC
Mercer, Robert A.....PWM
Murphey, Harvey W.....LDT
Miller, Charles Winfred.....SLA; EOT
Mezger, William W.....CWT
Marshall, John H., Jr.....PWM
Mayer, Herbert C.....PWM
Myers, Ray G.....CGC
Mowry, Lewis D.....Note 7
Murphy, Gerald C.....CGC
Magoffin, Paul P.....WFO
Miller, Frank M.....CGC
Murphy, Harry C.....CGC
Marshall, Fred L.....CGC
Mathews, Herbert S.....CGC
Miskell, James B.....CGC
Moninger, Arthur Van Kirk.....CPA
Murphy, William Herbert.....CGC
Molter, Bennett A.....Note 2



Lieut. Henry W. Hoyt, U. S. N., veteran kite balloonist, who has been spotting U-boats from his "sausage". It will be recalled that he had one of the narrowest escapes when his balloon was caught in a gale

Morrison, John Miles.....PWM
Massey, Ivor.....CGC
Metcalf, William H.....CGC
Morrissey, John F.....CGC
Martin, Thomas Russell.....RSD
Munz, Hugh E.....RSD
Meredith, Russell Luft.....CPA
Maher, Raymond Jerome.....SLA; TMA
Munchhof, Theodore J.....FRF
Myers, George I.....LHV
Myers, Devereaux Maitland.....FFA
Mahannah, Alva E.....TFT
Morgan, William T., Jr.....TFT
Madden, Edward C.....RSD
Mason, Stephen S.....CUI
Montgomery, Robert C.....PWM
Mozley, Warren M.....PWM
Moore, Walter McHenry.....LHV
Myers, Clarence G.....CGC

M

Maywald, Frederick.....PWM
Metzer, Carlisle L.....CGC
Meng, Walter J.....PWM
Marsh, Ian D.....CFT
Meservey, Elmer R.....CJW
Mills, Herbert H.....CJW
Mason, Shirley L.....TFT
Mabry, Palmer V.....TFT
Monteith, Darrell M.....CGC
Manning, Robert.....CJW
Moody, Marvin J.....PMT

Mc

McCaulley, Edgar L.....DAP
McCue, John B.....TFT
McCuistion, Edward T.....CGC
McGovern, Edward T.....CGC
McLean, Norman Reynolds.....PWM
McAllister, Thomas E.....PWM
McKee, Stuart.....SLA; EOT
McCarty, Eugene Richard.....SLA; Note 18
McCormack, Victor A.....KST
MacLure, Henry Goldsborough.....FLA
McCall, Lewis Livingston.....SLA; PMT
McDermott, Cleveland W.....FRF
McRoberts, Horace E.....RSD
McMullen, William H.....GLC
McCarty, Carl Daniel.....SLA; ABC
MacCalla, John D.....Note 6
McMillin, Gail Hamilton.....PWM
McCoy, Peter J.....CPA
McSaughey, Harold S.....PWM
McLaughlin, Oscar F.....FLA
MacKeeby, Paul Herbert.....FLA
McInerney, John.....CPA
McDaniel, Vancy C.....CJW
MacKenzie, William J.....CGC

N

Newman, Samuel H.....CGC
Newberry, Hawley D.....CGC
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Neet, Lewis, E.....CGC
Netcher, Charles.....DMA
Nighman, Clare Edwin.....FLA; DAP
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THE THEORETICAL BASIS OF MODEL STRENGTH TESTS FOR AEROPLANE STRUCTURES

By W. L. COWLEY, A.R.C.Sc., D.I.C., Wh.Sc., and H. Levy, M.A., B.Sc., F.R.S.E.

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THE importance of an accurate knowledge of stresses brought into being upon an aeroplane under various conditions of flight cannot be overestimated, in view of the manœuvres that the present war machine must be able to execute with safety. The analytical treatment of this question of stresses in aeroplane structures is unfortunately extremely complicated, both on account of our present lack of mathematical knowledge, and of the imperfectly known factors affecting the strength. If justifiable and at the same time sufficiently simplifying assumptions could be made, we might proceed with considerable rapidity to a solution, but unfortunately it is only as a result of careful experimental work that valid assumptions of this nature could be furnished.

As a simplification of the question, it is generally assumed in practice, that the problem of the strength of the various parts of an aeroplane structure is self-contained and independent of the existence of neighboring parts. An attempt for example is made to treat the wing system as an isolated structure, or the body and fuselage, the tail system or the undercarriage. But it cannot be supposed that this assumption even if it should—as it generally does not—lead to a complete mathematical solution is in any sense satisfactory, for it is clear that the mere fact that in the complete aeroplane these parts are not isolated involves an end condition, in general indeterminate, to be applied to the isolated portion. For example, the problem of the strength of a fuselage under the torsional effect of the force on the rudder might admit of an approximate solution even if the redundancies which occur were known, provided the effect of the body upon it in the region of juncture could be assumed. This itself would obviously depend upon the degree of rigidity of the framework in the neighborhood of the gap struts, and it would thus appear that the isolation of a particular part, and its treatment by rigorous mathematical methods is at most a very rough approximation to the true problem. Even in those cases where this isolation may be affected with any degree of justification, as for example, in the case of the wings, a still further simplifying assumption requires to be introduced to reduce the remaining complications. In the case referred to, it is customary to treat the effects of the normal and of the longitudinal forces on the wings separately, on the assumption that the effects can be added algebraically. Whether or not this method of treatment is legitimate can only be determined by experiment, but at any rate, it is already recognized that in the case of a staggered biplane the results are far from the truth, and intelligent designers are compelled to face the question whether the gain in aerodynamic efficiency derived from the stagger is not counterbalanced by the uncertainty of the conclusions from stress calculations. Frequently it has happened, in fact, that unknown factors for which allowance could not be made, because of our ignorance of their magnitude, have been such as to reverse completely, the conclusions as regards strength. For example, wing structures which on calculation have indicated weakness have been found on final trial to furnish a much better performance than that anticipated, on account of the effect of such unknown factors as the fabric, ribs, etc. Although in this case the errors have occurred on the safe side they are just as likely to be on the other side, and involve weakness. A continuance of the present method of blind groping is clearly wasteful and futile.

It appears, then, that the failure of analysis to treat this problem in any satisfactory manner demands the pursuit of some line of experimental investigation for confirmation of the analysis at least, if not for more direct and positive research into the question. If the basis for such experimental work could be securely laid, it would be possible to produce results both of empirical value and of the nature of the simplifying assumptions required for the mathematical treatment. To some extent the ground has already been broken on this question by tests to destruction on full scale machines. The part to be tested is loaded with sand bags according to distributions previously determined, until collapse occurs. Apart from the expense and cumbersome nature of this test it is clear that serious limitations are imposed upon its application to determine the effects of apparently unimportant parts, and various degrees of complexity of loading. No such experimental difficulties arise, however, if it should be possible to conduct the test upon a model, under which circumstances complete command can normally be obtained over the experimental conditions.

If the basis of the methods of transition from results on model tests, to full scale, could once be made secure it is evident that an immense advance could be made and tests executed with rapidity, thoroughness and relative cheapness. This point scarcely requires emphasis.

It is proposed to show that the theoretical basis of the whole method may be developed in quite a rigorous yet simple manner by an application of the principle of homogeneity of dimensions to the type of problem under discussion.

When a homegeneous prismatic strut of length l pin-jointed at the ends is subjected to axial end thrusts, then up to a load given by

$$F = \pi^2 \frac{E I}{l^2}$$

the undeflected position is one of stable equilibrium provided the ultimate stress is not exceeded. Beyond this so-called Euler's critical load, the straight position is one of unstable equilibrium. If the strut be deflected, as long as the load is maintained the axis will continually undergo change in shape until it ultimately takes up a form of elastica. During this process the yield point of the material of which the structure is composed may be exceeded and the material may rupture. The strut may thus be supposed to fail for two possible reasons, on the one hand because its shape has been permanently changed from the straight normal position owing to the instability of that position, and on the other hand because the actual material has failed to withstand the stresses originated. This conception is of course not limited to such a simple structure as a strut, for it may be seen that in general a framework of any kind may fail for either of these two reasons. In the first place, the geometrical configuration may be such that when the structure is subjected to a particular type of loading a small disturbance may involve a continuous change in shape until a finite deviation or deflection is produced. This presupposes that the geometrical shape is considered maintained as long as alterations in outline are at most of the same order as those of the disturbance, assumed small. In the second place, irrespective of any alteration in the geometrical shape of the structure, if the stresses brought into being immediately subsequent to the loading are as great as or greater than the ultimate stress the material can sustain so that the yield point is reached, the structure will collapse by direct rupture of the weakest member. Even if no external loading be applied, but the structure is under forces due only to its own weight—in a sense, of course, external loading—it can be shown that a limit exists to the dimensions of a geometrically similar structure made of the same material, so that if this limit be exceeded stresses will be called into existence so great as to involve rupture. It is proposed to investigate what information may be furnished regarding these two types of failure, rupture and instability, by an application of the dynamical laws through the medium of the dimensional theory.

Consider the case of a structure of the type of an aeroplane framework, for example, where it is supposed that the assumptions made in the ordinary beam theory apply to every part. Let the length of one part, say a bay, be given by l, the area of a particular section by A, moment of inertia I, and the elasticity and density of the material of which it is composed E and ρ, respectively. Given these quantities for this one portion, it will be assumed that the shape and geometry of the structure involve an exact specification of how to derive the corresponding quantities for the remaining portions. Let the external load be F, applied in some given manner specified by the geometry, and suppose this is sufficient to produce a stress just greater than the yield stress f in the material of the weakest member. F can only depend apart from the geometry and manner of application upon the quantities enumerated above, defining the properties of the material. These are as follows:

Physical quantity.	Symbol.	Dimensions.
Young's Modulus	E	M/LT^2
Area	A	L^2
Moment of Inertia	I	L^4
Length	l	L
Density	ρ	M/L^3
Yielding stress	f	M/LT^2
Gravity	g	L/T^2
Load	F	ML/T^2

Since F, the load which will cause collapse by rupture of the material, must involve all these quantities grouped together in such a manner as to make the dimensions of the product identical with those of F, we may write

$$F \propto E^x A^y I^z l^p \rho^q f^r g^s,$$

The dimensions of this are clearly

$$M^{x+q+r}\, L^{-x+2y+4z+p-3q-r+s}\, T^{-2x-2r-2s} = \frac{M\,L}{T^2}$$

Equating powers of M, L, and T,

$$x + q + r = 1,$$

$$-x + 2y + 4z + p - 3q - r + s = 1,$$

$$-2x - 2r - 2s = -2,$$

$$\therefore F \propto E^{1-q-r} A^{1-2q-2r-4s} I^{r+s} l^{-1+3q+r-s} \rho^q f^r g^s$$

$$F \propto \frac{E\,I}{l^2}\left(\frac{f}{E}\right)^{r}\left(\frac{A}{l^2}\right)^{y}\left(\frac{W}{f\,A}\right)^{s}\left(\frac{I}{l^4}\right)^{z} l^{-1},$$

It will be more convenient to write this in the form

where instead of $g\,l^3\,\rho$ its equivalent W, the weight of the portion of the structure considered, is taken.

It is evident that every term in the expression for F must take the form given above, but so far no restriction has been imposed on the values of the quantities r, s, y and z. Under these conditions F could be represented as the sum of a series of terms in which f/E, A/l^2, $W/f\,A$, I/l^4 could appear to any power whatsoever, but in each such term EI/l^2 would be a factor. This is equivalent to the statement that

$$F = \frac{E\,I}{l^2}\,\psi\left(\frac{f}{E}, \frac{A}{l^2}, \frac{W}{f\,A}, \frac{I}{l^4}\right)$$

where ψ for the moment is an arbitrary function. Writing

$$\phi^2 = F\,l^2 / E\,I \qquad (1)$$

so that this quantity may be considered as a non-dimensional critical loading coefficient, it follows finally that

$$\phi^2 = \psi\left(\frac{f}{E}, \frac{A}{l^2}, \frac{W}{f\,A}, \frac{I}{l^4}\right) \qquad (2)$$

It is clear from the definition of ϕ, that for a given structure where l, E, and I are known ϕ is uniquely determinedwhen F, the breaking load is found, so that the discussion of collapse by rupture may equally well be centred round ϕ. Let it be clearly understood that the exact form of the function ψ in (2) depends only on the geometry of the structure, including the manner of loading and the law of distribution of material.

Similarity of Structures.—Out of the general class of framework embraced in this discussion so far let there be selected a series of which all members are identical with respect to external shape, differing only in magnitude. This implies that A the area of cross section of any selected part is proportional to l^2 and I to l^4. For this series, therefore, A/l^2 and I/l^4 are constants depending only on the geometry, and accordingly expression (2) now takes the simplified form

$$\phi^2 = \psi_1\left(\frac{f}{E}, \frac{W}{f\,A}\right) \qquad (3)$$

It is not difficult to give an interpretation to the two non-dimensional qualities f / E and W / f A. The former being the ratio of the yielding stress to Young's modulus may be taken as the strain at the yield point, on the assumption that Hooke's Law applies rigorously over the whole range. In the same way, W / f A is the ratio of the weight of a particular member, say the weakest, to the maximum tensile or compressive force, as the case may be, which that member is capable of withstanding without yielding assuming that the section A is taken at the position of collapse.

As far as a discussion of the breaking load co-efficient ϕ^2 is concerned, it is evident that if a series of geometrically similar structures be selected two distinct variables, and two only, functions of the material affect the question. These are the strain at the yield point for the weakest member, the ratio of the weight of that member to the maximum tensile or compressive force it can withstand at the point of yield. It is equally clear, however, that the so-called geometrical restrictions determining the distribution of the constants of the materials in a composite structure are not absolutely vital to the above discussion, so that violations of the laws determining the selection of the material from member to member would not necessarily vitiate the conclusions arrived at here. For example, one would not be rigorously entitled to vary I, A and E in certain members, since such a change would clearly upset the geometrical similarity of shape and the distribution of force with the possible result that the previously weakest member might now not remain such. No such trouble, however, could arise if the selection of the materials was made without changing these factors, but allowing a variation in f the yielding stress so long as the previously weakest member always remains so in the series. This is equivalent to an increased latitude in the scope of selection of material.

Generally in experimenting with a model of this nature it is convenient, of course, to have corresponding parts in the model and the full-scale structure composed of identical materials. If for example, the frame of an aeroplane were under discussion, wires in the model would be composed of the same metal as those in the original, corresponding struts, spars, ribs, &c., of the same wood.

Since the quantities f, E l, ρ, &c., in the expression for ϕ^2 all refer ultimately to the same part of the model, to ensure geometrical similarity in the widest sense it follows that the assumption that f / E is a constant is one which is obvious experimentally. Under these circumstances also W / f A, as can easily be verified becomes proportional to the linear dimension l. The breaking load co-efficient ϕ^2, therefore, when the weight of the structure contributes towards rupture is purely a function of l,

$$\phi^2 = \phi_1 (l),$$

and the form of the function is determined only by the shape of the various parts, the geometry of the loading and the so-called geometry of the material.

This expression for ϕ^2 may likewise be supposed solved for l in terms of ϕ. For every external load coefficient this equation then determines the size of the structure corresponding to failure. When there is no external load and failure is due to weight alone $\phi = 0$ and the result previously anticipated is seen to hold.

Structures of Negligible Weight.—When the material is not sufficiently heavy to involve the weight of the structure appreciably as a factor in causing collapse the term W / f A may be omitted in equation (3) and the expression for ϕ^2 takes the relatively simple form

$$\phi^2 = \phi_2 \left(\frac{E}{f} \right).$$

Let us imagine that the weakest member is replaced by another of the same geometrical shape and size but with a different value of f / E, though not so different as to prevent its remaining the weakest member, then a test on each one of these models will give a particular value of ϕ^2, breaking load coefficient, and these when plotted against f / E will give a "characteristic curve" for the structure of the given geometry. For geometrically similar structures of which the corresponding parts are made of the same material, so that f / E is constant, the critical load coefficient becomes an absolute constant for the series depending for its value purely on the shape. It follows that a simple test to destruction on a model will suffice under these conditions to determine the breaking load coefficient ϕ^2, and therefore the breaking load F for any other member of the series.

Failure Due to Instability.—It is assumed in this section that the failure is not necessarily accompanied by collapse or rupture in the material but is due merely to permanent deformation of the configuration of the structure. It follows that in the expression for the critical load, the yield stress does not enter although all the other terms A, l, E, I, ρ, g may do so. Using ϕ^2 as a critical load coefficient defined by F l^2/E I ϕ^2 then

$$\phi^2 = \psi_1 \left(\frac{A}{l^2}, \frac{W}{E A}, \frac{I}{l^4} \right) \quad . \quad . \quad . \quad . \quad (4)$$

obtained by the same method as in the previous section.

On the understanding that the structures in the series are all geometrically similar as regards external shape without reference to material composing them, then A/l^2 and I/l^4 are constants for the series and

$$\phi^2 = \psi_2 \left(\frac{W}{E A} \right) \quad . \quad . \quad . \quad . \quad . \quad (5)$$

where W/E A is the ratio of the weight of a member to the tensile or compressive force required to produce unit strain at some particular section of that member.

If corresponding members of the series are made of the same material then W/E A is easily seen to be proportional to l, from structure to structure and as before the critical loading coefficient,

$$\phi^2 = \psi_3 f \quad . \quad . \quad . \quad . \quad . \quad (6)$$

depends on the size only.

When the weight of the structure is negligible as far as its effect in contributing to failure is concerned, the whole instability arising from the external loading, then ϕ^2 is constant for a series of structures of identical form irrespective of the material of which it is composed, and a test to destruction on one model suffices for the series.

It has been found that the critical loading for a uniform prismatic strut of negligible weight under end thrusts and pin-jointed at the ends is given by $F = \pi^2 \frac{E I}{l^2}$, where l = length of strut, I the least moment of inertia, and E = Young's modulus, so that ϕ for this structure is π. For a strut under the same conditions but with fixed ends $\phi = 2\pi$.

In certain cases of simple shapes of structures, it is obvious that the function ϕ^2 may be derived by calculation as for example in the case of the prismatic beam supported either on "pin-joints" or clamped supports, but for more complicated problems where the calculation is too abstruse a number of points on the characteristic curve may be derived by a series of tests to destruction on models.

In the special cases where ϕ is a constant for the series a single test on one model is clearly sufficient. This, as has been shown, applies with equal force when the collapse is due either to instability or failure of the material.

The basis of the experimental method thus having been made secure, no scale effect difficulty of the type normally arising in aerodynamic work being present, it should now be possible to proceed to a direct accurate test of failure and its causes under various circumstances. As usual there are of course both advantages and disadvantages to be faced. A model of an aeroplane or a special part sufficiently accurate for the present purpose may be constructed at comparatively little cost. All the numerous details of contour and finish that are normally necessary in the production of such a model for ordinary aerodynamic purposes now find no place here. The question as to whether exceptional care or otherwise would require to be exercised with any special portion, as for example the junctions between the fuselage and the remainder of the machine, the junction of the wires and of the spars and ribs, etc., could of course easily be settled experimentally by testing for consistency of results.

A much more serious question, however, is that involved in the possible invalidity of the foregoing analysis should Hooke's Law fail to be obeyed—a real difficulty in the case of wood of which most of the members are composed—but exactly the same trouble would arise in a mathematical investigation of the stresses brought into play. In all such cases Hooke's Law is assumed to hold.

Two further points merely require to be mentioned. There is no mathematical machinery at our disposal for determining accurately the dynamic effect of a variable load such as occurs for example when an aeroplane is executing rapid manœuvres of particular types, or when the controls are brought sharply into operation. Essentially this is of the nature of an impulsive loading and the ordinary convention that it suffices to consider it as a live load and thus to double the safety factor cannot be regarded as quite satisfactory. Physically the problems are quite distinct. Secondly, the question of the effect of vibration of and upon the structure has received scant attention. Model experimental work of the type indicated, clearly furnishes an extremely convenient method for approaching these problems.

(*Continued from page* 289)

a full-sized aircraft programme, large enough to set the manufacturers going at full speed, with orders far enough ahead to permit them to establish efficient quantity production and keep labor happily engaged in producing, with an idea of a permanent position. Labor in the aircraft industry has been constantly upset by the fact that factories only had limited orders, with no further orders to look ahead to. Under such conditions, labor could hardly be blamed for looking for other positions. Speeding up under such conditions was very much like rushing oneself out of a job.

Secretary Ryan is Back

Secretary Ryan is back. He returned a few days ago.

"Upon reaching France," Mr. Ryan said, on October 15, "I went immediately to the front and was with our forces during the St. Mihiel fight and the battle of the Argonne.

"The air forces in both offensives were under the direction of the American commander, and, while the French furnished a large part of the forces used and the British co-operated, the American squadrons made up about half of the number participating. The commendation of the work of our pilots was tempered only by a suggestion that perhaps our boys were too venturesome and overcourageous.

"The United States De Haviland 'planes were in general use for observation and day bombing in both the St. Mihiel and the Argonne attacks, and the pilots were to a man enthusiastic as to their performances. While individual pilots and commanders had suggestions as to improvements and betterments that might be made, they were individual and seldom indicated anything more than a personal preference for some rearrangement of details.

"The commanders of all the squadrons using De Haviland 'planes, as well as 'planes of British and French manufacture for like purposes, told me that the pilots in every case would prefer to take a De Haviland machine with a Liberty engine over the line rather than any machine of a like type. This is due to the fact that the machine is fast, and for one of its type is quite manœuvrable; that it climbs well, and the pilots all agreed is a very efficient machine for the uses for which it is intended.

"On my trip the Liberty engine was the cause of more worry to me than anything else, because all of the Allied nations were demanding more of them than could possibly be supplied. French, British and Italian have used the Liberty engine in their own machines at the front, and their building programmes as now laid out are based to a considerable extent upon obtaining a supply of these motors in this country.

"I come home feeling that our allies consider the success of the United States in producing this engine in large numbers one of the greatest accomplishments in the war. Both the British and the French are now putting the Liberty motor in 'planes that formerly carried engines of either a heavier weight or less power. I can safely say that the Liberty engine, with its high power combined with lightness, has greatly increased the efficiency of some of the 'planes that the Allies have been using at the front for some time.

"Their representatives even expressed themselves to me that it has made new machines of several types."

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville

The Aerial Mail Is Using Surplus Facilities

By Charles N. Kight, Special Representative of the Post Office

The following is a copy of a letter Mr. Otto Praeger, Second Assistant Postmaster General, is mailing to the Presidents of all the leading business organizations and clubs in this city, embracing in part information not previously incorporated in matter distributed in the interests of the aerial mail service:

"Dear Sir:—I desire to bring to your attention the facilities of the aerial mail service which is equal, if not superior to the telegraph in the transmission of important communications to Philadelphia and exceeds the fastest train service by two and a half hours to Washington. Letters mailed in New York in time to catch the noon aerial mail, invariably reach the professional and business element in Washington before the close of the day's business.

"This service is rendered for only three cents per ounce more than the usual special delivery letter forwarded by rail. Six cents is charged for each additional ounce.

"The Postmaster at New York will furnish any information desired, or Mr. Charles N. Kight, special representative of the Aerial Mail Service, with headquarters in Washington, will be glad to go into the subject of the aerial mail service, its accomplishments and prospects, should his presence at any time be required, to shed light on this new and interesting governmental agency.

"Sincerely yours,
(Signed) "Otto Praeger,
"Second Assistant Postmaster General."
"100 per cent. perfect service daily."

Among the very few criticisms I have met in efforts to familiarize the business element and the public generally with the superior facilities offered by using the aerial mail service, I note the following: One party said: "Why attempt to inaugurate a service by aeroplanes when both aeroplanes and pilots are needed on the battle front in France?" The answer is this: "The aeroplanes now used in this service with a carrying capacity of about 500 lbs., and a limit of speed of about 100 miles per hour have been rejected as unfit for service abroad; planes with the Liberty Motor and a carrying capacity of 1,000 lbs. and a speed limit of about 150 miles per hour, being recognized as far superior for use in France." After the war these superior planes will be at the disposal of the Aerial Mail Service, enabling the time between terminals to be shortened nearly fifty per cent., insuring the delivery of mail from New York to Chicago, for instance, being delivered in about six hours.

The pilots employed in the present service are men who have failed to pass the extremely rigid examination required to make them eligible for foreign service, or possess certain disqualifying conditions, all, however, being eminently qualified as pilots handling the planes employed in the United States Aerial Mail Service. As an evidence of the rigid tests applied to applicants desiring to enter service overseas, the following facts stand out prominently, reflecting somewhat on the government's requirements: A number of men who offered their services, and failing to pass the rigid examination, applied for service to the Canadian government, were accepted and sent abroad. To-day several of them have made a world-wide reputation, ranking high among the Aces.

The service now effective between Washington and New York is daily growing in popularity now that it is understood that the service insures immediate delivery and, in some instances, hours in advance of time by rail mail, necessitates the use of only three cents per ounce more than required if forwarded by special delivery train service.

It is also true that the present congestion of mails, as well as delays by telegraph, owing to the shortage of help and the epidemic of influenza, has directed special attention to the aerial mail service, which makes 100 per cent. daily records, regardless of winds, storms or any other serious climatic conditions. Mail matter forwarded by the aerial mail service is in rapid motion from the time it is delivered to the planes until it reaches the party addressed.



To left: The Aerial Mail box at one of the New York hotels being cleared by a postman



To right: Captain Benjamin B. Lipsner, Superintendent of Aerial Mail Service



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F. C., C. F. A.

SOME sections have had great success with a permanent screen of withes and thatches. These were built up around the bed and about ten to fifteen feet outside the ridge wire. It withstood the wind very well, I understand, but it had the disadvantage that it was not movable and also it tended to cramp the action of the crew in working around the balloon. Sometimes this is a very great disadvantage. Personally, we had fairly good success with a canvas screen which we erected and carried with us. Poles were put in the ground to which pulleys were attached and through these, ropes attached to the heavy tarpaulins were rove. In this way we were able to raise and lower the screen at will. In the terrific winds we were subjected to in France, sometimes the tarpaulins would tear to pieces and blow to ribbons before they could be resecured. I have seen the poles, on which the screens were erected, snapped off like matches. On one occasion we secured half a dozen steel rails from a railway track and when we got them up—I say when we got them up, for it was quite some job in the wind—they were there to stay.

The main function of a screen is not so much to keep the wind from hitting the balloon as to shoot the wind upward to the curved upper surface, where it will even help to press the balloon to its bed.

Balloon Baskets

BALLOON baskets are a thing which have undergone many changes since war broke out. There was the day of the old spherical observation balloon the basket of which was a small uncomfortable affair, which sometimes, if one is to believe all the stories one hears, was not altogether too strong. It is easily imagined that those baskets would not stand up to service very long as they received rather rough handling from the wind. Landings those days were not the comfortable thing they are today. They were as often as not quite involuntary. I have seen spherical balloon baskets, however, which were fitted up comfortably, if not luxuriantly. One in particular I remember was a regular Pullman car for comfort. It was about the size of the ordinary Pullman smoking room and had a leather upholstered couch across one side very much the same as the smoking room.

With the advent of the kite balloon, however the baskets underwent a change. They were made quite a bit roomier and considerably stiffer. Nothing is quite so uncomfortable, particularly the first or second ascent, as to have a basket with a springy floor. The floor may be quite safe, but it is impossible to make the novice believe it when it is springing under his every step. Quite recently in fact, we had some balloon baskets issued to us in France. They were designed for one observer but for some reason they had been issued with a single basket balloon. That meant that two men must ascend in a basket meant for one. None of these single baskets were re-inforced with steel cables in the bottom and under the strain of two observers they did not last very long. They were not popular with any of our observers and when the writer, stepping heavily on the middle of the floor one day, felt his foot go through into the top layer of four thousand feet of atmosphere, he added his mite of condemnation. Shortly after, these baskets were condemned and double baskets issued.

The baskets at present in use in the Caquot type of observation balloon are almost square. They are about four by four and a half feet in dimensions and are designed for two observers. They can carry more. In fact in training I have seen five men in one of them but for real work on the front two men are about all they can carry efficiently. They are made of woven willow wickerwork as shown in the illustration, re-inforced by small steel cables woven in with the willow. On the bottom they have landing skids, partly to allow the basket to slide along the ground in landing and partly to add to the strength of the basket.

The interior of the basket is fitted up with the dual idea of having comfort and efficiency. To a great extent the latter is dependent, or at least augmented, by the former. The basket is lined with a rubberized fabric which is windproof. The floor is covered with a thick carpet and in winter generally with a goodly layer of straw also. In an aeroplane at great heights there is no doubt that it is much colder than in a balloon at a comparatively low altitude, but in the winter it is bitterly cold standing in a balloon basket for several hours at a time even clad in heavy flying togs. Running round the inside of the basket is a thick piece of upholstery to reduce the damage to one's hipbones in a rough landing. Pockets for the reception of maps, pencils, spare instruments, binoculars, lunches and sometimes, I fear, a stray magazine or book, for use when things get slow, or when one is "sitting up" waiting for a shooting view, are placed around the interior of the basket.

To be continued.



Fitting the basket of a Caquot observation balloon at a training camp "somewhere in the United States". The basket has been "toggled on" to the balloon rigging and then the instruments are adjusted. The telephone is tied into the basket, the aneroid barometer is adjusted to zero, the Pitot tube or anamometer put in place, binoculars and maps placed in the basket and the telephone fastened on and tested. One of the training type of parachute can be seen hanging on the outside of the basket

FOREIGN NEWS

BELGIUM

An official statement from Belgian headquarters on October 7 says:

Our aviators bombed enemy camps at Westende and Middelkerke.

During the day the enemy bombarded Nieuport and the zones about Clercken and Westroosebeke, as well as our communications in the rear areas.

German aviators are very active machine gunning our first lines and our roads near Moorslede and Passchendaele.

Ten enemy aeroplanes were brought down and three balloons burned.

GREAT BRITAIN

"Twenty-two hostile machines were destroyed and three were driven down out of control. Twenty-four of our machines are missing. Twenty-two tons of bombs were dropped on Sept. 28.

"Night bombing continued with greater intensity, in spite of the unfavorable weather. Thirty-four tons of bombs were dropped, and many machines continued attacks until dawn. All the night-fliers returned."

"The air force with the navy, coöperating in the Belgian offensive on September 28, dropped thirteen tons of bombs and set fire to two trains and several ammunition dumps," says an Admiralty statement. "Massed motor transports and a hostile battery were attacked and casualties inflicted. The airmen engaged also in spotting for the monitors shelling the German coast defences.

"The latter part of the day large formations of hostile aircraft working inside the enemy lines were encountered. Four planes were destroyed and four were brought down out of control. Thirteen of our machines are missing; a majority of them failed to return from the enemy lines after a sudden and violent rainstorm."

British bombing aeroplanes during the day of September 28 contributed very greatly to the success of the operations. They bombed without cessation enemy troop columns, transports and communication lines, says a Belgian Report.

In an official report on September 30 Field Marshal Haig says:

"On Sunday fifteen hostile balloons were destroyed. Twenty-six planes were brought down, and nine others driven down out of control. Nineteen of ours are missing. Thirty-six tons of bombs were dropped on railway stations and junctions.

"The air force, in coöperation with the navy, bombed enemy destroyers and raided Zeebrugge, Ostend, and Bruges, and aerodromes in the vicinity of Ghent. Twelve hostile machines were destroyed, and fifteen driven down out of control. Ten of ours are missing."

The following shows the six points from the coast of Flanders to the fringes of the Syrian desert where the Royal Air Force have operated recently:

Destructive air raids on German submarine, naval, and aircraft stations in Belgium.

Air fighting between La Bassee, Peronne, and the St. Quentin road.

Sixteen heavy bombing raids by the Royal Air Force independent section in Germany.

Low-height bombing and machine-gun fighting from the air on the roads to Strumnitza.

A double raid on Constantinople, causing damage to the station and military buildings at Nagara and Stamboul.

Great aerial activity on the Palestine front, resulting in much destruction of enemy transports, stores of war material, and heavy casualties to the retreating enemy.

For some time past contingents of the Royal Air Force and the Australian Flying Corps have been carrying out a reconnoissance over the maritime plain stretching from Mount Carmel on the north to the Shechen-Joppa road, as well as over Samaria and the Valley of the Jordan. Acting in coöperation with the infantry and cavalry units, British airmen on the night of September 18 bombed the enemy railway junction of El-Afuleh in the plain of Esdraelon, south of Nazareth, hindering the despatch of reinforcements from the south. Through the following day they continuously bombed the enemy's headquarters and harassed the retreat by firing thousands of rounds against troops and transports, and dropping more than eleven tons of bombs on various objectives behind the enemy's lines.

On the Salonica front, on the morning of September 21, British aeroplanes brought timely advice of the impending retirement of the enemy. Later in the day they saw that the Kosturine-Sturza road was densely packed with troops and transports hurrying to the rear. Squadrons of British airmen continuously attacked these from a low height, causing much material destruction and many casualties.

In the course of a single air fight between four British machines and fourteen enemy craft two of the hostile machines were destroyed, while one British aeroplane failed to return.

On the western front in France, in addition to dropping nearly 140 tons of bombs, destroyed ninety-one enemy machines, drove down thirty-five out of control, and shot down eight kite balloons in flames. Forty British machines were reported missing. On the Rhine front nearly fifty tons of bombs were dropped during the week on railways, blast furnaces, factories, and hostile aerodromes. In Italy six enemy machines were destroyed and three were driven down out of control. All the British aeroplanes returned safely.

The British Air Ministry issues the story of a neutral resident who has just returned from Germany with information on the effects of recent British air raids over the Rhine provinces, particularly in Frankfort.

The central part of the Frankfort main station was so extensively damaged by bombs that trains have not been able to enter and are being operated from hastily constructed platforms some distance from the station. The people of Frankfort, according to this neutral, are in a state of nervous excitement. At the least unusual noise the people retire to their cellars, not daring to sleep in their apartments.

As to the moral effect of the raids, the neutral says he heard nothing but the most depressing talk of the present conditions in Germany and the prospects of further attacks from the air.

The Treves Railway was bombed by the British independent air force Tuesday, according to an official statement issued October 2.

British aerial squadrons bombarded Lichtervelde, causing a fire at the railway station. They also broke up several enemy convoys.

The Cologne *Gazette* frankly acknowledges that "these raids are having the effect on morale which the Entente Allies intended."

It speaks of how the pessimism of the bombed districts is spreading to other parts of the empire through letters written from the Rhine towns.

And the air offensive is not only directly but indirectly having its effect on the military operations—through the German efforts to increase their air power and the consequent drain on other branches.

British air power is constantly increasing and the Air Ministry is taking every possible step to see that the fliers' and workers' efforts for the country do not "set them back" when they return to civil life. Almost every mechanical trade is taught in the training schools, and exceptional educational advantages are offered.

The British losses are comparatively light, the air chiefs state. They announce that one machine is lost or damaged for every five tons of bombs dropped, or one machine for every six raids.

The British airmen during the last three months have wrought heavy damage to military objectives in Western Germany and forced the withdrawal of several enemy air squadrons from the battlefront in a vain effort to protect the raided territory, the British Bureau of Information announced here on October 4.

A 250-mile belt of the Rhine Valley, in which are located the principal German war industries and railway systems vital to maintenance of the Teutonic lines in France, has been brought definitely into the war zone, the statement said. British fliers have raided enemy territory 249 times and dropped 247 tons of bombs on strategic points. Aside from destroying or damaging munition and poison gas factories, railway stations and trains, the attacks have had a widespread moral effect, demonstrated at dozens of public meetings in the Rhine towns demanding cessation of aerial warfare.

FRANCE

Concerning aerial activities of September 27 the official statement from the French War Office says:

"Our bombing aeroplanes made expeditions during the day and night incessantly harassing enemy transports and troops and attacking convoys. Twenty-five tons of bombs were dropped behind the battlefront, especially on the railroad from Somme-Py to Challerange and on the important centres of the Medeah Farm and Ardeuil and on the crossings of the River Alin. At night the railroad stations at Longuyon and Audun-le-Roman and the aviation field at Stenay were bombarded heavily.

"French aeroplanes destroyed nine German machines and set on fire one captive balloon. It is confirmed that Lieutenant Fonck alone destroyed six enemy machines on September 26."

Lieutenant Fonck's total now aggregates sixty-six.

Fonck's latest feat duplicates his own record and also those of Captain Trolloppe and Lieutenant Claxton, both of the British Flying Corps.

The statement of Sept. 30 says:

"On September 30 our aviators destroyed and put out of the fight twenty-five German aeroplanes and set fire to two captive balloons.

"Twenty-six tons of bombs were dropped on convoys and concentration points behind the enemy lines, especially on Challerange, Liry, and Mont St. Martin. Thousands of rounds were fired at the enemy troops by French airmen."

FRENCH

The French official on aviation, issued October 3, says:

Our bombarding squadrons surprised gatherings of the enemy which were being formed in the region of Contreuves and Mont St. Martin. They attacked them with bombs and machine guns. Twenty-six tons of bombs and thousands of cartridges were used with good results.

Ten enemy aeroplanes were destroyed or put out of action. A balloon was set on fire.

The report for October 5 says: "Nineteen enemy machines were destroyed by our aviators and three balloons set on fire. Bombing aviators dropped during the day 1,700 kilograms of projectiles. Several thousand rounds were fired at enemy troops and more than five tons of bombs were dropped on them.

"Thursday night bombing aviators dropped twenty-nine tons of bombs on enemy cantonments and bivouacs in the region of Lens and in the Valley of the Suippe and on railway stations.

"Captain Raymond, commander of the famous Stork Escadrille, has died in a hospital at Chalons-sur-Marne of injuries received in an accidental fall."

GERMANY

The German official for October 4 says:

On October 3 we shot down thirty-seven aeroplanes and two captive balloons.

On October 5 the German official said:

In the last two days sixty-five aeroplanes were brought down.

Berlin, September 26, via London.—Allied airmen lost seven aeroplanes in an attack on Frankfort-on-Main and Kaiserslautern, according to the German headquarters' statement to-day.

Great headquarters issued the following on September 28:

Yesterday we shot down thirty-three enemy aeroplanes.

On September 28 we shot down thirty-two enemy aeroplanes and three captive balloons.

We shot down forty-five enemy aeroplanes on October 1.

On October 1 we shot down twenty-seven enemy aeroplanes and three captive balloons.

ITALY

The Italian War Office has issued the following:

Our airships have bombed Primolano and Fucine.



MODEL NEWS

Edited by John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Model Aeroplane Building as a Step to Aeronautical Engineering

The next and final part to be made is the rudder or vertical stabilizer. This part is fastened to the tail booms rigidly and is made of the same stock as the tail plane. Note the two cross pieces at the center with just enough space between to allow the tail to be inserted and fastened in place. The two uprights are fastened outside of the tail piece.

When covering, the fabric should be fastened to these center cross pieces and then down to the bottom or top piece.

The tail booms are made of spruce, 1¼", fastened to the ends of the tail booms for fastening to the rear spars of the wing assembly. The plate is fastened to the bottom side of the boom on the top spar and the top side of the boom on the bottom spar, as shown in the sketch to the right of side view. These plates are fastened to the booms and the spars by bolts for ease in assembling and dismantling. A sketch of the rear view is shown at the lower left-hand corner of the cut. This will clearly show the method of bracing in use.

A clip for fastening the wires is also shown. This clip is made of sheet steel. A small hole is drilled for the wire and a larger one for the bolt.

When glider is assembled, as shown in the two views at the right, the builder can test the strength of it by setting main section on two wooden horses and taking his place in the operator's space. The horses should be placed a point directly under the middle pair of struts, and taking care that the wing beams set firmly on the horses. If the wings show no sign of bending, it is safe to fly with the glider.

To fly, the operator can select a slight rising of ground with no obstructions, such as trees and the like, face into the wind, run to the edge of the hill and cast himself off. If balanced properly the glider will make a graceful glide to a point some distance away on the level ground.

The writer would not advise trying this from a high hill at first, or when the wind is blowing too strong, as it is best to practice under less severe conditions at first until the operator knows how to control the machine.

The control of the glider is simple and needs but little practice. For instance, the operator hooks his arms over the two bars running from the forward to the rear struts. This allows his legs to move where he wishes to put them. The operator should locate his body as far forward as possible.

When in the air, should the right wing of the glider be lifted higher than the left, the operator promptly throws his legs to the high side, thereby changing the center of gravity so that the load moves to the high side and it falls back to normal, and the same should be done to the left side if that wing rises. The legs also control the rising and falling motion of the machine.

Should the builder wish to make towed flights, wheels can be affixed to the bottom wing spars at the center of the machine, by "V" shaped struts, as shown in the sketch.

The wheels and struts should be as light as possible in order to keep down the weight of the machine.

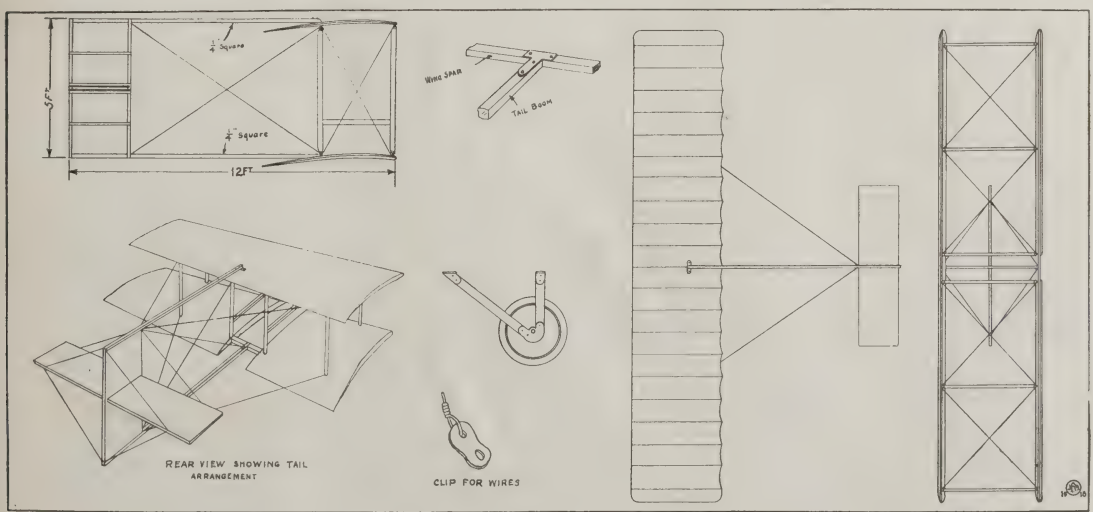
Don't attempt towed flights until you are well acquainted with every move of the glider when in free flight.

The weight of the glider, eighty pounds, might look heavy and the operator will think it is impossible to run with a machine of this weight, but this is a mistaken idea, as the curve of the wings is such that the slightest wind blowing against them will almost hold the machine in the air, with the result that the operator will have nothing to do but run and he will find himself lifted clear of the ground.

The operator will experience a wonderful sensation the first time he feels himself lifted clear of the ground, and after the first flight he will never be satisfied until he has a powered machine and can travel in any direction. It is well to remember that the Wright Brothers, Curtiss, Chanute, Montgomery and others got their first feeling in the air from a glider flight, and this is the real stepping stone to powered flight.

We will now take up the more important work of designing and building a powered machine.

(To be continued)





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Wanted—Almost Anything

Dear Mother—Squadron life, they say,
Is fearfully exciting.
It's rot. For half an hour today
There wasn't any fighting.
They tell you War's a thrilling Game,
Ye gods, it's nothing if not tame.
Our fellows pulverized just now
A host of Hun formations.
And then they bombed—the Lord knows how,
A crowd of railway stations.
I can't think why the game's so slow,
There's still a war on, don't you know?
I chased a Hun a dozen miles,
And ultimately licked him.
The C. O.'s face is wreathed in smiles;
That Hun's my thirteenth victim,
But life is stagnant none the less.
(Hello! a bomb's dropped on the Mess.)
"As tedious as a twice-told tale"—
That's Shakespeare's own expression.
Monotony has made me stale;
I long for a digression.
I haven't crashed since yesterday,
When will adventures come my way?
If this is warfare, Mother mine
(Hellup, the roof has vanished).
Then give me back the days divine
Ere motor bikes were banished.
If this is war, then may it cease
And let's have an exciting peace.



Courtesy N. Y. Globe

Revenge

I have often thought
Of
The only way
To get back at
The censor.
Supposing that
You
And your Lieutenant
And your Lieutenant's
Fiancee
Came from the same town
And went to school together.
As he reads all
Your letters,
Why not keep up
His interest by
Writing
Passionate love letters
To
His Fiancee.
Oh, Joy.
Oh, Rapture.
Oh, Blisters.

MY SOLDIER



Now I lay me down to sleep
I pray the Lord my soul to keep.
God bless my brother gone to war
Across the seas, in France, so far.
Oh, may his fight for Liberty,
Save millions more than little me
From cruel fates or ruthless blast,–
And bring him safely home at last.

BUY WAR SAVINGS STAMPS

COMPLIMENTS OF
CURTISS AEROPLANE AND MOTOR CORPORATION

W.S.S. W.S.S.

Trans-Oceanic Float System For Airplanes

A SUCCESSFUL METHOD FOR PONTOONING THE ATLANTIC INVENTED BY ALFRED W. LAWSON

There are eleven strong reasons why the Trans-Oceanic Float System invented by Alfred W. Lawson should be established and put into operation at once.

1. It would enable us to send all of the airplanes we can build in America to Europe.

2. It would get airplanes from America to Europe in 90% less time than it now requires.

3. It would save the number of machines lost in the holds of torpedoed ships.

4. It would be the means of furnishing 24 hour service for mail delivery between America and Europe.

5. It would establish 24 hour passenger carrying service between America and Europe.

6. It would establish a safety lane for shipping between America, England, France, and Italy.

7. It would mean the saving of approximately $300,000,000 for every 50,000 airplanes sent across the Atlantic Ocean.

8. It will stamp the U. S. A. as the foremost nation of the world to put into operation the biggest of practical plans.

9. It will be the forerunner of commercial air navigation and rapid trans-oceanic traffic.

10. It will benefit every aircraft manufacturer in the world as well as increasing the efficiency and scope of the entire aeronautical industry.

11. It will bring all of the great nations of the world into close association with the U. S. A. and make this Country the source of supply to all humanity.

According to this system any airplane that is capable of flying and carrying more than one hour's fuel and oil can be flown across the Atlantic or any other ocean.

Any aviator who has graduated from a military training school will be qualified to pilot an airplane across the ocean according to Mr. Lawson's system, the chief requirement being that he knows how to make a good landing.

It will be easier for a pilot to fly across the Atlantic Ocean by this system than for one to make a cross country flight of the same number of miles, for the simple reason that by this system the landing place is always within sight and within gliding distance.

Briefly an outline of the plan is as follows:

Approximately 25 miles apart between the coast of America and the coast of Europe will be placed floats upon which the pilot can land and depart from, whenever he wants to descend for fuel or repairs.

These floats are to be approximately 500 feet long and 100 feet wide, but can be increased in length and width if preferred.

These floats are built in the shape of regular steamship hulls and are kept in their position of latitude and longitude by their own power.

These floats are protected from submarines by carrying longer range guns than the submarines carry and also by a system of nets which protect them against torpedoes. They are also further protected by the airplanes which carry a supply of bombs for that purpose.

In the holds of these floats are carried the supplies of fuel and spare parts for airplanes, as well as a repair shop, and sleeping apartments, and dining rooms, etc., for the pilots and crew.

The float contains a slowing up process whereby the speediest machines can be stopped within 300 feet and slow machines within 100 feet.

There are elevators arranged at both the bow and the stern of the float whereby airplanes can be let down into the hold and receive their fuel and repairs out of the way of other machines while landing.

The float is always headed into the wind so that the pilot always lands into the wind from the stern, while he is let down into the hold at the bow and then moved back in the hold of the stern again where he is elevated to the deck from whence he starts off on his journey again into the wind. By this method, airplanes can be landed and sent off again at the rate of one every five minutes.

On condition that each machine stops at every 4th float more than 1,000 airplanes can be transported from America to France every day that the weather is suitable.

It is estimated that there are more than 150 suitable flying days over the Atlantic Ocean during the course of a year, so that by this system it is possible to send to France more than 150,000 airplanes of every description in a year.

By this system airplanes can be sent across the Atlantic Ocean within twenty-four hours, or they can be sent from factories in the interior of the United States to the battlefronts in the interior of France within forty-eight hours, thus saving all of the material and labor necessitated in crating the machines at the factory and uncrating them and setting them up at the battlefields.

At the present time by steamship methods it requires more than thirty days to deliver airplanes from the factory in America to the battlefront, and therefore more than 90 per cent in time will be saved by this system in delivery of machines.

This system will also save the transportation cost of the pilots who will also receive some much needed practice in flying en route. If 50,000 airplanes were transported across the Atlantic by this system, that would mean a saving in shipping facilities for 100,000 more troops alone. It would also save enormous shipping facilities for other war materials that would take the place of the space occupied by the extreme bulky airplanes.

Besides the time and shipping facilities saved on the transportation of 50,000 airplanes an approximate saving in the cost of transportation will total more than $300.000,000.

This system can be put into operation within four months after it has been begun and Mr. Lawson is ready to give an actual demonstration of its practicability whenever called upon to do so.

Many letters have been received from the leading aircraft engineers and manufacturers of the United States in which they say that they have examined Mr. Lawson's system and find it practical in every way.

The engineering force of the Lawson Aircraft Corporation are unanimous in their praise of the system, and the Lawson Aircraft Corporation herewith publicly advocate and recommend that the United States Government give it a trial and if found practical to utilize it at the earliest possible moment as one of the short cuts to the heart of the Kaiser.

THE LAWSON AIRCRAFT CORPORATION

GREEN BAY :: :: :: :: :: WISCONSIN

ALFRED W. LAWSON

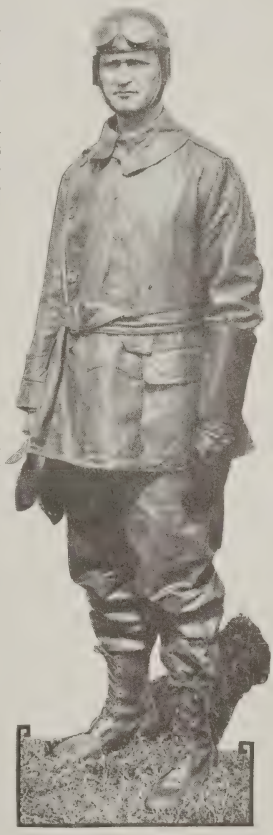
:: *Vice-President and General Manager of* ::

THE LAWSON AIRCRAFT CORPORATION

Alfred W. Lawson, the Inventor of the Trans-oceanic Float System which enables an ordinary pilot to take any type or an overland airplane across the Atlantic Ocean or any other ocean by its own power has been for the last two years the Vice-President and General Manager of the LAWSON AIRCRAFT CORPORATION of Green Bay, Wisconsin.

During these two years, Mr. Lawson has given ample demonstratoin to the Directors of the LAWSON AIRCRAFT CORPORATION that he is most practical and conservative in all of his undertakings.

THE LAWSON AIRCRAFT CORPORATION manufactures only the latest types as well as the most practical airplanes, and as Mr. Lawson is a practical pilot of airplanes, as well as a builder of them, and as he has also spent a large part of his life at sea, the Trans-oceanic Float System was therefore invented by a man who based his plans upon the knowledge he had already gained by practical experience.



Alfred W. Lawson was one of the first of the pioneers of aviation in America. He began his active work in the movement in 1907 which was before the Wright Brothers made their memorable first public flights in France and the United States. In fact it was in 1908 that Wilbur Wright gave the first demonstration of the Wright Biplane to the French Government in France while Orville Wright during the same year demonstrated the Wright machine to the United States Government at Washington, D. C.

Just before these famous public flights were made by the Wright Brothers, Alfred W. Lawson founded his first Aeronautical Magazine, FLY, in Philadelphia and through the columns of this periodical he did the first missionary work for the aeronautical movement in this country.

After editing FLY for over a year Mr. Lawson went to New York and founded the magazine AIRCRAFT in 1909 and from that year until the fall of 1914 he was the editor-in-chief of that periodical. During that time AIRCRAFT established a reputation as being one of the foremost aeronautical magazines in the world and Mr. Lawson's writings on aeronautic subjects were quoted by aeronautic authorities in every country. It was, in fact thru the inspiration of Mr. Lawson's enthusiastic editorials and articles on the future possibilities of air transportation that started into the movement thousands of men who have since taken a leading part in development of the industry. Many of the present authorities on aeronautics in America are proteges of Mr. Lawson and manufacturers of most of the leading plants as well as aeronautical engineers, designers, managers, superintendents and foremen of these plants were urged into the business either directly or indirectly by Mr. Lawson.

Mr. Lawson's activities entered into every branch of aeronautics. He helped to organize the Belmont Aircraft Meet in 1910 and also the Chicago Meet in 1911—these being the two classiest aeronautical sporting events ever taking place in America.

In 1911 Mr. Lawson was associated with Henry Farman, the leading Aeroplane builder of France, who established in this country the Farman Company of America of which Mr. Lawson was President.

In 1912 he edited the aeronautical section of the Websterian Dictionary and introduced into that lexicon many new and original words including the word Aircraft. In fact, it was Mr. Lawson who actually coined the word Aircraft which is at the present time the most used aeronautical word in the world. This word was coined by Mr. Lawson in 1907 and in 1910 he had the word Aircraft registered in the United States Patent Office as a trade mark for the magazine he published.

In 1912, he was elected first vice president of the Aeronautical Manufacturers Association of America.

In 1913, Mr. Lawson learned to fly both the Sloane-Deperdusin and Moisant-Bleriot Monoplanes at the Hempstead Plains, L. I., Aerodrome.

The same year he purchased a Thomas Flying Boat and became distinguished as the first New York Air Commutor by flying from his country residence at Seidler's Beach, New Jersey, to the foot of 75th Street, New York City, a distance of 35 miles.

He has since then flown almost every type of airplane made in America.

During his career as editor of aeronautical magazines, Mr. Lawson outlined in his writings in advance practically every important step that has since taken place in the development of aeronautics besides making suggestions that proved of great value to the movement. He also went through a great deal of personal expense and inconvenience to petition Congress on different occasions to appropriate funds with which to establish a large American Air Fleet.

During the past year Mr. Lawson has been furnishing the U. S. Congress with a bi-weekly Bulletin concerning Aircraft information.

There is no man who has done more to advance Aviation in America than Alfred W. Lawson. There is no greater authority on aeronautics than he. His name is well known to every man in the aeronautical world, either at home or abroad.

OBSERVING





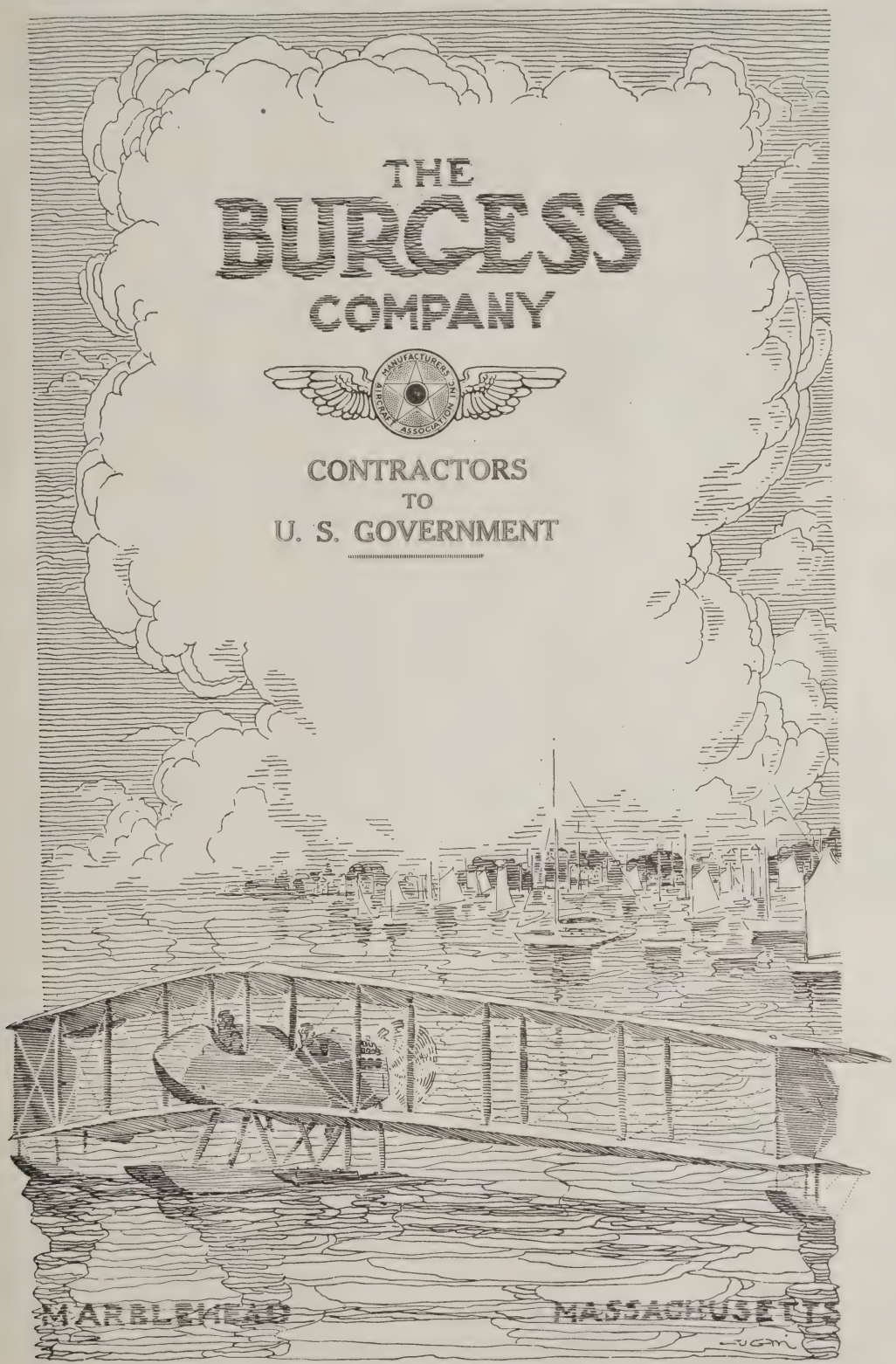
Observation post of Civil War times.

Manufacturers for the United States Government

The Dayton Wright Airplane Co.

DAYTON, OHIO

"The Birthplace of the Airplane"


THE
BURGESS
COMPANY
MANUFACTURERS AIRCRAFT ASSOCIATION INC
CONTRACTORS
TO
U. S. GOVERNMENT
MARBLEHEAD
MASSACHUSETTS



THE slowest speed at which an aeroplane can land is thirty-five miles an hour. Some of the largest machines weigh five tons and cost $60,000.

Unless the elastic Shock Absorber Cord is of the best quality to neutralize the shock of landing the aeroplane may be 'crashed' and the aviator killed. Our Shock Absorber Cord is the best insurance against such accidents.

We make Special Cords for Special requirements — Radiator Hose, Gas Hose, Molded Rubber Bumpers and Miscellaneous Rubber Items.

The Ohio Rubber Co.

Headquarters :
Cleveland, Ohio

Branches :
Cincinnati, Ohio, and Detroit, Michigan



The VICTOR AIRCRAFT CORPORATION

Manufacturers of

AIRPLANES *and* SEAPLANES

For Military and Sporting Purposes

FACTORY

Freeport, Long Island, New York

(*Continued from page 282*)

tremendous distance between the two wings, which would prevent one wing from competing against the other, brought about the conclusion to give two trophies instead of one.

The decision to have two trophies for the Naval and Marine Corps Air Stations was brought about by the fact that the tremendous distance between the Atlantic and Pacific Coast Stations would prevent competition between the two groups.

(4) Each of the four trophies is to cost $1,000.00, and with each trophy will be given five $100.00 Liberty Bonds, making five prizes of $100.00 each to go with each trophy. The idea in giving these Liberty Bond prizes was that while, under the rules of the competition, a station or squadron would have to win the trophy three times in succession to get permanent possession of it, the winning station or squadron would get a $100.00 Liberty Bond prize, immediately upon winning the contest.

It is left to the Military, Naval and Marine Corps authorities to decide whether the $100.00 Liberty Bond prizes shall go to the squadrons, or to the stations, or the individuals competing.

The Military and Naval officers who were consulted by the Aero Club of America authorities stated that the offer of these trophies and prizes would greatly add to the interest of the work of training and developing professional efficiency in the Air Service. They pointed out, in the event it were not possible to hold contests between squadrons or stations, it would be possible to award the trophies and prizes for the greatest efficiency shown by the squadron or stations in their respective work, during a given period of time. For instance, one station or squadron may specialize in formation flying, another in bomb dropping, another in cross-country flying, another in patrolling, etc. Each station or squadron keeps a close record of its work, thereby making it easy to figure the percentage of efficiency, and the station or squadron having the largest percentage within the given period of time, would be awarded the trophy and prize for that period.

In the event that the Military, Naval and Marine Corps authorities decide to hold the contests, or award the prizes, once each month, and the trophies are not won three times in succession by the same station or squadron, then the competition will continue until some one station or squadron does win it three times in succession.

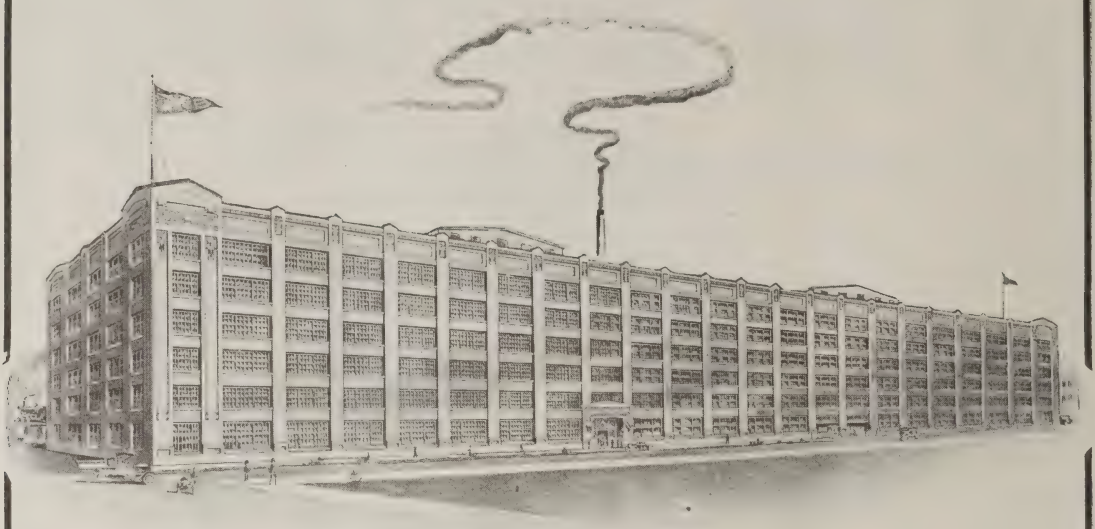


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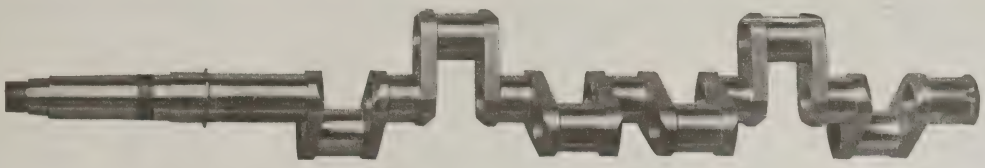
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Tonkin, Earl H....MAC
Thayer, Raymond H....TFT
Towle, Ellingwood H....PWM
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U

Ullman, Roland Gyula Ellis....SLA; CRI

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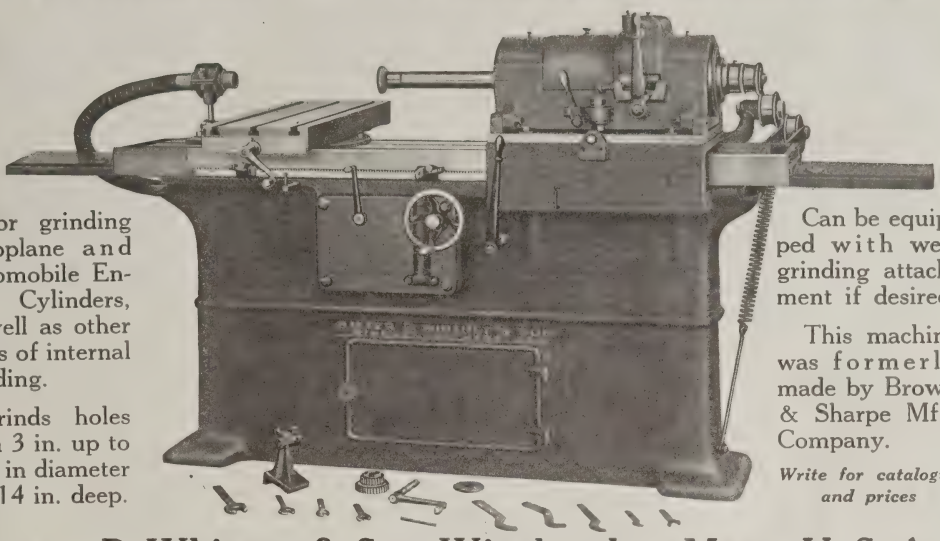
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Witney, William Reilly....SLA; CWT
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Welty, James A....WFO
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Wassall, Allen Dexter....SLA; GLC
Wallace, Edward S....TFT
White, George Crosby....SLA; CJW
White, Albert F....DMA
Wilkinson, William Hugh....SLA; CJW
Watson, Lester....REL; CGC
Wellman, William Augustus....FLA; RSD
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Wine, Edward A....TFT
Waterworth, Harold Alexander....SLA; AAD
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Ward, Allen Bryan....SLA; SBI
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(*Continued on page* 345)

Cylinder Grinding Machine



For grinding Aeroplane and Automobile Engine Cylinders, as well as other kinds of internal grinding.

Grinds holes from 3 in. up to 7 in. in diameter and 14 in. deep.

Can be equipped with wet-grinding attachment if desired.

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(Continued from page 317)

Tail Group

The control cables to the upper elevator tillers pierce the stabilizer. The covering around these holes is then reinforced with leather washers to prevent wear. The fin is larger than was employed on the KB-2T. The stabilizer is braced with seamless steel tubing, the fin and rudder post with cable. Tillers are made of sheet steel welded to a steel plate. The elevator flaps and rudder are so constructed so as not to allow a space between them and members to which they are hinged, when their positions are changed. Tail measures 10′ 4″ x 3′ 2″. Elevator flaps 3½′ x 2½′.

Landing Gear

Regular "V" shape, with struts connecting to the body at points in line with front and rear wing spars. The tread is 5′ 3″ and wheels 26″ x 3″ are covered with linen covering "doped".

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Elastic cord is used for absorbing the landing shocks.

Engine Group

A regular Curtiss O X rated at 100 h.p. is used, with a two-bladed Lang propeller 8 feet in diameter and 5 feet 4 inch pitch.

One fuel tank with a capacity of 30 gallons is mounted just behind the engine.

A Mayo radiator 3″ deep with a frontal cooling surface of 210 square inches is used. It weighs 53 pounds empty and holds six gallons of water.

Aeroplane Construction and Operation

In this book the author has succeeded in compiling an exceptional amount of invaluable material for the instruction of students, as well as for ready reference of the technical man and aeronautic engineer.

It is written in simple, concise language, starting with the most elementary principles of flight and explaining the construction of the aeroplane, finishing with the most complete calculations for the surfaces, power, weight, etc.

The following is a partial list of contents:

1. 429 pages. Up-to-the-minute data on construction, operation and calculations on aeroplanes. Dimensions and data on well-known machines.

2. 172 illustrations of assembled machines and details. 5 folding plates of machines and controls.

3. A glossary defining the latest aeronautical words and terms with their French equivalents.

4. **Lifting** surfaces, aerodynamic calculations, streamline bodies, etc.

5. **Training** and operating, explaining operation of control systems and methods of training students.

6. Military aeroplanes.

7. Tables of dimensions, with characteristics, weights, performance, etc.

8. Types of construction, arrangement and details.

9. Power, weights estimates, and general notes on the design.

This book is well illustrated with photographs, tables, diagrams and charts.

There is also a detailed diagram of a Blimp or scouting dirigible, with a key to the diagram, giving the names of the parts.

This book contains a large folding chart, giving a drawing of the de Haviland 4, also drawings showing the methods approved by the Government for handling the machine while "looping the loop," doing the "Immelmann turn," and other "stunts."

Aeroplane Construction and Operation by John D. Rathbun. Price $2.20, postpaid, from Aeronautical Library, 299 Madison Avenue, New York.

To Increase Officers' Pay

In the Senate of the United States on September 24, 1918, Mr. Penrose introduced the following bill, which was read twice and referred to the Committee on Military Affairs.

A bill to increase the rates of pay of officers of certain grades.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter the current yearly pay of officers of the Army of the several grades herein mentioned, exclusive of longevity pay, shall be as follows: Colonel, $4,500; lieutenant colonel, $4,000; major, $3,500; captain, $2,900; first lieutenant, $2,500; and second lieutenant, $2,200: *Provided,* That in no case shall the pay of a colonel exceed $5,500; the pay of lieutenant colonel exceed $5,000, or the pay of major exceed $4,500.

Sec. 2. That all laws and parts of laws in conflict herewith are hereby repealed.

(Continued from page 344)

Wybrant, Rolla Hugh.....SLA; ABC
West, Conrad Riley.....SLA; CWT
Wentz, Alan William.....SLA; MAC
Witt, Joseph B.....PWM
Williams, Le Roy.....SLA; CWT
Woolsey, Clinton F.....CGC
Williams, Errett.....CGC
Wilkinson, William T.....DMA
Wright, Bailey A.....WFO
West, Conrad R.....WFO
Wyatt, John A.....WFO
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Woodward, Irving J.....PWM
Witsell, Frederick C.....PWM

Y

Young, Evan Dale.....SLA; BFT
Young, George Joseph.....SLA; GLC
Yale, Donald Lewis.....SLA; FOB
Young, Henry M.....CGC
Yates, James Stephen.....SLA
Yerkes, William Dilworth.....SLA; CFT
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Yount, Barton K.....DIK; WDM; Note 1
Yager, Frank R.....CWT
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Yeiser, Henry C.....CJW
Yule, George C.....CJW
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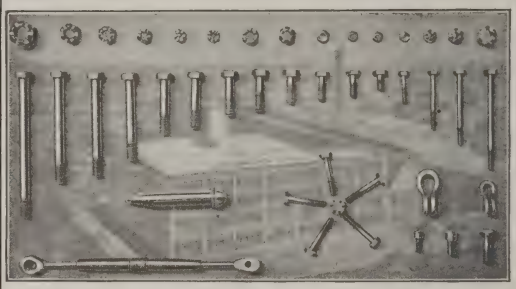
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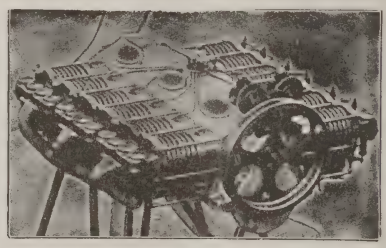
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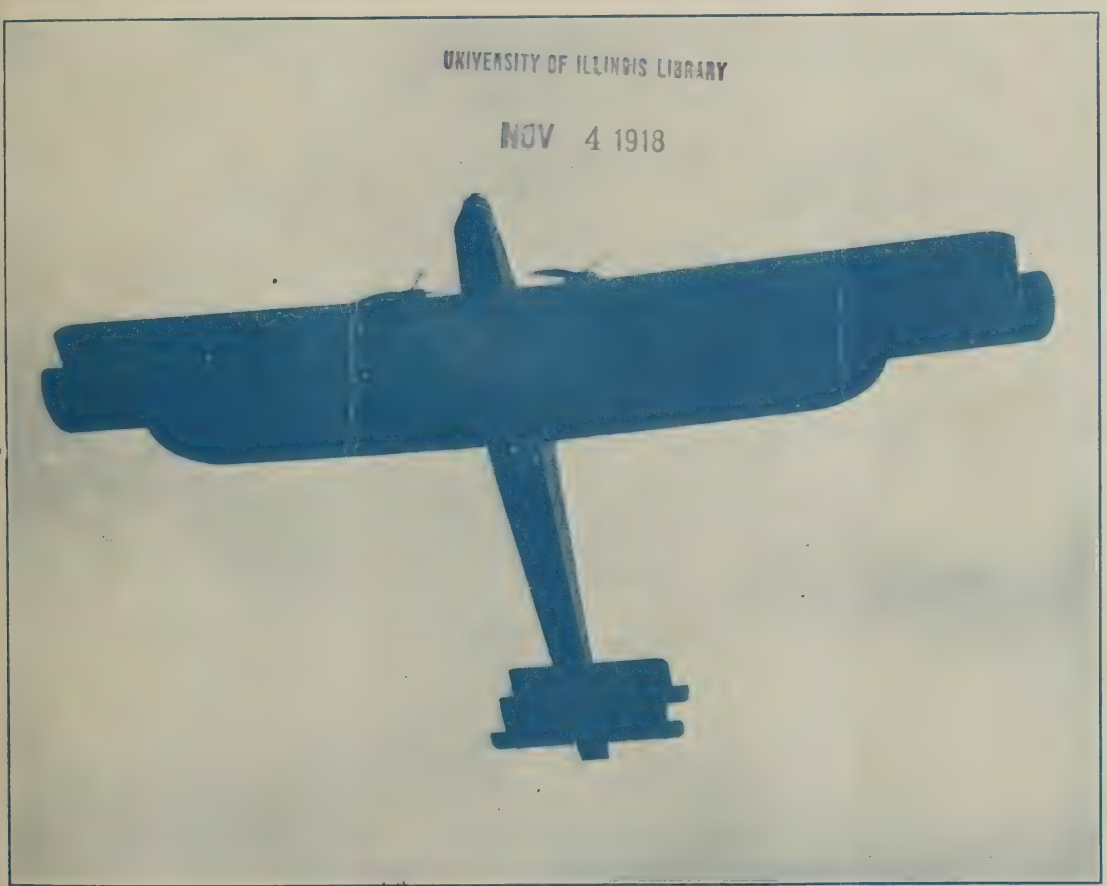
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VOL. VIII OCTOBER 28, 1918 No. 7

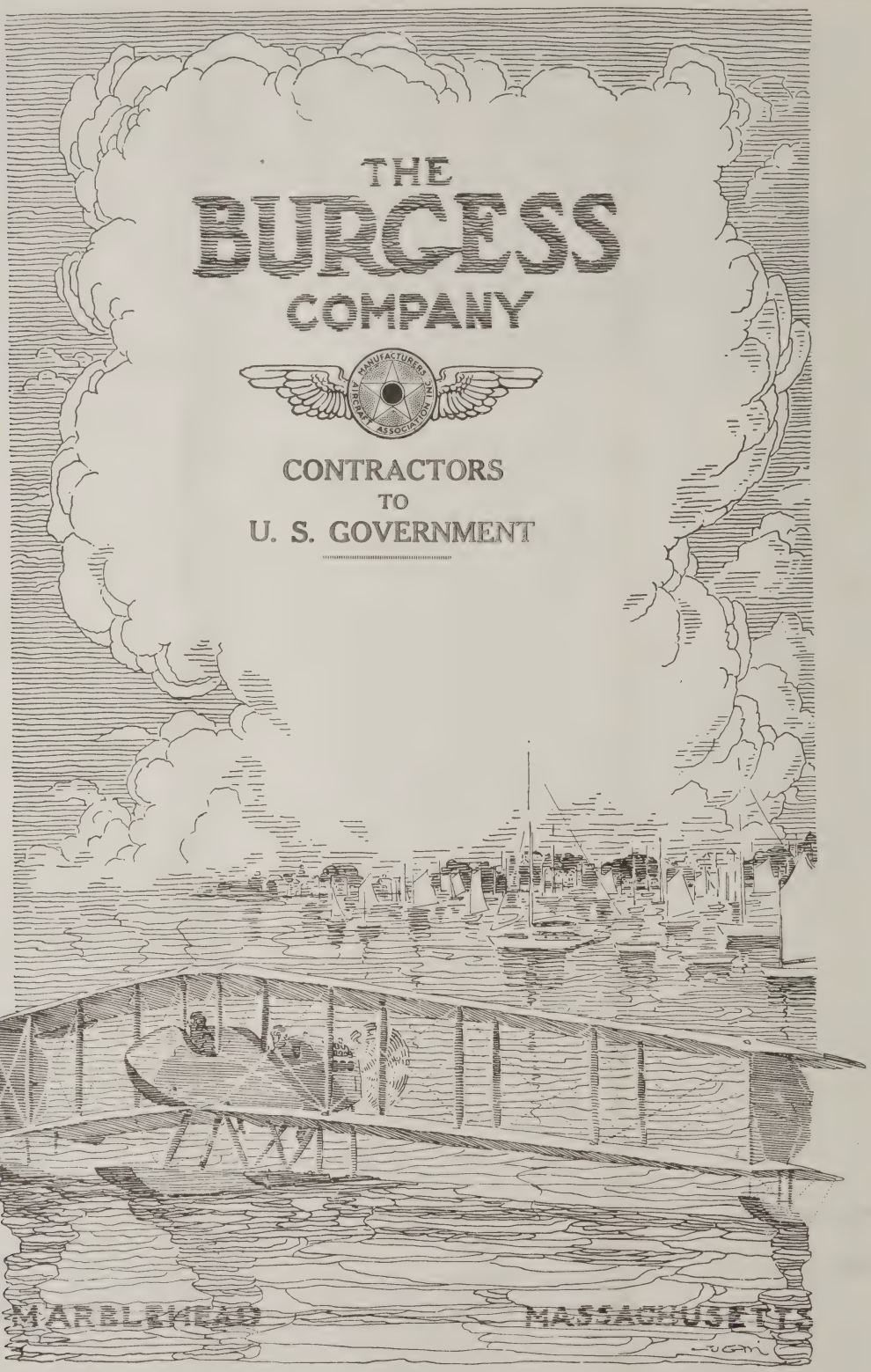
TABLE OF CONTENTS

PAGE

Ten Thousand Aeroplanes Are Worth Half Million Troops, Says British Authority 365
Secretary John D. Ryan Outlines Aircraft Policy 365
U. S. Army Air Programme Provides for Training 30,000 Fliers. 366
American Aviators in France 366
News of the Week 367
U. S. Arial Mail 370
Military Aerostatics 371
Aircraft Trade Review 372
Loughead Plane to Fly Across Continent 373
The French A. R. Biplane 374
Problems of Crankshaft Design 376
Some of the American Planes in the Recent Allied Air Drive 380
Artillery Observation 382
The Forceful Suggestion of "PLANE TALK" 384
Naval and Military Aeronautics ... 385
Foreign News 388
Model News 389
Aeronitis 390

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879


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PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., October 28, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, OCTOBER 28, 1918 NO. 7

TEN THOUSAND AEROPLANES ARE WORTH HALF MILLION TROOPS, SAYS BRITISH AUTHORITY

LORD SYDENHAM, British authority on fortifications, says in a message received by Major-Gen. Kenly, Director of Military Aeronautics, on October 18:

"Impress upon your people that 10,000 aeroplanes at this juncture are worth more than 500,000 troops on the ground, and will not require nearly so much transport. We can bring Germany to terms by air force, that is certain.

This comes as a timely request. Ten thousand bombing planes—the largest that can be built—can be produced in a comparatively short time in the United States. Many aircraft factories that are working at only part of their capacity because of lack of orders large enough to keep them going at full speed are ready to speed up. There are other firms going at full speed who feel that they are "rushing out of a job," because they have no orders to look forward to or to prepare for. And there are other manufacturers of component parts, scores of them, ready to fill orders.

There is, of course, going to be work for all—and more. Now that Second Assistant Secretary of War John D. Ryan is back, we may soon expect the word: "Go ahead!" Everything was waiting for his return.

SECRETARY JOHN D. RYAN OUTLINES AIRCRAFT POLICY

IN one of the official interviews during the past week, Second Assistant Secretary of War John D. Ryan outlined the aircraft policy.

Mr. Ryan said that the object of his trip to France with Secretary Baker was to acquire in the shortest possible time the best information regarding production and operation in the Air Service, not only of the United States or its Expeditionary Force in France, but of the allies as well, and to endeavor to bring to our own service whatever was found to be desirable and that would effect the best results. Continuing, he said:

Work of U. S. Airmen Commended

"Upon reaching France I went almost immediately to the front and was with our air forces during the St. Mihiel fight and also the one in the Argonne. I believe that in both these offensives the air forces were stronger in numbers and perhaps as high in efficiency as in any battle of the war. This opinion was expressed by both the French and British commanders as well as by our own. The air forces in both offensives were under the direction of the American commander, and while the French furnished a large part of the forces used and the British co-operated, the American squadrons made up about half of the number participating. The testimony of all commanders, both our own and those of the Allies, was to the effect that our machines were fought well and that our pilots distinguished themselves. Their commendation of the work of our pilots was tempered only by a suggestion that perhaps our boys were too venturesome and overcourageous, and I am inclined to believe that restraint more than anything else in the fighting of aircraft is necessary for our pilots.

De Haviland Planes

"The United States DeHaviland planes were in general use for observation and day bombing in both the St. Mihiel and the Argonne attacks and the pilots were to a man enthusiastic as to their performance, and while individual pilots and commanders had suggestions as to improvements and betterments that might be made, they were individual and seldom indicated anything more than a personal preference for some rearrangement of details. The commanders of all the squadrons using De Haviland planes as well as planes of British and French manufacture for like purposes, told me that the pilots in every case would prefer to take a De Haviland machine with a Liberty engine over the line rather than any machine of a like type. This is due to the fact that the machines is fast and for one of its type is quite maneuverable; that it climbs well and the pilots all agreed is a very efficient machine for the uses for which it is intended.

To Use All Manufacturing Resources

"In Paris and also in London I met at conference the heads of the air ministries of France and Great Britain, and the whole question of joint program both as to production and operation was gone into, with the result that the program now aimed at by the United States and the Allies is one that should utilize to the best advantage the facilities and the resources of all the countries on our side of the war in materials as well as in men. The air ministers of the other nations were all in accord in arriving at this understanding, and I came home pledged to them and they to me to carry out in the closest co-operation a combined program that has the approval of the commanding officers, as well as the heads of the air ministries of the other countries. The combined air services will be directed as the armies are, and while the commanding general of each of the nations controls his own air forces, he places it at the disposal of the commander-in-chief, just as he places the divisions of his army, and the result has already been seen in the great concentration of aircraft fighting at St. Mihiel and the Argonne such as has never been brought about in any previous action of the war.

Demand for Liberty Engines

"On my trip the Liberty engine was the cause of more worry to me than anything else because all of the allied nations were demanding more of them than could possibly be supplied. French, British and Italians have used the Liberty engine in their own machines at the front, and their building programs as now laid out are based to a considerable extent upon obtaining a supply of these motors in this country. I come home feeling that our allies consider the success of the United States in producing this engine in large numbers one of the greatest accomplishments in the war. Both the British and the French are now putting the Liberty motor in planes that formerly carried engines of either a heavier weight or less power. I can safely say that the Liberty engine, with its high power, combined with lightness, has greatly increased the efficiency of some of the planes that the Allies have been using at the front for some time. Their representatives even expressed themselves to me that it has made new machines of several of their old types.

Ten Thousand Motors Turned Out

"While I was abroad the 10,000th Liberty motor was turned out in Detroit. When you reckon that 10,000 of these en-

gines will develop 4,000,000 horsepower, you realize what it means to the air forces on our side to have them in such quantities, and that this total has been produced virtually since May 1, or in five months' work.

"From now on my effort will be so to lay down the policy of production and the training of pilots in this country as to perfectly fit such work into the combined program of the Allies, so as to put into operation at the front in the shortest possible time the greatest air power and efficiency in order to help win the war at the earliest day."

U. S. ARMY AIR PROGRAM PROVIDES FOR TRAINING 30,000 AVIATORS

THAT the U. S. Army Air program provides for the training of 30,000 aviators was made public on October 16 during the testimony of Colonel H. H. Arnold, of the U. S. Air Service, as given to the House Appropriations Committee. The following is from the New York *Times:*

"Colonel Arnold, who appeared before the committee together with Major Gen. Kenly, chief of the army air division, told the committee that 11,000 fliers have already been trained. During the testimony it came out that there are 8,390 American fliers in France and 6,210 in this country.

"Revelations of a 'scandal' in the purchase of cameras for the aeroplanes were made when it was testified that some one in the Aviation Department had been connected with a camera company which obtained contracts. It was implied that Chas. E. Hughes is looking into the matter.

"It was shown that General Pershing has such faith in the value of the military balloon that he doubled his orders for them. It also developed that Sandy Hook probably will be used for a repair depot for coast defense aeroplanes.

"Chairman Sherley of the Committee asked Colonel Arnold if there was any difficulty in obtaining candidates for fliers' commissions. The officer answered that every time a need for cadets came up more appeared than could be taken care of. He said that none, except a few men from the ranks, had been taken in since last December.

"Colonel Arnold said that the army plan was, as far as possible, to get university men, and this was a recent ruling of the War Department. Enlisted men were allowed to enter, and 1,500 of them had qualified, he said.

"Testifying on the Division of Military Aeronautics, Colonel Arnold said that there are now 39 balloon companies organized, and that 329 balloons had been produced to date. These, he said, would 'take care' of 162 companies. He said there were two balloons to a company.

"The disclosures concerning the cameras came out when Colonel Arnold gave the following testimony:

" 'When the photographic section first started in operation there was competition between three different firms, but for some reason or other there was some breath of scandal and that caused great delay in receiving equipment for several months. The Motlau Camera Company, the Eastman Company, and there was a third camera company, the name of which I have forgotten, bid on the cameras. It appears now that the camera which was accepted was not the most suitable for aerial photography.

" 'However, a certain number of them were purchased, and they are being used, but they are probably not as good as some other camera which might have been obtained at that time. The scandal part that came about was that a man in the Aviation Section was connected with the firm that was making the camera.'

"The Aviation Section purchased the Motlau camera, but at present, so the testimony ran, is buying a foreign-made camera and rebuilding it in this country.

"At present there are in the army air service 355 squadrons, and 450 are contemplated, according to Colonel Arnold. He said 9,000 enlisted men would be obtained in September, and these would supply about sixty squadrons.

" 'Just what proportion depends on what General Pershing asks for,' he said. 'In all probability it will be about fifteen or twenty squadrons more this month, and increased until by the end of November we expect to have them all.'

"Extra pay for the flying cadets was asked for during the hearings. When they first went into the service, candidates for commissions received extra pay, first of $100 monthly, and then $75, because of the hazard. This was eliminated, but the aviation authorities asked that the extra $75 be restored."

AMERICAN AVIATORS IN FRANCE

(*Editorial in New York Times*)

ASSISTANT SECRETARY OF WAR JOHN D. RYAN, in charge of aircraft production, has return from France and England with such a favorable report of his mission that there should be no more anxiety about America's contribution in material and aviators to the campaign on the western front. Perhaps the best news he brings home is the announcement of an agreement between the Allies to "pool their resources" and to provide for "unity in the air." Each commander, French, British, American, Italian, will direct the operations of his aviation force, but the combined forces will be at the disposal of Marshal Foch, who may call for concentrations and service at any point to execute his strategical plans. Unified command in the air as well as on the field is assured.

Before Mr. Ryan visited England and France some material was dispatched from the United States to be assembled in France, but there was no compact to "pool resources" and make the best use of labor and material for the common cause; all that seems to have changed; henceforth the Allies will waste nothing, lose no time in production, avoid duplications, and work in harmony toward the peak of production. They will be able, if the war lasts into next Spring and Summer, to overwhelm the enemy in the air, to prevent any reconnaissance at all by him, to smash his troop concentrations, to bomb and destroy his bases.

A few months ago, when American aircraft production was so behindhand that there were no bombing and combat planes of American make on the western front and not enough training planes to supply our large aviation force as organized, no one was disposed to believe that American aviators would take a conspicuous part in the Summer and Autumn offensives in France. It seemed fatuous to hope that General Pershing would have the American machines and enough American pilots, observers, and fighters. But, thanks to timely exposure of the deficiencies of production and to the rigor of investigation by committees in Congress, also to reorganizations undertaken by the War Department in response to public opinion, motors were at last produced in quantity, and a beginning was made in shipping to France aeroplanes all ready for use and materials to be assembled at the aerodromes. Let Mr. Ryan tell the story of what he was privileged to see at the front:

"I was with our air forces during the St. Mihiel fight and also the one in the Argonne. I believe that in both these offensives the air forces were stronger in numbers and perhaps as high in efficiency as in any battle of the war. This opinion was expressed by both the French and British commanders as well as by our own. The air forces in both offensives were under the direction of the American commander, and while the French furnished a large part of the forces used and the British co-operated, the American squadrons made up about half the number participating."

The only criticism of the performance of the American airmen was that they were too daring, took too many chances, and did not always make the best use of their opportunities; but the faults were largely virtues, and with more experience our airmen will have no superiors in offensive tactics. About the planes we are now building, installing Liberty motors in them, there cannot be two opinions. The Liberty motor, light and powerful, is so efficient that our Allies will take all that we can spare. The ten thousandth Liberty motor was completed at Detroit while Mr. Ryan was in France. A De Haviland plane equipped with this motor is always a prime favorite with the Allied airmen, because it is fast and climbs easily. An American built de Haviland flew from Dayton to Washington a few days ago in two hours and fifty minutes, at the rate of 143 miles an hour, and the pilot reported that he had no difficulty in holding his course true the entire distance. That is the kind of machine we are sending to the other side. No wonder England and France want the Liberty motor in quantities.

It is high speed and ease of handling that make the American planes so formidable on the western front. In group fighting with the Germans the American airmen are almost uniformly victorious. General Pershing's bulletins tell the same story every day, a story of unchallengeable superiority. If the war were to end tomorrow, it could be said that the American airmen had excelled in reconnoissance and combat. If the war should go on, the enemy on the American front would soon find himself driven from the air and helpless.



THE NEWS OF THE WEEK



Ryan Says Liberty Motors Have Passed the Ten Thousand Mark

Washington, D. C.—With the Allies unquestionably supreme in the air, definite arrangement has been made for a combined program of production and operation of aircraft in this country.

Unified war in the air will result, according to Assistant Secretary of War Ryan, in charge of our air program, who has just returned from France.

The aim of the unified program, Secretary Ryan said, "is to get the best results in the shortest possible time, and thus help to hasten the conclusion of the war."

Hereafter a policy of keeping secret the plans and figures on aeroplane production will be enforced.

Ryan said all pilots preferred American-made machines when available. He praised American pilots as equal to the best—quick witted, though perhaps inclined to be reckless and overventuresome.

At St. Mihiel and in the Argonne, he stated, there was a larger amount of American-Allied aircraft than in any other particular battle. He also stated that Liberty Motor production had passed the ten thousand mark.

Costly Country Club to Promote Aviation

Actuated by the patriotic impulse which has brigaded American big business into the national war plan, a group of men of first business importance in New York, Baltimore, Chicago, San Francisco and other cities have acquired a large tract of land at Lloyd's Neck, Long Island, for the purpose of extending the work of the Government in aviation and hydroaeroplane practice. The project, which has been completely formulated, is under the presidency of Reginald C. Vanderbilt, with Alan R. Hawley, President of the Aero Club of America, as one of his many associates.

For this purpose the Lloyd's Neck Club has been incorporated, with Mr. Vanderbilt as President. The Vice Presidents are Harry Payne Whitney and Lawrence Lewis Gillespie. Samuel Willets is the Secretary, and Henry Sanderson the Treasurer. Their associates on the Board of Governors are C. Oliver Iselin, Edwin D. Morgan, Frederick N. Watriss, Elbert H. Gary, General T. Coleman du Pont, Cornelius K. G. Billings, Leroy W. Baldwin, Frank C. Henderson, William Russell Grace, A. Kingsley Macomber, Arthur V. Davis, Roy A. Rainey, Nicholas F. Brady, William R. Coe, and William Goadby Loew. Mr. Watriss and Chares K. Beekman have worked out the necessary legal details of this club for national service.

The Lloyd's Neck Club property consists of 260 acres facing Long Island Sound a few miles from Oyster Bay and Huntington. It is about thirty-nine miles from the Queensboro Bridge, with fine roads for motoring leading to the point. On the property is a fresh-water lake covering ten acres. The location for schooling and post-graduate work in aviation and hydro-aeroplaning is therefore ideal. A farmhouse on the property, together with portable barracks, will furnish comfortable accommodations for aviators.

The expense of arranging aeroplane and hydro-aeroplane landings and practice fields is negligible, and to this essential end the officers of the club soon will be in communication with the National Government. Coal will hardly be needed, as a large supply of timber is part of the resources of the property and will be utilized.

After the war the Lloyd's Neck Club will become a great centre of outdoor social and sporting life, one of the largest, best equipped and most representative of country club plantations in the metropolitan district, although the governors will for all time maintain its identity as a phase of the Air Service of the Government. This national idea will be one of the basic principles of the organization. In the near future the clubhouse will be erected. An eighteen-hole golf course, 6,000 yards in extent, has been surveyed.

The plan calls for a polo field and a race course a mile in length, with grand stand, ample stables, and the encouragement of all forms of outdoor sport in summer and winter, with special attention to yachting. Just now the shooting on the plantation is excellent.

A certain number of persons not engaged in military or naval aviation will be enabled to join the club in the immediate future at moderate initiation fees and dues, for the purpose of building up a club fund, so that the Government may not be under expense. The aeroplane and hydro-aeroplane landings and practice fields will be for the free use of United States and allied officers.

Roland Rohlfs in 26,300 Feet Altitude Flight in Curtiss-Kirkham Triplane

According to a special despatch in the Buffalo Express, Roland Rohlfs, of Buffalo, experimental pilot for the Curtiss Engineering Corporation, on October 5 established a new record for altitude



Lieut. Sam Mustain, of California, who is now overseas

with load at McCook Field. He was flying the new Curtiss-Kirkham triplane.

Rohlfs is credited with a ceiling climp of 26,300 feet. He was in the air less than two hours. The climb was made with the use of oxygen tanks. The instruments on Rohlf's board recorded a temperature of ten degrees below zero.

Experts are highly pleased with the tests that have been made here of the new American invention. Rohlfs has been demonstrating the Curtiss-Kirkham innovation to selected groups of army and navy officers for the last ten days. His tests completed, he has returned to Garden City, L. I., where the Curtiss Engineering Corporation is located.

The Curtiss-Kirkham triplane and biplane, it is understood, embody new principles of fuselage and wing construction and an entirely new engine.

Remarkable in this altitude flight was the speed the engine maintained at this great height of five miles with the temperature ten degrees below zero.

Rohlfs's machine during the flight was loaded with two machine guns and their cartridge drums and other deadweight equal to the weight of an observer. Because of this extra weight the flight becomes as notable as that by Captain R. W. Schroeder at the Wilbur Wright Field on September 18. In a single-seated Bristol fighter Captain Schroeder ascended 28,900 feet. He was flying without weight. His climb has been certified as official after the most careful tests of his recording instruments.

National Advisory Committee Meets

At the annual meeting of the National Advisory Committee for Aeronautics, held at Fourth Street and Missouri Avenue, Washington, D. C., on October 10, 1918, reports of progress in the scientific study of the problems of flight were submitted by the Executive Committee and ordered published in the Fourth Annual Report, which will be submitted to Congress in December. The committee reviewed the present state of the art and adopted estimates for continuing further experimental and research work for the following fiscal year.

In the absence of the Chairman, Dr. W. F. Durand, who is at present in Paris, Dr. John R. Freeman, of Providence, R. I., presided. The officers of the committee and members of the Executive Committee were elected and appointed to serve for one year, as follows:

Chairman, Dr. John R. Freeman; Secretary, Dr. S. W. Stratton. Members of the Executive Committee: Dr. S. W. Stratton, Dr. J. S. Ames, Dr. J. R. Freeman, Dr. J. F. Hayford, Major General W. L. Kenly, U. S. A.; Professor C. F. Marvin, Dr. W. C. Sabine, Rear Admiral D. W. Taylor, U. S. N.; Lieutenant Commander J. H. Towers, U. S. N.; Dr. C. D. Walcott.

Immediately following the meeting of the full committee the Executive Committee met and elected Dr. C. D. Walcott Chairman of the Executive Committee and Dr. S. W. Stratton Secretary of the Executive Committee.

Liberty Motor Triumphs

Washington.—The British Air Mission in this country has handed to William C. Potter, Acting Director of Aircraft Production, a cablegram sent from London, under date of September 26, by the British Air Ministry reporting another satisfactory performance by an American Liberty motor in a test performance in England.

"After 100 hours' flying," said the message from the British Air Ministry, "one engine (Liberty) was stripped and found to be in very good condition. Tests have been made in the air in de Haviland 9-A and de Haviland 10 machines. Engines have performed uniformly satisfactorily in these tests. Information officially expressed four months ago to the effect that the engine would prove satisfactory in service is fully confirmed."

Plane to Bomb Berlin May Be Ready Soon

Washington.—Giant bombing aeroplanes capable of reaching and bombing Berlin, despite its distance from the fighting front, are being developed by British experts, according to information reaching Major General William L. Kenly, Chief of Military Aeronautics.

Whether Berlin will be bombed probably depends on the speed of the enemy in accepting the conditions precedent to an armistice and peace as laid down by President Wilson. The advance in Belgium and Northern France is daily reducing by many miles the distance between the fighting front and the German capital and important German industrial cities.

The difficulty has been to develop a plane capable of carrying sufficient gasoline to make the journey to Berlin and at the same time carry enough bombs to do substantial damage. The British are confident they have solved this problem.

Morane, Air Pioneer, Dies

Paris.—Leon Morane, the French aviator and aeroplane builder, is dead. Leon Morane during the autumn of 1909 and the spring of 1910 forged to the front of French airmen, finally becoming the premier ace of the period. In July of 1910 he established a new record for speed, and five months later he drove his machine to a height of 8,471 feet, at that time the greatest altitude attained by an aviator. He was injured in October, 1910, and afterward gave his entire attention to the construction of aeroplanes.

8,390 of Our Airmen Already in France

Washington.—The present army aviation program contemplates training 30,000 aviators. This became known on October 16 when testimony by Col. H. H. Arnold, as given to the House Appropriations Committee, was made public. Col. Arnold, who appeared before the committee together with Major-Gen. Kenly, chief of the army air division, told the committee that 11,000 fliers have already been trained. During the testimony it came out that there are 8,390 American fliers in France and 6,210 in this country.

It was shown that General Pershing has such faith in the value of the military balloon that he doubled his orders for them. It also developed that Sandy Hook probably will be used for a repair depot for coast defense aeropanes.

Chairman Sherley of the committee asked Col. Arnold if there was any difficulty in obtaining candidates for fliers' commissions. The officer an-

swered that every time a need for cadets came up more appeared than could be taken care of. He said that none, except a few men from the ranks, had been taken in since last December.

Col. Arnold said that the army plan was, as far as possible, to get university men, and this was a recent ruling of the War Department. Enlisted men were allowed to enter, and 1,500 of them had qualified, he said.

Testifying on the Division of Military Aeronautics, Col. Arnold said that there are now 39 balloon companies organized, and that 329 balloons had been produced to date. These, he said, would "take care" of 162 companies. He said there were two balloons to a company.

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"Just what proportion depends on what General Pershing asks for," he said. "In all probability it will be about fifteen or twenty squadrons more this month, and increased until by the end of November we expect to have them all."

Extra pay for the flying cadets was asked for during the hearings. When they first went into the service, candidates for commissions received extra pay, first of $100 monthly, and then $75, because of the hazard. This was eliminated, but the aviation authorities asked that the extra $75 be restored.

Aircraft Hearings Ended, Hughes to Prepare Report

Washington.—Hearings in the investigation of aeroplane production by the Department of Justice practically were completed on October 11, and final drafting of the report will begin next week. Charles E. Hughes, who is conducting the investigation, declined to say how long it will take to complete the work, but it is understood two or three weeks will be required.

Deliveries of Aircraft Bombs

Quantity production five months after the first deliveries was the achievement of American manufacturers of aerial projectiles. Official announcement of this was made October 11.

First deliveries of the "demolition" and "fragmentation" bombs were made in April. Since then more than 3,000,000 of the projectiles have been turned over to the Government.—*New York Tribune.*

Air Raid Thrills Washington

Washington.—Word of the first great American air raid against the German camps north of Verdun sent a thrill through War Department officials on October 10, although no official report of details had been received.

So far as could be learned, however, the participation of 350 machines in this one enterprise marks it as the greatest air offensive yet undertaken on the Western front in point of number of forces employed. No record could be discovered here showing either Allied or German bombing raids on anything like a similar scale.

No official comment could be obtained pending the receipt of formal advices. There is every reason to suppose, however, that a considerable portion of the bombing planes used were De Haviland bombers, built in the United States and equipped with Liberty motors. Shipments of these machines to France have now reached considerable proportions, and recent performance reports from France have been encouraging.

The language of the account of the raid, permitted to pass by the American military censor, is taken here to indicate that the operation was a joint enterprise, with French and possibly British aeroplanes aiding in the protection of the Americans. The reference to fifty triplanes included in this great air fleet found no explanation here. If they were operated by American pilots they are French-built machines, and no details of the equipment obtained abroad by General Pershing have been released for publication.

The fact that only thirty-two tons of bombs were dropped by such a force struck some air service officers as surprising. The ordinary bomb capacity of a fleet of the kind described for such a short trip probably would be ten times that weight of explosives, it was said.

Air Service Citations

General Pershing has cited Second Lieut. Earl W. Porter, observer, Air Service. "For extraordinary heroism in action near Lassigny, France, August 9, 1918. Lieut Porter, with First Lieut. Charles Raymond Blake, pilot, while on a reconnaissance expedition at a low altitude and beyond the enemy lines, was attacked by five German battle planes. Although wounded at the beginning of the combat, Lieut. Porter shot down one of the enemy machines and by cool and courageous operation of his gun while his pilot skilfully manœuvred the plane, fought off the others and made possible a safe return to friendly territory."

Bombing Plane Reaches Utica

Capt. E. T. Waller, who started from Mineola Field early for Dayton, Ohio, in the Langley, the first large Handley-Page bombing machine built in America, arrived safely at Utica late in the afternoon, according to a message received by the Standard Aircraft Corporation at Elizabeth. He encountered strong winds. The Langley, which is driven by Liberty motors, was turned over to the Government July 6.

Fells His 109th Aero

Paris.—Lieut. Rene Fonck, according to an announcement made here on October 9, has brought down four German aeroplanes within twenty minutes on the same day.

Fonck now is credited with seventy official victories and has actually brought down 109 German planes.

Lieut. Brody, Aviator, is Reported Missing

Lieut. Alton Alexander Brody, Aviation Service, a formed student at New York University, is reported among the missing in France.

His father, Joseph M. Brody, who lives at the Hotel Brunswick, 22 East 89th Street, received the following telegram from Acting Adjutant General Harris at Washington:

"Deeply regret to inform you that Lieut. Alton Alexander Brody, Air Service, is officially reported as missing in action since September 15. Will report first information received."

Lieut. Brody enlisted in the army in April, 1917, and was one of the first men at New York University to enter service. He was at that time a student in the School of Applied Science at University Heights.

Airman Saved TNT from Fire

Washington.—Eight million pounds of TNT were saved from destruction in the recent fire at the Gillespie shell loading plant at Morgan, N. J., by an army aeroplane which flew over the wrecked works at an altitude of 1,000 feet and directed the fight against the flames.

The War Department announced the feat on October 16, disclosing that the plane was piloted by Lieut. Cyrus F. Smythe, with Maj. H. L. Armstrong as observer.

Aviator A. L. Gates Reported Missing

Washington.—Lieut. Artemus L. Gates, naval aviator and former captain of the Yale football team, has been missing since October 4, the Navy Department has been advised by Vice-Admiral Sims.

The message gave no details, and it was announced that the department has asked for additional information.

Aeroplanes an Aid to Wounded

Paris.—The aeroplane is now to be used to bring help and medical assistance to the wounded on the battlefield. "Aerochir" is the name given to this new type of messenger in a communication made this week to the French Academy of Medicine. It is the invention of a Russian engineer and scientist, Nemirovsky, and a French doctor, Tilmant; it has the indorsement of all the best French surgeons, including Dr. Carrel, and already plans for the formation of a first squadrilla are under way. An aerochir is used to carry the surgeon to the wounded. It is, in fact, a small first aid station in itself equipped with all the necessities for surgical and X-ray assistance. "Give me a shelter and some wounded and I can begin to operate at once," the surgeon can say, landing in no matter how remote or difficult a spot, or, if an operation is immediately necessary and the spot not actually under fire, the stationary aerochir can be used as an aid station. They had even at first thought of operating while in the air, but this proved impractical because of the instability of even the steadiest plane.

The plane used is a special triplane machine which carries, in addition to the pilot, a surgeon and an assistant. The power for a small sterilizing plant and for the X-ray apparatus is supplied by the motor of the plane, which is detached from the propelers and kept running.

The equipment, which, although necessarily limited, is sufficient for any immediate purpose, includes a light folding table of aluminum, so arranged that in an emergency it can be mounted on the aeroplane itself; a complete wash-stand, also folding; two smaller folding stands; two water containers, each holding twelve quarts of sterilized water; a sterilizer and a supply of sterilized bandages, gauze, linen, etc.

The first squadrilla of these "aerochirs" will be named the "Esqudarille Pozzi," in memory of the famous Dr. Pozzi, who was recently brutally murdered in his consulting room by a demented patient, and who before he died took the most vivid interest in the idea of these winged angels of mercy.



The Italian S. I. A. Biplane, one of the most efficient Italian machines

Officers With Ratings Below 45 Points

1. General Order 85, War Department, 1918, provides that—

"Whenever the average of a rating and revised rating of any officer falls below 45 points, the rating will be reviewed by the personnel board appointed under the provisions of paragraph 2, General Order 78, War Department, 1918. If the rating in question is verified by this board as falling below 45, the commanding officer will recommend to the Adjutant General of the Army that the officer in question be either

(a) Placed upon probation until next regular rating; or

(b) Transferred; or

(c) Discharged from the service.

"Any officer placed upon probation or transferred because of low ratings, the average of whose rating and revision at any subsequent time is less than 45 points, will be recommended for discharge from the Army."

2. It has been found that many officers whose rating falls below 45 points are serving in a branch or arm of the service for which they are not fit. The personnel adjutant will, therefore, draw from the file of officers' qualification cards the cards of all officers the average of whose rating and revised rating falls below 45 points. He will study the card and any other evidence to discover the qualifications underlying the officer's greatest success in civilian life and to state what branch of the service (if any) requires for its officers those qualifications. Cognizance will be taken of the officer's physical qualities, his intelligence rating and all civil and military experience. The personnel adjutant will attend the meeting of the personnel board when such cases are considered and will make a report and recommendations.

3. It is the intention of the War Department to transfer all such officers as in the opinion of the personnel board can be utilized to good advantage in different branches of the service, rather than to recommend their discharge. Careful review of each case is therefore imperative.

By order of the Secretary of War.

PEYTON C. MARCH,
General, Chief of Staff.

New Army Balloon School at Lee Hall

To complete the construction of the new balloon school at Lee Hall, Va., the allotment of $203,000 has been approved by the Assistant Secretary of War. This balloon school is for the training of officer observers in the control of artillery fire from observation balloons. Lee Hall will be a finished school for air service officers in aerial observation and will co-operate with the artillery stationed there. In this manner the officers will receive actual experience in artillery fire adjustments, directing the same from observation balloons, in the air, just as they will do at the front.

The completed plans for the new school include about 60 buildings, among them being a balloon shed, aero repair shop, garage, fire house, photo laboratory, as well as mess halls, barracks, school buildings, etc. The capacity of the school will be more than 1,000 men.

Major Harry R. Vaughn is the commanding officer.—*Exchange.*

New Record Flight

Lieut. H. H. Wells of March Field, with Col. W. N. Hensley, Jr., commanding officer of the Arcadia Balloon School as passenger, flew from Arcadia to Mather Field, Sacramento, in 5 hours and 45 minutes. Two stops were made en route, at Merced and Bakersfield. The time of the flight is a record for army planes over the same route.

Col. Hensley will remain at Mather Field to receive flying instructions.—*March Field Flyleaf.*

Service Stripes to Date from Arrival

The computation of time for the wearing of the gold service chevron will in future be made from the date of arrival at a French, British or other European port, according to a cablegram from Washington just received at G. H. Q.

In the past this time has been reckoned from the date on which the transport left United States territorial waters. Now, instead of counting from the first day out, we shall have to count from our first day in.—*The Stars and Stripes.*

Telegraphers Wanted

The War Department authorizes the following:

The Signal Corps needs seven hundred and fifty bonus telegraphers for service in France. Men skilled in telegraphy, between the ages of 18 and 55, inclusive, should apply at once for details to the Chief Signal Officer of the Army, Washington, D. C.

Requisitions have been received from General Pershing for 750 bonus Morse telegraph operators to be sent to France between now and June 30, 1919. One hundred and fifty qualified men are to be sent abroad immediately and the balance will go overseas at the rate of about 80 per month.

Men between the ages mentioned above, who are qualified, are needed badly at the front and unusual opportunities are offered them for early service. Bonus telegraph operators who enter the service will not be kept in training camps for instruction, but only for a sufficient time to outfit them with the necessary clothing and equipment.

Qualified bonus telegraphers who have physical disqualifications for active service will be accepted for this duty overseas. The Signal Corps states specifically that the physical standard will be lowered in cases of men having the necessary technical qualifications, so that practically anyone who is physically able to do this work will be accepted.

Aeroplanes Fly Over Liberty Parade

The parade on Fifth Avenue, New York City, on Columbus Day—Liberty Day; call it what you will—in aid of the Fourth Liberty Loan was nothing more or less than a bit of history. Very few people realized as they watched the different units and personages march by that they were looking at something the like of which the world has never seen before. Perhaps the only time when a parade closely approximating this one took place was in London, England, on the occasion of the late Queen Victoria's Diamond Jubilee in 1897. There were more troops in the jubilee parade, but at that time aeroplanes were not thought of as they are to-day. The parade on Liberty Day had just got under way when there appeared overhead formation after formation of aeroplanes. These flew up and down the parade throwing out Liberty loan literature.

De Haviland "Fours" appeared at three different levels. The lowest flew along at about two to three thousand feet. The steady roar of their Liberty Motors was drowned out in the cheering their appearance occasioned. De Havilands were also nying as high as twelve thousand feet and higher, their wings being just little specks of white. Besides the D. H. planes a number of training planes also flew along the parade. These planes came from the Provisional Wing at Mineola, Long Island. There were over one hundred altogether.

Aerial Observers Urgently Wanted

Washington.—General Pershing has sent an urgent call for air service observers, which the Aeronautical Bureau of the army is making prompt efforts to fill from civil life as well as from the army. A strong response from the daring spirits of the country is hoped for. There is no limit in the number to be accepted for training, and qualified men are certain to get quick action.

In announcing the needs of the expeditionary forces Major General Kenly, chief of the bureau, said there were no rigid age limits nor other limitations. It is up to the man himself. If he thinks he can stand the hard, dangerous service and can pass the rigorous physical and other tests, he will be trained for twelve weeks and sent over.

General Kenly said: "We will guarantee to get men who qualify to France without delay."

After reviewing the work of the aerial observers in the war and outlining how the results of their observations greatly facilitate the movement of troops and the artillery bombardments, General Kenly made public a letter from General Pershing to the chief of the American Air Service in France which without doubt refers to the great air raid north of Verdun in which 350 machines, probably a majority of which were American, took part.

For military reasons, no details of the operations could be made public here. But the letter, which explains itself, follows:

"Please accept my sincere congratulations on the successful and very important part taken by the air forces under your command in the first offensive of the First American Army. The organization and control of the tremendous concentration of the air forces, including American, French, British, and Italian units, which has enabled the air service of the First Army to carry out so successful its dangerous and important mission, is as fine a tribute to you personally as is the courage and nerve shown by your officers a signal proof of high morale which permeates the service under your command.

"Please convey to your command my heartfelt appreciation of their work. I am proud of you all."

Canada's Premier Ace Here from War

Lieut.-Col. William Avery Bishop, Canadian ace of aces of the British Royal Air Force, whose active fighting days ended four months ago when he was appointed to the British Air Board, has arrived at an Atlantic port on a month's visit to his home at Owen Sound, near Toronto, wearing the insignia of still another war decoration for valor in the air. His latest medal is the Cross of the Legion of Honor, first class.

In addition to his most recent decoration Lieut.-Col. Bishop has all of the French war medals. He has twice been decorated with the British D. S. O., and has won the coveted of all British medals, the Victoria Cross.



The first annual banquet of the Faculty of the West Side Y. M. C. A. Aeroplane School held at the Hotel Martinique on October 6th. Mr. Augustus Post, of the Aero Club of America, was the guest of honor

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

Douglas Fairbanks Flies to New York as Aerial Mail

It was quiet for Douglas Fairbanks on October 9th. The movie studios have shut down for a month because of the Spanish influenza, so there were no windows for "Doug" to vault through, no buildings up which to climb like a human fly, no chasms to leap with a running broad jump, no ruffians to knock about, no South American revolutions to stop single-handed.

Therefore, to repeat, it was a slow day for "Doug." All he did was to fly from Washington to New York in a Curtiss biplane with a 16-cent stamp on a tag in his buttonhole to indicate that he was classed as third-class mail matter, and then sell $2,000,000 in Liberty Bonds, indicating that he is a first-class bond salesman.

Fairbanks travelled in a regular mail plane piloted by Dana D. DeHart and was tagged as a parcel sent from the Postmaster of Washington to the Postmaster of New York. He left Washington at 11.45 A. M. and arrived at Belmont Park at 2.55 P. M., only a quarter of an hour behind schedule time.

The plane stopped at Trenton and Philadelphia and circled around all the other cities on the way, dropping Liberty Loan placards. Secretary McAdoo arranged the trip after Bernard M. Baruch had agreed to take a $1,000,000 subscription from Fairbanks if the actor got somebody to match it. The actor decided New York was the only place where he could do that.

On arriving here Fairbanks, dirty and greasy, without changing his aviator's togs, hurried to the office of Harvey Fisk & Sons, bankers, at 32 Nassau Street. He got the firm to match Mr. Baruch's subscription promptly.

New York-Chicago Aero Mail this Winter

In a letter to AERIAL AGE, Second Assistant Postmaster Otto Praeger says:

"I beg to advise that the New York-Chicago route will be established by the Post Office Department this winter, as soon as sufficient machines can be obtained and landing fields completed. Fields are now being laid out at Chicago, Ill., Bryan, Ohio, and Cleveland, Ohio, for this service, and the route will probably be in operation by December 1st. It will be a ten-hour run, including all stops, and will carry approximately 20,000 letters on a trip."

As Others See Us

Quite a lot is being heard just now about aerial mail services, more particularly in neutral countries. A newly formed company intends to inaugurate a mail service between Madrid, Barcelona, and the Balearic Islands; it is to develop eventually into a passenger service. No subsidy is asked for, but merely the provision of authorized landing places and permission to stamp mails carried, according to the Ministry of Public Works.

Its Possibilities

This project is likely to attain some measure of success, not financial, but utilitarian success. First of all, it is out of the sphere of the war, and, in the second place, it may provide an immunity from submarine risks. What the capitalization is to be and how much profit is expected out of the services we are not told. But Spain is reeking with gold, thanks to the neutral benefits derived from the war, and one can scarcely believe that the provision of the necessary capital at a comparatively low cost will be at all difficult.

Aerial Mail Service

By the way, some appropriate calculations have appeared in the daily press in connection with the commercial basis of an aeroplane passenger and postal service. With a capital of $2,500,000 a service of 24 machines could be provided. On a non-stop flight of 400 miles and a minimum service of six medium-sized 300 horse-power machines, carrying 4,000 lbs. of revenue-earning load in addition to the pilot, mechanic, and petrol necessary for a five-hour flight, the cost per ton mile would work out about 45 cents. It would be commercially possible to carry six passengers at 5 cents per mile, while letters could go 800 miles for less than 2 cents per oz.

Promoters May Be Busy

Statistics, according to the cynic, can be made to show anything and prove nothing, according to the point of view. There is something in this. One can scarcely expect these estimates to convince the average man; they are not exhaustive enough; there is an absence of detail sacrificed, one supposes, because detail would prove too dry for the average reader. But it is surprising how people are beginning to realize that aeroplanes have commercial possibilities, just as it has been proved that there military potentialities are great. One wonders if this will continue, and if, on the return of peace, the company promoting fraternity will work on this topic to the disadvantage of the Aircraft Industry, and the gullible public, and to their own pecuniary profit?

Aeroplane Postage Stamps

Mails carried by aeroplane, according to a regulation just announced by the United States Postmaster-General, will be charged with postage at the rate of 16 cents for the first ounce or fraction thereof, and 6 cents for each additional ounce or fraction, of which 10 cents shall be for special delivery service. Such mail shall consist of matter of the first class, including sealed parcels not exceeding 30 ins. in length and girth combined. The postage on

(*Continued on page* 383)

UNITED STATES POST OFFICE AIR MAIL SERVICE

Monthly Report of Operation and Maintenance

AUGUST, 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	PILOTS		HANGAR MEN		MECHANICS		Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST					
							Actual time	Dead time	On plane	Miscellaneous	On plane	Shop time					Gallons of Gasoline	Total time run	Total miles run	Miles run per gal. gas.	Cost per hour	Cost per mile
																		hr. mi.				
39362	$96.90	$18.75	$13.27	$24.29	$29.63	$9.59	$81.07	$15.97	$31.21	$7.43	$72.57	$13.08	$ 3.00	$80.12	$61.50	$558.38	288	11 19	808	2.80	$49.34	$.6910
39363	65.70	7.56	13.27	24.29	29.63	9.59	25.55	15.97	31.21	7.43	52.32	13.08	13.96	80.12	61.50	451.18	219	7 —	629	2.87	64.45	.7172
39364	28.50	1.69	13.27	24.29	29.63	9.59	53.10	15.98	31.21	7.43	57.18	13.08	—	80.12	61.50	426.57	95	3 28	313	3.29	123.05	1.3628
39367	81.60	6.02	13.27	24.29	29.63	9.59	93.31	15.98	37.26	7.42	113.72	13.08	15.95	80.12	61.50	602.74	272	10 36	847	3.11	56.86	.7116
38262	47.52	16.21	14.81	24.29	29.63	9.60	40.21	15.98	13.83	7.42	60.71	13.08	263.06	80.12	61.50	697.97	158	10 13	654	4.13	68.32	1.0672
38274	133.67	44.45	14.81	24.29	29.64	9.60	107.21	15.98	13.83	7.42	140.59	13.09	345.27	80.12	61.50	1041.47	438	30 59	1853	4.23	33.61	.5620
38275	108.00	41.83	23.54	24.29	29.64	9.60	119.26	15.98	25.93	7.42	156.68	13.09	287.12	80.12	61.50	1004.00	354	22 —	1344	3.79	45.64	.7470
38278	103.67	38.84	14.81	24.29	29.64	9.60	104.45	15.98	13.83	7.42	131.49	13.09	153.98	80.13	61.50	802.72	340	25 32	1713	5.03	31.43	.4686
1	117.55	36.49	15.04	24.29	29.64	9.60	177.44	15.98	19.88	7.42	139.25	13.09	139.87	80.13	61.50	887.17	387	24 16	2037	5.26	36.56	.4355
2	81.90	23.47	13.27	24.29	29.64	9.60	166.68	15.98	25.93	7.42	117.95	13.09	4.80	80.13	61.50	675.65	273	14 28	1410	5.16	46.70	.4791
3	52.50	11.13	13.27	24.29	29.64	9.60	102.06	15.98	25.93	7.42	121.64	13.09	22.30	80.13	61.50	590.48	175	12 24	963	5.50	47.60	.6131
4	63.58	8.51	19.40	24.29	29.64	9.60	72.99	15.98	25.93	7.42	172.85	13.09	28.90	80.13	61.50	633.81	209	11 11	773	3.69	56.67	.8199
5	18.30	6.73	13.27	24.29	29.64	9.60	20.52	15.98	25.93	7.42	111.94	13.09	4.80	80.13	61.50	443.14	61	1 47	170	2.78	248.48	2.6067
6	72.45	28.67	13.27	24.29	29.64	9.60	205.71	15.98	25.93	7.42	115.26	13.09	37.45	80.13	61.50	740.39	241	17 48	1606	6.66	41.39	.4610
Total	$1071.84	$290.35	$208.57	$340.06	$414.91	$134.36	$1369.56	$223.70	$347.84	$103.91	$1564.15	$183.21	$1320.46	$1121.75	$861.00	$9555.67	3510	203 01	15120	4.30	$47.06	$.6319

Note.—Depreciation is not estimated in this report, for lack of convincing data, but is reflected in the items under repairs, parts and labor.
Items for rent, light, power, etc.; misc.; dead time of pilots; time of hangar men, misc.; shop time of mechanics; interest on investments; and departmental overhead charges; all of which are not directly apportionable to individual ships, are pro-rated equally between all of the ships.



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F.C., C.F.A.

Commissions Offered in the Balloon Service

Commissions are offered in the Balloon Service, which, like the other branches of the Air Service, is to be greatly extended.

Interesting information with regard to the formation and equipment of balloon companies for the army overseas is contained in the hearings on the deficiency bill before the Appropriations Committee of the House, recently made public.

While the army now has sixty-nine balloon companies, it is proposed to have 175 companies by June 30, 1919, each company being equipped with two balloons, so that while one is down being repaired the other may be in the air.

The balloons are used in the army for observation purposes and are sent up from various distances behind the front lines as captives. Each balloon is equipped with parachutes in order that the observers may leap to safety when attacked by hostile airplanes or are hit or are in danger of being hit by shrapnel.

The balloons signal to the artillery on the ground, giving information relating to ranges, &c., telling when hits are made and when to increase ranges to keep from hitting American troops. In addition balloons are used to make observations of concentrations of enemy troops, to report enemy movements and for dozens of other purposes.

This Government has had no difficulty in getting all the balloons it wants, it was brought out in the hearing, and has been supplying its surplus balloons to the British Government.

Elementary training in balloon observation is given to observers and mechanics at Camp John Wise, San Antonio, Tex., and when the men have completed their preliminary work there they are sent to one of four other schools, where the advanced course is given.

Of the advanced schools, that at Fort Omaha, Nebraska, is the only permanent one. A permanent hydrogen plant, the only one in the country, has been erected there, while balloons at other schools are usually filled from gas supplied by gas cylinders which are shipped to the stations.

The school at Fort Sill, Oklahoma, is for the training of observers who are to be connected with the light artillery, while the school at Lee Hall, Va., is used for observers connected with the heavy artillery. The school at Arcadia, Cal., is for mechanics and for miscellaneous observation work.

Each balloon company is equipped with complete motor transportation in order that the balloon and necessary equipment may be transferred rapidly from one place to another. Included in the motor equipment are eleven three ton trucks, six one and one-half ton trucks, two kitchen trailers, four motorcycles, one touring car and one balloon tender chassis. This equipment, at current prices, costs $63,100.

IF my memory serves me aright, it was early in 1917 when the practice of putting swinging seats in the observation balloon baskets came into vogue. These seats are merely a strip of canvas bent onto two short pieces of wood and the pieces of wood suspended from either side of the basket. There is nothing to them, of course, but when they were introduced they caused several different opinions to be rather explosively brought to light. I remember the first basket we had received in which these seats were fixed. As it happened, several of the officers of the section were present when the brand new balloon was unloaded from the motor truck. The company commander was also among those present. One of the officers had his attention drawn to the innovation by the basket corporal. This officer was one of those who firmly believed that comfort was absolutely necessary to efficiency and that so long as he did his job satisfactorily it did not matter how he accomplished it. He made a remark audibly to the effect that from now on we would be able to sit at our ease while we were strafing the festive Hun. The major happened to hear his remark and upon closer inquiry discovered the cause thereof. His opinion was that the Army was not what it used to be in the good old days. Now everybody was looking for soft jobs and that he for one would not use the seats, and that he would advise very strongly against their used by any of the rest of us. As the seats were rather flimsy looking affairs and as he weighed somewhere in the neighborhood of two hundred and eighty pounds, standing six feet five, perhaps he had another reason for not using the new seats. Two or three days later, when the new basket had been put in use, another reason against their use came to light from an altogether overlooked point. As it happened, the writer was making a flight that day, and after sitting up at about thirty-five hundred feet for three hours, doing very little on account of very low visibility, we were made the victims of an attempt at Hun "frightfulness." A Hun plane came over with the evident intention of destroying our peace of mind and incidentally our balloon. For once our aeroplanes were about. There were lots of them, and they pounced on Fritz and spoiled his little game. Our "Archie" barrage also was working to perfection. However, as soon as the Hun appeared, we, in the basket, as those most vitally interested, discovered him first and immediately made our preparations to descend, via the parachute route. How were we to know that our aeroplanes were round in large numbers. There had been times when a balloon had been attacked by a Hun that all our planes seemingly had gone home for tea. At all events, we were not obliged to take to our parachutes, but after the danger had passed and the Hun had been chased home we discovered that had we had to jump, one of us would not have reached the ground safely. We had both toggled on to our parachutes when we ascended, and while we had been sitting up there, we had fixed our canvas seats. While not in use they hung on one side of the basket. As I said, when the Hun had been chased home, we found that the parachute harness of one of us had led from the parachute into the basket, *underneath the canvas seat* and then to our harness. If we had had to jump, one of those parachutes would have been dragged into the basket and certainly would not have opened if it would have come loose at all. The knowledge that the seats were a source of danger in that way we bought very cheaply. As a rule, experience in the balloon game generally costs more than that. The less there is to think about in clearing a parachute harness the better and the bigger chance of escape there is. After that we made it a rule that when we used the seats we would make sure at the time of adjusting them that they were clear of the parachute harness. These seats do not deserve the amount of space which has been given them, but for the reason given above we have enlarged upon them.



An American-made Caquot in flight

What is known as the optical equipment of the basket consists of binoculars only. We made experiments with a high powered telescope, but found it almost impossible to work with. It is true that under ideal conditions we were able to work with one, but when there was the least wind it could not be kept on the target. Telescopes are not a part of the basket equipment at all. The idea that they are in common use is a widespread fallacy among laymen. With a high-powered binocular it is possible to do better work than with any telescope.

The basket is equipped with glasses of varying powers. For ordinary observation and picking up targets, as well as when beginning a shoot, a pair of 6 power or 8 power glasses are generally used. This is so because of the greater view one gets with a comparatively low powered glass. In beginning a shoot it is necessary to see considerable of the country surrounding the target, else if a round landed several hundred yards away from the target, it would be outside of the vision of the glass and be lost. Indeed, it is quite a common practice in observing the first round or so of a shoot to dispense with the glasses altogether. So as to be sure to get the first round of a series. The high-powered glasses, 10 power, 12 or sixteen power, are of greatest use in picking up the detail of a target when one is trying to identify a certain point, or when one is right on the target and shooting for demolition effect. It used to be the practice for each observer to ascend with three or four pairs of different powered glasses. However, when we had a balloon break away on us one day and drift over in the general direction of Berlin, we found that we were short six pairs of glasses. Glasses were very scarce at that time, too, good ones were more so. Of course, the observers threw out the glasses with the rest of the basket equipment. The glasses or what was left of them were no doubt found by the infantry. The infantry, of course, immediately hunted out the section which had lost them and returned them to us—I don't think. After that we never took up more than two pairs of glasses, one low and the other high powered.

The AIRCRAFT TRADE REVIEW

Splitdorf Victory Meeting

Lieutenant F. Farquhar, discharged wounded British army officer, formerly connected with the Army Signal Corps of the British Army in France, gave a rousing address to his fellow employees of the Splitdorf Electrical Company in the factory yard, 98 Warren Street, at what was designated the Splitdorf Victory Meeting.

Limping somewhat badly from a shattered leg, slowly coming back into use, Lieutenant Farquhar, who went to the front from his position with the Splitdorf Company's London headquarters, dwelt upon the importance of the work of every employee in the factory in winning the world war. "Remember the lives of thousands of brave men depend upon the ignition systems in aeroplanes, motor truck, motorcycle, tanks and whippets, as well as the submarine chasers, and all Splitdorf men in a measure are responsible for these lives," he declared. Continuing, he pointed out the vital importance of conscientiously performing their duties, no matter in what department they happen to be located, and explained the importance of the most minute details of manufacture in actual performance on the battlefield.

He was explicit in the statement that each and every one in the factory was "doing his bit" without a doubt, if that "bit" was the making of ignition devices that in their place would help drive the German beast back toward Berlin. This was received with cheers, and when the meeting developed into a rally for the Fourth Liberty Loan and Lieutenant Farquhar said he was proud and honored to be the first factory subscriber he was greeted with a rousing acclamation. Lieutenant Farquhar announced that he was returning to London in the near future to resume his duties with the Splitdorf Company and he voiced the wish that he could carry the message back that Dixie Magneto makers were working every hour of the twenty-four, not only in turning out magnetos for the big victory, but lending their hard-earned money in the cause of liberty, of righteousness, and justice.

That the prediction of the workman came true was confirmed by the late reports, which indicated that the Splitdorf Electrical Company employees had gone "over the top" with subscriptions of over $125,000 for the Fourth Liberty Loan.

Y. M. C. A. Aeroplane School Moves

The Y. M. C. A. Aeroplane Mechanics School was conceived along the latter part of the summer of 1917 under the direction of Mr. F. S. Gostenhofer; but classes did not begin until November of that year, with a faculty of five members. It was through the efforts of the Aero Club of America that the school received its first equipment, consisting of a Curtiss O. X., a six-cylinder Maximotor, a Thomas Scout biplane complete, and a Standard fuselage—besides a number of spare parts and wings. From the very beginning the school was successful, and ever since then its history has been one of constant growth. Nothing can show the marvelous development better than to compare the payroll of the first month, which amounted to $589.00, with that of October, 1918, which amounted to no less than $6,400.00. To-day the personnel of the school consists of fifty-seven men. Early this year under the leadership of its present principal, Mr. F. F. Tenney, the school outgrew its present quarters at 240 West 52d Street and it was decided to lease a floor in a large building at 239 West 56th Street, where sufficient space for aeroplane work could be found, the former floor being retained for the motor department.

In July the valuable equipment of the Claymont School of Aviation was presented by Colonel Irenee Dupont—again through the efforts of the Aero Club of America, the officers of which directed Mr. Dupont's attention to the wonderful work which the school was doing in training men for the service of Uncle Sam.

At the present time the school is preparing an average of 600 men per month, about 40% of whom go into aircraft factories after graduation, while the rest join the aviation sections of the Army and Navy. This growth has made it imperative to secure larger quarters again, and a location has been found comprising three floors on Broadway and 56th Street.

The present equipment of the school is as follows: Ten Curtiss O. X. engines, 1 Hispano-Suiza, Model "A"; 1 Mabimotor, 6 cylinders; 1 five-cylinder Anzani, 3 fifty H.P. Gnomes, 1 Sectional Monosoupape Gnome, 1 Thomas, 130 H.P.; 1 six-cylinder Hall-Scott (loaned), 1 twenty-cylinder Anzani (loaned).

The plane department has the following equipment: 1 Curtiss J. M. 4, 1 Thomas D. 5, 1 Thomas Scout biplane, 3 Curtiss Model "F" flying boats, 1 Gnome engined looping biplane, 1 Standard fuselage, 1 Wright-Martin seaplane (loaned), number of spare wings, panels and miscellaneous parts.

American 'Plane Makes a Successful Flight

Elizabeth, N. J.—Captain E. T. Waller, British R. A. F. aviator, who left Mineola Field on October 15 in charge of the Langley, the first large Handley-Page bombing machine built in America, arrived safely at Utica, N. Y., en route to Dayton, Ohio, according to a message received by the Standard Aircraft Corporation. Captain Waller reported strong winds were encountered all the way across New York State.

Langley, which is driven by Liberty motors, was turned over to the United States Government July 6.

Those flying in the Handley-Page are: Captain Waller, A. Livingston Allen, navigator; Lieutenant Beck, U. S. A.; Lieutenant Everson, R. A. F., and three mechanics.

The detailed report of the flight will be printed in the next number of AERIAL AGE.

Personal Pars

Donald R. Black, formerly Chief Draftsman of the L-W-F Engineering Company, is now in the Air Service, U. S. A:, having been inducted by his request. He is assigned to Langley Field, Hampton, Va.

Mr. Black's interest in aviation dates back to 1910 and he was connected in turn with the Curtiss, Schmitt, Aeromarine and L-W-F companies during the past three years.

Watson Called to Important Post

John W. Watson, president of the American Bronze Corporation of Berwyn, and former chairman of the Pennsylvania Section, Society of Automotive Engineers, has just been appointed assistant chief of the Hispano-Suiza Engine Section of the Bureau of Aircraft Production. In the absence of Mr. B. D. Gray, chief of the Hispano Section, Mr. Watson is entirely responsible for the administration of this particular section, which includes all engineering, production and inspection activities for the Government in connection with the production of about $80,000,000 worth of Hispano-Suiza engines and spares. Mr. Watson wil make his headquarters in New York City.

During the past year the Hispano-Suiza engine has made it possible for French planes to retain air supremacy, and it is a matter of record that of all the German planes destroyed during that period by the French Air Service, the Hispano-Suiza engine is credited with 90 per cent of the total brought down, the remaining 10 per cent distributed among the balance of all other engines in use.



The Curtiss Engineering Corporation plant at Garden City, Long Island, N. Y. On the right is the administration building, in the center the workshops, on the left the recreation building



LOUGHEAD PLANE TO FLY ACROSS CONTINENT

THE Loughead Aeroplane, which recently completed a trip flight from Santa Barbara to San Diego, a distance of approximately 300 miles, is being made ready for a transcontinental flight to Washington, D. C. The start will be made from the naval training field on North Island, across the bay from San Diego, about October 20. The aeroplane will carry four passengers, including the pilot, and a mechanic, a large amount of mail matter, addressed to Government officials, members of Congress, and prominent eastern men, and enough gasoline for twelve hours of continuous flying. It is expected the transcontinental flight of 2,100 miles to Washington, with only one stop at a Mississippi Valley point, will be made in 30 hours.

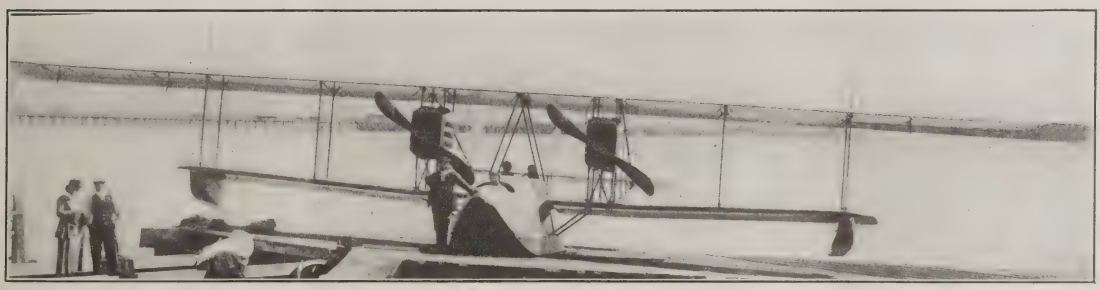
This proposed flight, which from the earlier performances of the Loughead machine in the air may be accepted as an accomplishment, is the longest non-stop and also the most rapid long distance flight ever made by a heavier-than-air machine, with so many passengers and carrying so much additional weight. It will have a live load of 2,522 pounds, which, added to the weight of the machine and equipment, will bring the total weight up to more than 6,150 pounds.

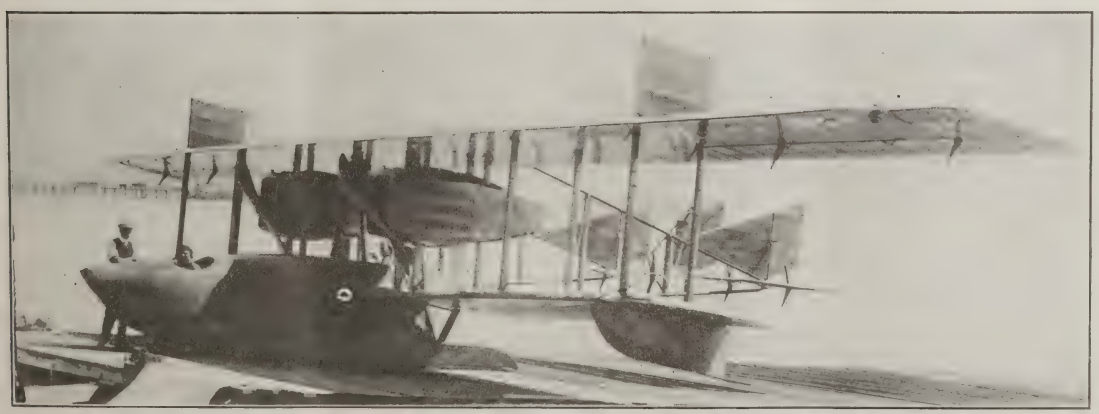
Early this spring the Loughead Aeroplane, Model F-1, which was built in Santa Barbara by the Loughead Brothers and a company of local capitalists, made a successful flight from this city to San Diego, carrying four passengers. It was then equipped as a flying boat, starting and landing on the surface of the ocean. The machine is now being altered by fitting a new body, landing gear and wheels, to permit of landing in a field instead of on the water. Otherwise the aeroplane is identical with the one which made the San Diego flight and returned at Santa Barbara recently, after numerous cross country flights from the San Diego flying field with army and navy aviators aboard.

Powered with twin Hall-Scott Aeroplane engines of the A-5a type, made by this pioneer Pacific Coast aeroplane engine building concern, the Loughead twin motored, model F-1-A will have a maximum speed of 100 miles per hour. Its minimum speed is 45 miles. The two Hall-Scott engines are so mounted and controlled that either correction of the rudders. With the live load of 2,522 pounds and only one engine running, it will maintain a speed of 62 miles per hour.

As much of the flight will be made at night, special luminous dial instruments will be installed in the pilot's compartment of the body, to assure the aviator knowing his direction, altitude, etc. The

(*Continued on page* 383)





Two views of the Loughead twin-motored flying boat powered with Hall-Scott motors

THE FRENCH A. R. BIPLANE

(The following illustrated description of the French "A. R." machine has been translated from a German contemporary, and should be of considerable interest, inasmuch as one is not permitted to refer in detail to the modern aeroplanes of the Allies until the enemy has isued a report.—Ed.)

THIS machine, designed by Dorand, is designated as A. R. or A. L. D., according to whether it is fitted with a Renault or with a Lorraine-Dietrich engine. The particular machine under review is marked A. R., Typel, and the number is 309. The machine is a two-strutter biplane of 13.30 m. span, and has its fuselage supported between the planes on ash struts. Sweep-back and dihedral angle are only present in the lower plane. The former amounts to 1 deg., while the dihedral angle is 2 deg. The top plane is staggered backwards 0.5 m. The gap is 1.825 and 2 m., respectively; that is to say, in the centre it is 0.945 of the chord. The angle of incidence of the upper plane is 2.5 deg., that of the lower plane 3 deg.

The halves of the wings are screwed together in the centre of the machine. The wing spars appear to be of one section, covered on both sides with three-ply. Between every two ribs, whose spacing is 300 to 340 mm., is a short false rib on the top surface only, running from the leading edge to the front spar. The wing fabric, which is of a cream color, is sewn to the ribs. In front of the trailing edge, which is formed by a wire, as in all French machines, eyelets are incorporated.

The plane struts, which, with the exception of those secured to the body, are of hollow section, are of stream-line form. In order to prevent lateral bending the outer plane-struts are provided with a peculiar bracing. In addition the middle of the struts are braced to one another and to the bottom of the body struts. The strut fittings are of a very simple type, as shown in one of the illustrations. Strut sockets of sheet steel are secured to the spars by U bolts, the two shanks of which pass through the spar and are secured by nuts on the other side. The flying wires and landing wires are anchored to the corners of these U bolts, while the incidence wires are secured to lugs projecting from and forming part of the steel plate bottom of the strut sockets. This bottom is simply resting inside the socket and is not secured in any other way.

The wing bracing consists of solid wires throughout, which are connected to the fittings and turnbuckles in the usual way by bending them over and sliding a ferrule of spiral wire over the free end. The flying wires are in duplicate and lie one behind the other. The space between them is filled with a strip of wood. The external drift wire running to the nose of the body is wrapped with thin cord to prevent it becoming entangled in the propeller in case of breakage. Between the fuselage and the lower plane there is diagonal bracing in the plane of each spar. As, however, there is no corresponding bracing above the fuselage, the upper ends of the top plane body struts are allowed a considerable amount of play.

Non-balanced ailerons, positively operated, are hinged direct to the rear spar of the top plane only. The aileron control cables are in the form of simple cables running from the sprocket wheel on the control column, around pulleys in the lower plane, along the lower side of the lower plane and under another pair of pulleys. From this point on they are in the form of solid wires of 2 mm. diameter running to the aileron crank levers, which are in the form of quadrants. The upper cranks of the ailerons are connected by cables and wires running across from side to side, along the upper surface of the top plane.

At the stern of the fuselage is fixed a small tail plane to which is pivoted the balanced trapezoidal elevator. The rudder is also balanced. The rudder post is braced to the elevator, and this in turn to the body, by stream-line steel tube struts. The ends of these struts are flattened out and bolted to the various fittings. There is no vertical fin. The rudder is controlled by plain wires of 2.5 mm. diameter. Only where they pass over pulleys have cables been substituted for the wires.

The undercarriage struts are secured to the spars of the lower plane at the points where occur the attachments for the struts running to the body. The short body struts are braced by stream-line tubes fore and aft to the body. The one-piece axle rests between two cross struts of steel tube. The travel of the axle is not restricted. The undercarriage is braced diagonally in the plane of both pairs of struts.

The longerons and struts of the fuselage, which is fabric covered, are made of ash up to the observer's seat. From there they are made of spruce. The struts of the rear portion of the fuselage rest on the longerons without any attachment, and are held in place by the bracing only. To prevent them from sliding along the longerons the ends of the struts are notched to correspond with the shape of the wiring lugs, which surround the longerons.

The 8-cylinder, Vee type Renault motor develops, according to a plate in the pilot's cockpit, 190 h.p. at 1,550 to 1,600 r.p.m. The radiator is placed between the body and the lower plane. There is a shutter arrangement for varying the cooling. A water collector or tank is placed above the port row of cylinders. The exhaust gases are carried outwards to each side through short collectors. With the older motors the exhaust from both rows of cylinders was carried inwards to a common collector carrying it up above the top plane, an arrangement which greatly hampered the view of the pilot. In these machines the radiator was in the nose of the body. An auxiliary radiator was placed below the fuselage.

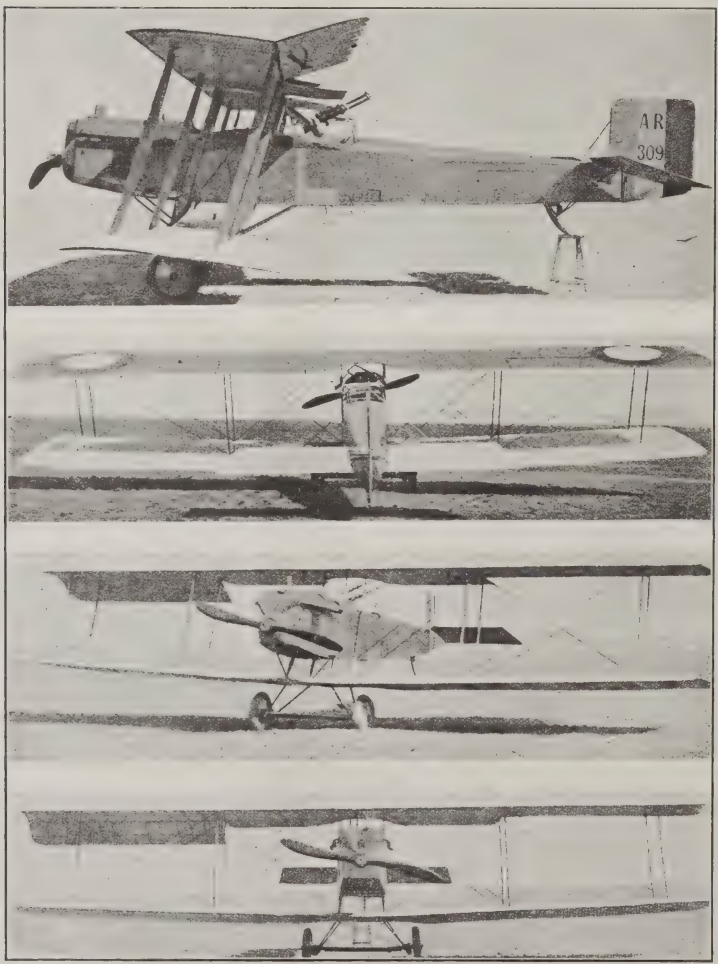
The motor is bolted to two channel section steel bearers, which rest on strong sheet steel cradles. Immediately behind the engine is placed transversely the oil tank, which has a capacity of 7 litres. The main petrol tank, which has a capacity of 170 litres, is divided into three compartments, and is placed behind the pilot's seat. From here the petrol is pumped into a small gravity tank holding 12 litres and placed behind the engine. For this is employed either a pump driven by the engine or a hand pump to the right of the pilot. If too much petrol is pumped through it is returned to the main tank via an overflow.

The pilot sits in a line with the leading edge of the top plane. Here he has a very good view forward, but the view in a rearward and upward direction is very restricted.

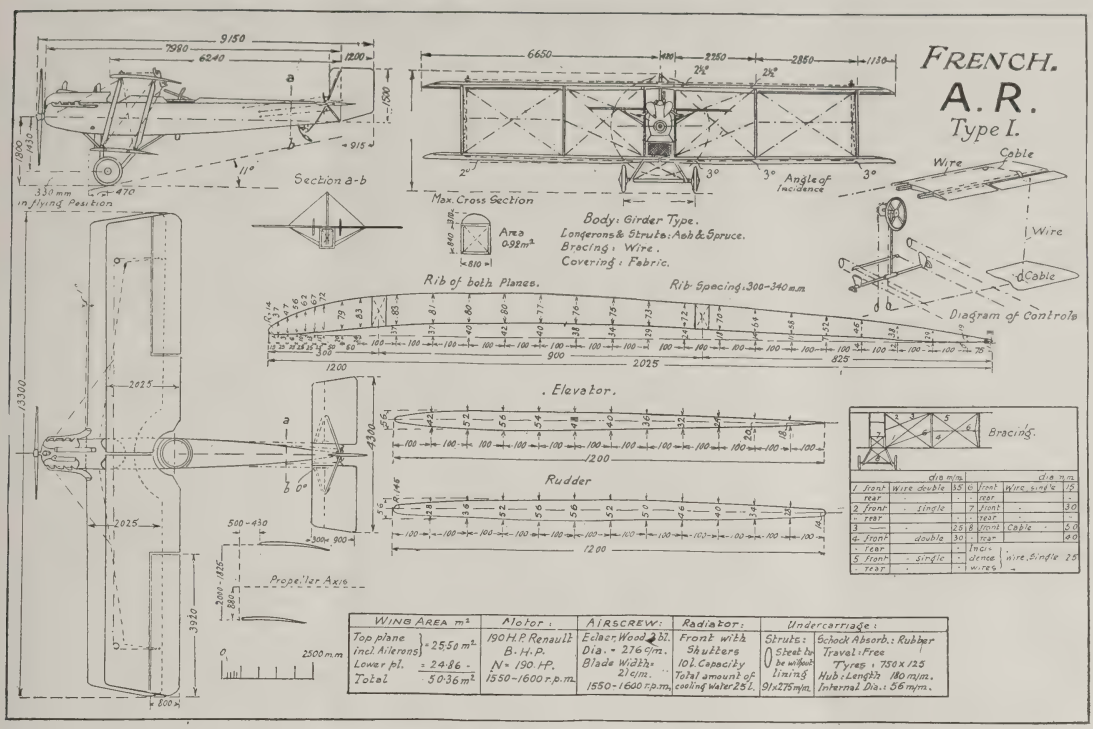
On the instrument board in front of the pilot are the following instruments: A cooling water thermometer, ignition control, compass, petrol cock and revolutions indicator. To the right, at the side of the seat, is the petrol hand pump elevator. On the left are the levers for advancing or retarding the ignition, the petrol and air levers, the radiator shutter control, and the oil cock. In the floor of the fuselage, in front of the rudder bar, there are small windows.

In the observer's cockpit there are two folding seats, one in front and one at the rear. In front, behind the petrol tank, there are on each side racks for four bombs. Between these racks, through an opening in the floor, the protographic camera can be inserted. A shelf for plate holders is placed behind the port bomb racks. On the starboard inner wall of the observer's seat are aluminum plates for the switches and keys of the wireless. The other instruments of the wireless are placed aft of the seat.

The pilot is armed with a fixed machine gun placed on the right-hand side above the body, and is operated from the left cam shaft. Firing is accomplished by Bowden control from the control wheel. The observer has two movable machine guns, couples together and mounted on a gun ring with elevating arrangements.

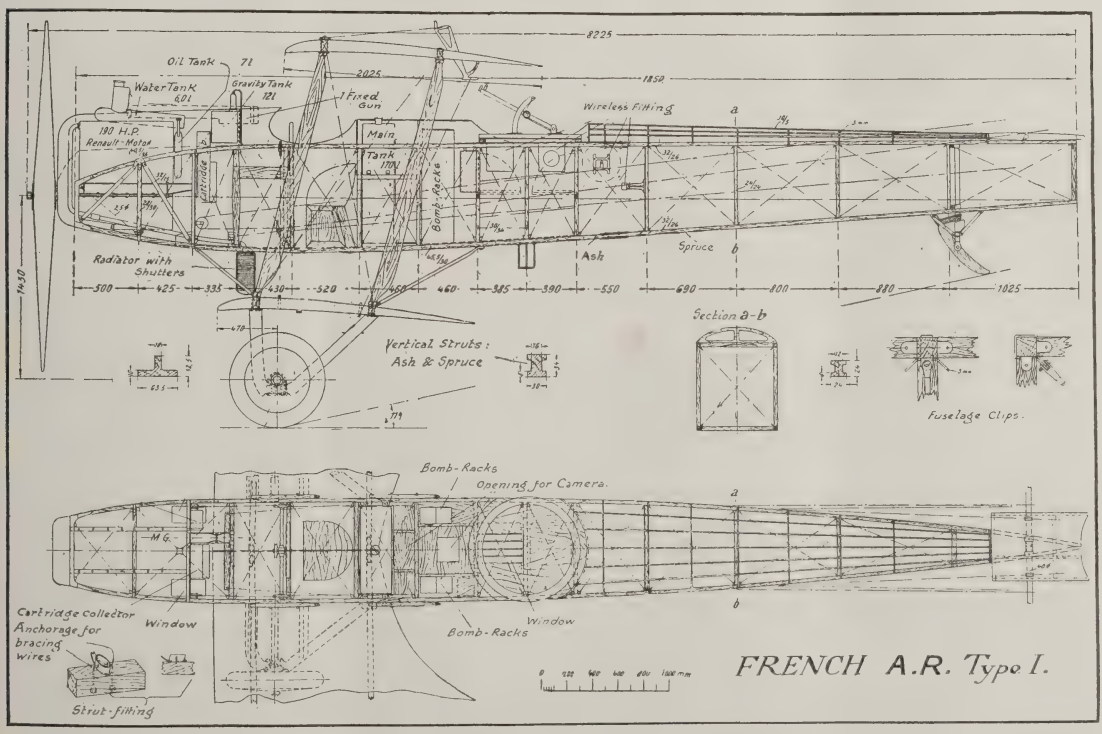


Four views of the French A.R. Biplane



WING AREA m²		Motor:	AIRSCREW:	Radiator:	Undercarriage:
Top plane	= 25.50 m²	190 H.P. Renault B.H.P. N = 190 H.P. 1550-1600 r.p.m.	Eclaer Wood 4 bl. Dia. - 2.76 c/m. Blade Width: 21 c/m. 1550-1600 r.p.m.	Front with Shutters 10 l. Capacity Total amount of cooling Water 25 l.	Struts: Steel (to be without lining)	Schock Absorb.: Rubber Travel: Free Tyres: 750 x 125
incl. Ailerons)					91 x 275 m/m.	Hub: Length 180 m/m. Internal Dia.: 56 m/m.
Lower pl.	= 24.86 -					
Total	50.36 m²					

General arrangement, and some details, of the French A.R. biplane.



Plan and elevation of the body of the French A.R. biplane.

PROBLEMS OF CRANKSHAFT DESIGN*

By OTTO M. BURKHARDT[1], Buffalo, N. Y.

GASOLINE engines, of the kind at present produced in large quantities for aeroplanes and motor vehicles, may turn over at 3000 r.p.m. or faster. The forces necessary to induce and maintain these speeds, as well as other forces closely associated with high speeds, are numerous; but with a particular object in mind,

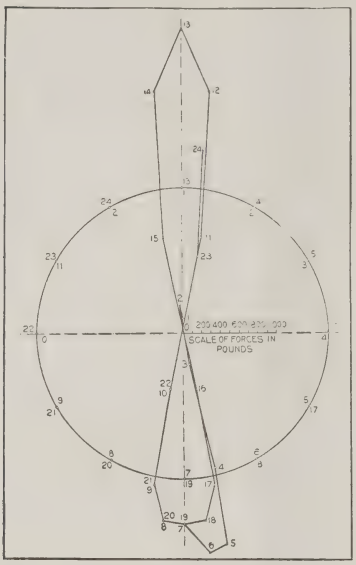


Fig. 1. Centrifugal forces and combined gas and inertia forces acting on crankpin of six-cylinder engine.

this paper will be confined to the three most important groups of forces—the pressures due to the gaseous mixture, the inertia forces, and the centrifugal forces. The smooth running and the life of an engine depend mainly on these three factors.

The reciprocating masses linked to the crankshaft will be considered as one mass concentrated at one point in the axis of the cylinder. This simplification implies that the inertia forces are, like the gas pressures, acting primarily in the direction of the cylnder axis, a condition that permits arithmetical addition of both groups of forces. To the same category belongs another group of forces which, according to a well-known law, has its origin in the angularity of the connecting rod. The different component forces have been determined in respect to two engines of equal capacity for 24 crank positions. These positions are uniformly spaced at intervals of 30 deg. and comprise two revolutions, which constitute one complete cycle in case of four-stroke-cycle engines.

Corresponding components when combined as resultant forces and graphically represented in magnitude and direction, yield irregular characteristic diagrams with which every engine designer should acquaint himself.

As subjects for investigation, medium-size six- and twelve-cylinder engines, both of the same cylinder volume, were chosen. Both engines are supposed to be similar in design and up to the same standard of construction. Some particulars relating to these engines are given in Table 1.

Table 1. Dimensions and Weights for Engines of Similar Design

	Six-Cylinder	Twelve-Cylinder
Cylinder bore, in.	3.75	3.00
Stroke, in. (= bore × 1.667)	6.25	5.00
Weight of reciprocating parts, lb. (1 cylinder)	4.07	2.60
Weight of rotating parts, lb. (1 cylinder)	2.40	1.93
Weight of rotating parts, lb. (2 cylinders)	....	3.86

Fig. 1 is a force diagram pertaining to the six-cylinder engine. The concentric circle is a graphical representation of the centrifugal forces acting on the crankpin at a speed of 2700 r.p.m. The combined gas and inertia forces as above referred to are represented by the irregular polygons.

For instance, O-3 of this diagram represents the magnitude and direction of the combined gas and inertia forces if the crankpin is in position 3, that is, 60 deg. from the top dead center. For one complete cycle the different strokes are represented as follows:

Power stroke, by forces O-1 to O-7
Exhaust stroke, by O-7 to O-13
Suction stroke, by O-13 to O-19
Compression stroke, by O-19 to O-1.

To obtain a clear picture of the total forces acting on a crankpin, we must combine both diagrams as follows: O-1 of the polygon with O-1 of the concentric-circle diagram, and so on. This yields the diagram shown in Fig. 2, which represents the magnitude and direction of the resultant forces acting on the crankpin of a six-cylinder vertical engine.

The combined gas and inertia forces for one unit of a twelve-cylinder engine and the corresponding centrifugal forces are diagrammatically represented in Fig. 3. We observe that these

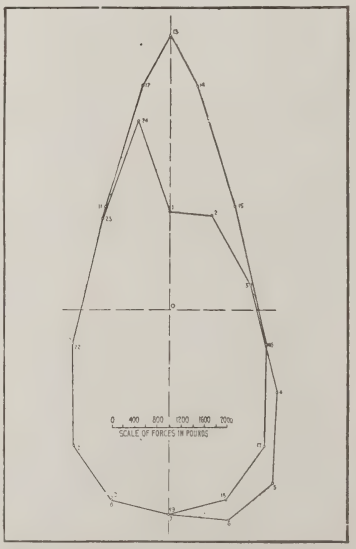


Fig. 2. Combined centrifugal, gas and inertia forces acting on crankpin of six-cylinder engine.

forces are much smaller but quite analogous to those given in Fig. 1. The combination of the gas and inertia forces with the centrifugal forces yields the diagram shown in Fig. 4, which represents in magnitude and direction the resultant forces per cylinder acting on the crankpin of a twelve-cylinder engine. It must be borne in mind, however, that in the case of the engine under consideration, two single-cylinder engines are acting on one crankpin. We have, therefore, to superimpose two diagrams so that their vertical axes include an angle of 60 deg., as in Fig. 5. The crank positions 1 to 24 in the dia-

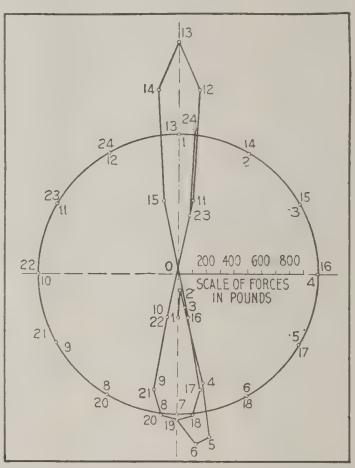


Fig. 3. Centrifugal forces and combined gas and inertia forces due to one cylinder acting on crankpin of twelve-cylinder engine.

gram are plotted according to the clockwise rotation of the crankshaft. The distinction between the right- and left-hand block of cylinders is made through the indices *R* and *L* by similarly viewing the engine. According to the conventional sequence of firing, we obtain: 1L, 6R, 5L, 2R, 3L, 4R, 6L, 1R, 2L, 5R, 4L, 3R. From this we see that the engine on the right is in phase 420 deg. behind the other, or (what amounts to the same thing) 300 deg. ahead of it. It follows that we must combine force O-1L due to the left-hand engine with force O-11R due to the right-hand engine and so on. Properly carried out for all simultaneous acting forces, this yields a diagram, Fig. 6, representing in magnitude and direction the forces acting on the crankpin of a twelve-cylinder V-type engine.

It is difficult to neutralize by balance weights the effect on the crankpin of the forces shown in Figs. 2 and 6. The reason is that the centrifugal forces involved are due to a mass performing a relative motion. That is to say, the rotating mass of the connecting rod does not rotate truly about its own center but turns relatively to another mass, which turns about a center of its own.

In order to be entirely effective under such circumstances, balance weights would in turn have to perform relative motions. This introduces extra friction and complication. Balance weights for this effect are quite feasible, however, for six-cylinder engines, but they are almost an impossibility for twelves. The diagrams reveal the fact that the forces are smallest in a horizontal direction. This suggests that the oil holes in the crankpin should be placed at right angles to the radial lines through the center of the pin. The preferable direction would be opposite to that of rotation. To prevent the oil from escaping, a labyrinth should be cut in the bushing bearing surface, where the forces are a minimum.

A glance at Figs. 2 and 6 shows that the difference in the loads acting on the crankpin of either engine is not marked. The maximum load in the case of the twelve is 4040 lb., and in the case of the six, 4795 lb. The difference between the two is 18¾ per cent of the former. These loads increase approximately as the square of the speed. If then the twelve-cylinder engine runs at 2940 r.p.m., it is subject to the same maximum load as is the six when running at 2700 r.p.m. Mention is made of this because it is generally found in practice that a car with a twelve-cylinder engine is geared so that the

* Abstract of paper presented at a meeting of the Engineering Society of Buffalo, Automotive Section, October 24, 1917.

[1] Mathematical Research Engineer, Pierce-Arrow Motor Car Company.

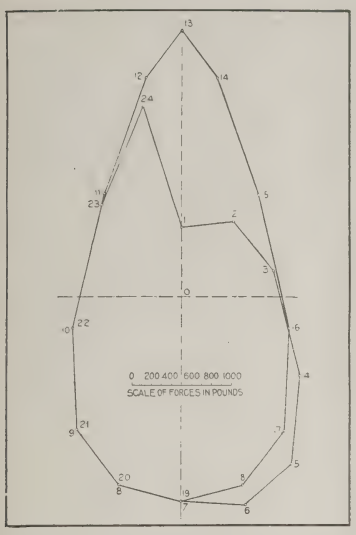


Fig. 4. Combined centrifugal, gas and inertia forces due to one cylinder acting on crankpin of twelve-cylinder engine.

engine runs at a slightly higher speed than a six-cylinder would be made to run.

The life of a crankshaft bearing depends largely on the magnitude of the mean pressure resulting from the various loads acting during one complete cycle, and this has been found to be 15 per cent smaller with the six than with the twelve. It is an axiom in bearing design that a certain permissible load per unit of bearing surface should not be exceeded. Nevertheless we shall not content ourselves with speaking of maximum or mean loads exclusively, a mistake which is committed by altogether too many engineers who endeavor to design high-speed-engine bearings with a certain specific load as their only guide.

Designers also should not lose sight of the fact that intermittent loads such as are encountered in high-speed internal-combustion engines affect bearings differently than does a steady load. It is well understood that a load acting continually in one direction is likely to cause lubrication difficulties. To what extent a bearing will behave well under the effect of a steady load is shown by an experiment[1] made by Professor Goodman, who states that he has had a journal running for weeks with a surface velocity of 4 ft. per sec. under a steady load of 2 tons (4480 lb.) per sq. in., the journal being kept at a temperature of 110 deg. Fahr. by a stream of water forced thorugh it. It is evident that bearing loads of this magnitude are hardly permissible under conditions where the load is subject to frequent and abrupt changes in direction unless an unusual amount of attention is being given to the maintenance of a certain running clearance by frequent adjustments. Therefore it is advisable under ordinary circumstances either to avoid fluctuations in load or to reduce the specific bearing pressure. For instance, the maximum permissible load on crankpins of slow-running stationary gas engines and locomotives is about 1500 lb. per sq. in. of bearing surface.

Furthermore, it is essential for an engineer to bear in mind the well-known fundamental empirical law of fluid motion, namely, that the resistance to sliding is due to the shearing of the fluid film and is consequently a function of the velocity of shearing, the viscosity of the fluid, and the shearing area. This law has proved useful for solving lubrication problems and conforms with the well-known experiments by Beauchamp Tower[2] which showed that the frictional resistance of a journal at a constant temperature is directly proportional to the square root of the rubbing velocity and is independent of the total load.

The laws of friction and carrying power thus far mentioned assume the presence of an oil film of not less than a certain thickness between the journal and the bearing. Without this film no bearing can be safe against undue abrasion. To maintain this much-desired oil film the designer should as far as possible protect bearings from unequal pressure distribution, from abrupt changes in the direction of these pressures, and from an undue rise in temperature.

The pressure distribution, which in most cases is more or less imperfect, depends on the design of the crankshaft, and will be discussed more in particular later. The character of pressures can be determined by means of diagrams. From these diagrams we may derive the mean bearing pressure, which, when multiplied by the circumferential velocity of the journal and the coefficient of friction, represents the work expended in friction.

The rise in temperature may be expressed as a function of the work expended in friction, if we limit ourselves to conditions under which the radiating surface of the bearing and the feed of oil are the same.

The frictional work per square inch of bearing surface is mathematically expressed by:

$$w = \mu \frac{P}{dL} \times \frac{d\pi N}{12 \times 60} = \mu p v \qquad [1]$$

where

w = work expended in friction per sec. and per sq. in. of bearing surface
μ = coefficient of friction
P = total bearing load, lb.
p = specific bearing load, lb. per sq. in.
d = diameter of shaft, in.
L = length of bearing, in.
N = speed of shaft, rev. per min.
v = circumferential velocity of shaft, ft. per sec.

From [1] it follows that

$$pv = \frac{PN}{229L} \qquad [2]$$

According to data gathered from well-performing and durable engines it may be stated that the value pv should not exceed 17,000 ft.-lb. per sec. This value is far in excess of other similar values. Güldner states that in case of stationary based on experience is about 1500 ft.-lb. per sec. for bearings lined with white metal. From this gas engines the maximum limiting value of pv it is evident that a value of 17,000 ft.-lb. per sec. is permissible only in cases where forced lubrication is used.

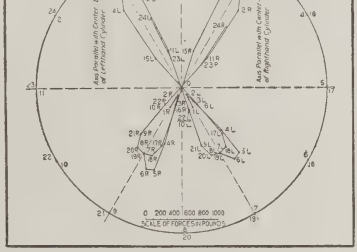


Fig. 5. Centrifugal forces and combined gas and inertia forces due to two cylinders acting on crankpin of twelve-cylinder engine.

In this connection it might be suggested that determination of pv values for various lubricating systems would be very desirable.

To apply this pressure-velocity criterion to the two engines under consideration it is necessary to determine the mean pressure of a complete cycle from Figs. 2 and 4. These are 2870 and 1650 lb. for the six and twelve, respectively. Assuming a crankpin diameter of 2⅛ in. for either engine, we obtain, at 2700 r.p.m., a rubbing velocity of

$$V = \frac{2\frac{1}{8} \times \pi \times 2700}{60 \times 12} = 25.02 \text{ ft. per sec.}$$

With a crankpin length of 2 in. we obtain, in the case of the six,

$$pv = \frac{2870 \times 2700}{229 \times 2} = 16{,}900 \text{ ft.-lb. per sec.}$$

With a crankpin length of 1 5/32 in. we obtain, in the case of the twelve,

$$pv = \frac{1650 \times 2700}{229 \times 1\,5/32} = 16{,}825 \text{ ft.-lb. per sec.}$$

The total crankpin length of the twelve, if the connecting rods are arranged side by side, should therefore be 2 5/16 in. This is about 15 per cent more than the corresponding length of the six. With equal crankpin diameters for both engines, the crankpin lengths must be proportional to the load. In order to verify this the mean total load acting on the crankpin of a twelve has been determined from the diagram in Fig. 6. As expected, it is 3300 lb., or 15 per cent more than the total load acting on the crankpin of the six.

This and all further comparisons between the six- and twelve-cylinder engines are based on the assumption that both engines are running at the same speed. But, as has been emphasized before, it is general practice to run a twelve-cylinder engine somewhat faster than a six. If this were taken into consideration, the difference between both engines would of course be more pronounced.

Before accepting the crankpin lengths given above as representing the final values, we will ease our minds with regard to the magnitude of the specific bearing pressure. In the case of the six we have a maximum load of 4795 lb. The projected bearing area of a crankpin 2⅛ in. in diameter and 2 in. long is 4¼ sq. in. This gives a specific pressure of 1125 lb.

In the case of the twelve we have a maximum load for each cylinder (taken from Fig. 4) of 2660 lb. and a projected bearing area of 2⅛ × 1 5/32 = 2.46 sq. in. If the engines are to be used for automobile propulsion, then it may be borne in mind that maximum speed is generally not maintained for any great length of time. The loads above given would represent, then, the exception and not the rule.

Automobile engines, however, are frequently subject to hard usage when long hills are climbed on high gear. Under such conditions the explosive pressures alone determine the loads on the bearings, because the speed of the engine is generally so low that the inertia and centrifugal forces are negligible. Assuming an explosion pressure of 380 lb. per sq. in. for both engines, we obtain total explosive loads of 4200 and 2690 lb. for the six and the twelve, respectively. In the first case we obtain a specific crankpin pressure of 4200/4.25 = 990 lb., while in the second we obtain 2690/2.46 = 1095 lb. The difference between both engines is here 10.6 per cent in favor of the six. The loads of the two engines due to explosive pressure alone are somewhat smaller than those obtained before at high engine speed.

All forces acting on the crankpin necessitate reactions on the main bearings. The total load on the main bearings also includes the centrifugal forces due to the crankpin and the adjacent crank cheeks. Theoretically, and now even practically, it is a simple matter to attach weights to the crankshaft that will relieve the main bearings on the centrifugal forces. Whether it is an advantage to do so will be presently investigated by means of diagrams.

The forces to be dealt with at first are those relating to the six-cylinder engine resolved into components in a manner as determined for a crankshaft of the seven-bearing type.

We are now concerned with two groups of diagrams:

a Main-bearing load for a crankshaft without balance weights: Fig. 7, loads on main bearings I and VII (counting from front of engine); Fig. 8, loads on II, III, V and VI; and Fig. 9, load on IV.

b Main-bearing load for a crankshaft with balance weights: Fig. 10, loads on main bearings I and VII; Fig. 11, loads on II, III, V and VI; and Fig. 12, load on IV.

It is plainly evident from the scale of the diagrams that the balance weights act to reduce

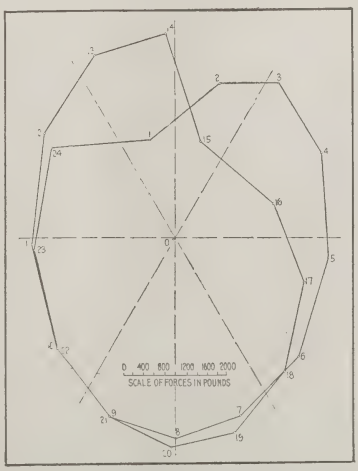


Fig. 6. Combined centrifugal, gas and inertia forces due to two cylinders acting on crankpin of twelve-cylinder engine.

[1] Unwin, Elements of Machine Design, part 1, p. 243.
[2] Proc. Inst. M. E., 1883 and 1884.

considerably the loads on the bearings, but, as already stated, magnitude is not the last word to be said about loads. Sudden fluctuations in the direction of the load are equally, if not more, detrimental to a bearing than the mere magnitude of the loads. Quick changes in the direction of a force acting on a mass are always accompanied by inertia effects. We must expect, therefore, that the journals carrying loads as shown in Figs. 10 to 12 will develop an undesired reciprocating or rocking action. Figs. 7 to 9, however, represent comparatively steady loads. The journals carrying these loads will creep around on the bearing surface, an action in principle like that involved when a planetary gear rolls within an internal gear. This facilitates lubrication, because the lubricant, while adhering to the metal surfaces, is continually wedged in between the two bounding surfaces. From this it is seen that beyond pounds of load per bearing there is, so far, nothing to say in favor of balance weights.

The length of the bearings necessary to carry the respective loads safely can be determined by the formula $pv = 17{,}000$ ft.-lb. per sec. With a main-bearing diameter of 2½ in. we obtain for 2700 r.p.m. of the engine a circumferential velocity of $v = 25.02$ ft. per sec. The mean loads on the bearings, as obtained from the diagrams, are given in Table 2, together with the necessary bearing lengths, the values of pv and the specific bearing pressures.

In the case of bearings I and VII a liberal amount should be added to the length of the bearing to take care of the loads due to the timing gears and the flywheel, and at least ¼ in. should be added to every bearing to allow for fillets. But in spite of this we find that the bearing lengths for the balanced type are entirely too short to hold the requisite oil pressure. If they are lengthened so that they are in conformity with *this* practical consideration we will obtain bearings for a crankshaft *with* balance weights about as long as those for a crankshaft *without* balance weights.

Apart from these analytical considerations it has now become an established fact that the smooth running, life and power of a well-designed engine with a seven-bearing shaft cannot be improved by the addition of balance weights. This is true in spite of the fact that any shaft with balance weights will perform much better on any balancing machine than will its prototype without balance weights. This paradoxical result is easily explained if we bear in mind that a shaft when running in a balancing machine is not subject to the sudden impulses which are a necessary evil inherent to the reciprocating engine. It seems that the best method

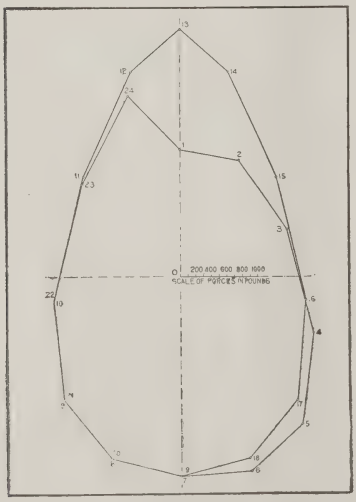


Fig. 7. Loads on main bearings Nos. I and VII of crankshaft without balance weights.

to make these impulses harmless is to smooth them out by means of the centrifugal forces, which, as we know, are available "free of charge."

It remains now to determine the loads on the main bearings for the twelve-cylinder engine in a manner similar to that which was adhered to in the case of the six. However, since there is not the slightest difference in the procedure, it is permissible to draw conclusions from former results. We must therefore reconcile ourselves with the fact that in all cases the mean pressure of a complete cycle will be about 15 per cent in excess of the corresponding pressures represented in Figs. 7 to 12. This conclusion is based on the results derived from the force diagrams shown in Figs. 2, 4 and 6. These diagrams show that the mean pressure on the crankpin of a twelve-cylinder engine is 15 per cent larger than that on the crankpin of a six.

In the case of a twelve with two connecting rods mounted side by side on one crankpin the distribution of load over the whole length of the crankpin is not uniform, because the loads on the two connecting rods do not at every instant act with equal intensity. The point of application of the resulting loads given in Fig. 6 is

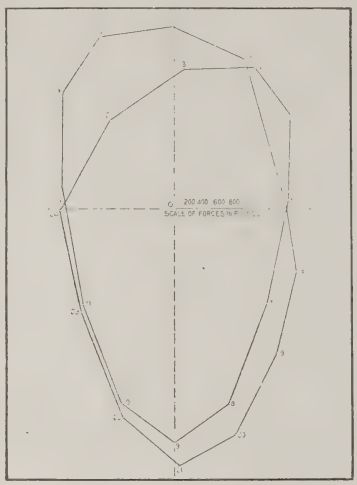


Fig. 8. Loads on main bearings II, III, V and VI of crankshaft without balance weights.

therefore not in the middle of the crankpin, as is the case with the loads given in Fig. 2. The two main bearings adjacent to the crankpin (seven-bearing crankshaft) will not receive at every instant exactly half the loads given in Fig. 6, but alternately the one will receive somewhat more and the other somewhat less than half of the total for well-known mechanical reasons.

This rough-and-ready analysis, however, permits the conclusion that the main bearings of a twelve-cylinder engine should be designed to give at least 15 per cent more bearing surface than main bearings which have proved successful for a six-cylinder engine of equal capacity.

In the preceding discussion we have been dealing with various dimensions for crankpins and main bearings. These dimensions were

Table 2. Data for Balanced and Unbalanced Crankshafts

Bearing number	Type of Crankshaft	Mean load	Theoretical bearing length	Value of pv	Mean specific bearing pressure
I, VII	Balanced	774	1⅛	16,200	648
	Unbalanced	2180	1⅝	16,425	657
II, III,	Balanced	839	⅞	15,800	633
V, VI	Unbalanced	2190	1⅛	16,500	660
IV	Balanced	1520	1⅛	16,725	670
	Unbalanced	4350	3	17,040	682

chosen according to the dictation of sound engineering. While this method is satisfactory, it is well to verify the results obtained, perhaps in the following manner. Both engines so far spoken about will develop probably a maximum torque of about 3000 in.-lb. This would correspond to about 48 h.p. at 1000 r.p.m. However, the torque on the crankshaft is subject to considerable fluctuation, depending on the number of impulses. This fluctuation, which, of course, has some bearing on the operating smoothness of an engine, was made the subject of many investigations in the early days of the six, and again at the advent of the eight and the twelve. Such investigations have revealed that the multi-cylinder engine, six, eight, twelve, etc., certainly deserves great credit for its smooth torque.

Owing to the small number of impulses, the torque on the crankpin of a six-cylinder engine may at intervals be two and a half times as large as the torque indicated on the dynamometer. In considering the strength of the crankshaft we must therefore deal with a torque of, say, 7500 in.-lb. With a crank radius of 3⅛ in. this torque results in a tangential force of 2400 lb., acting through the crank cheek on the crankpin as indicated in Fig. 13.

If we at first assume the crank cheeks as being infinitely strong, we can consider the crankpin as a cantilever. With a crankpin length of 2 in., plus half the width of the cheek, the total length of the cantilever will be about 2½ in. The bending moment is, consequently, $2400 \times 2\frac{1}{2} = 6000$ in.-lb. The moment of resistance to bending of a 2⅛-in. diameter cylinder with a 1-in. hole is 0.896 in.^{3} With an elastic limit of 110,000 lb. per sq. in. (chrome-nickel steel) we obtain from these data 16.4 as the factor of safety. Crankpins are further subject to some shearing and bending due to the load acting directly on them, but in the above calculation this has not been taken into consideration. If we allow for these extra stresses we may obtain a final factor of safety of 12, which is not too much for so important a part as a crankshaft.

After this we may now assume the crankpin to be infinitely strong. From this point of view we must expect the crank cheeks to deflect in a manner as shown in Fig. 13. The twisting moment to be resisted by the cheeks evidently is $2400 \times 3 = 7200$ in.-lb. The moment of resistance to torsion of a rectangular section is $2b^2h/9$. The permissible fiber stress in case of twist is about 75 per cent of that permissible for bending. Taking this into consideration, and maintaining a factor of safety of 12, gives the following equation:

$$7200 = 2 \times \frac{0.75 \times 110{,}000}{12} \times \frac{2}{9} b^2h$$

From this, taking $h = 2\frac{3}{4}$ in., we obtain the thickness of the cheek b as 0.925 in.; or, to give an even figure, 15/16 in. This small special allowance is desirable because the crank cheeks, like the crankpins, are subject to compound stresses.

In this connection it may be remarked that, as a rule, the crank cheeks are found to be the weakest parts. Fig. 13 and the calculations explain why so many shafts break along the lines marked *A B C*.

In the case of the twelve-cylinder engine the maximum torque on the crankpin will be only about 50 per cent more than that indicated on the dynamometer. We shall therefore have to deal with a torque of about 4500 in.-lb. With a crank radius of 2½ in. we derive from this torque a tangential force of 1800 lb. acting through the crank cheeks on the crankpin. With a crankpin length of 2 5/16 in., plus half the width of the cheek, we have a total length of 2¾ in. The bending moment on the crankpin is therefore $1800 \times 2\frac{3}{4} = 4950$ in.-lb. The factor of safety derived from this is 20. The twisting moment in the crank cheeks is $1800 \times 3\ 3/16 = 5740$ in.-lb.

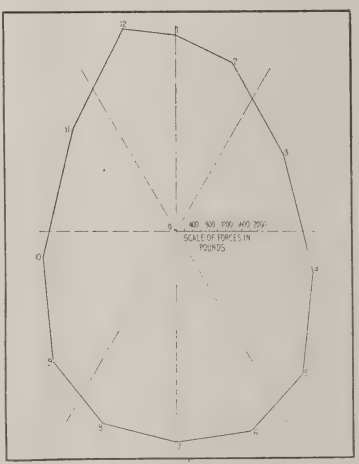


Fig. 9. Loads on main bearings IV of crankshaft without balance weights.

The thickness of the cheeks with a factor of safety of 12 we derive as before from the equation:

$$5740 = 2 \times \frac{0.75 \times 110{,}000}{12} \times \frac{2}{9} b^2h$$

From this we obtain a cheek thickness of 0.83 in., or, say, ⅞ in.

In order to compare a three- and seven-bearing shaft it must first of all be observed that the distance between the centers of the two main bearings is about two and a half times as much in the former shaft as in the latter. The tran-

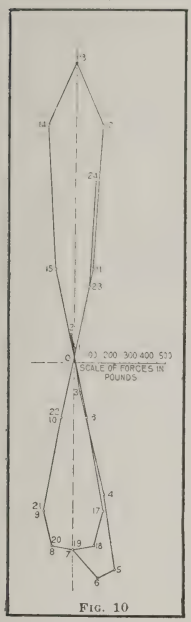


FIG. 10

Fig. 10. Loads of main Bearings I and VII.

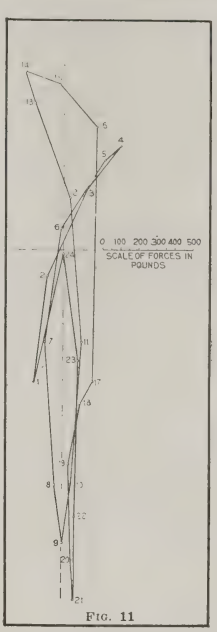


FIG. 11

Fig. 11. Loads on II, III, V and VI of a crankshaft with balance weights.

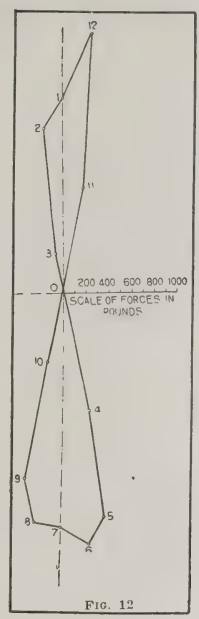


FIG. 12

Fig. 12. Loads on IV.

verse deflection of a straight shaft increases as the cube of the distance between the supports. It is evident, therefore, that if other conditions are the same, a three-bearing shaft will deflect up to $(2\frac{1}{2})^3$; that is, nearly sixteen times as much as a seven-bearing shaft.

It is hardly necessary to point out that excessive deflections are certainly not conducive to the operating smoothness of an engine. Not only that, but even the durability of the bearings is impaired, because a deflected shaft will not permit uniform pressure distribution in the bearing. Any eccentricity of the loading relatively to the middle of the bearing will create a tendency to drive out the oil at one end. This is the reason why bearings that swivel so as to accommodate themselves to any inclination of the journal on account of bending of the shaft are found to be of great advantage. However, as such bearings cannot be applied very well to crankshafts, it is advisable to design crankshafts so that their deflections approach a minimum.

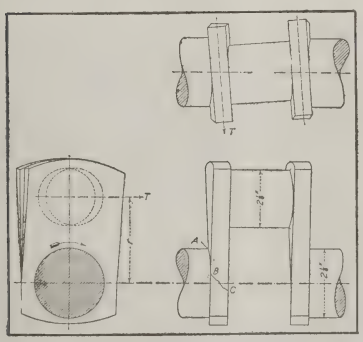


Fig. 13. Part of crankshaft illustrating deflection of crank-cheeks.

The deflection of a shaft varies inversely as the moment of inertia of its weakest section. In order, then, to hold a three-bearing shaft within the same limit of transverse deflection as may be obtained with a seven-bearing shaft the crankpin diameters of both shafts must be proportioned in the relation of $\sqrt[4]{16}$ to 1, which is as 2 to 1. This necessitates a crankpin diameter of 4¼ in. for a three-bearing shaft designed to conform to our premises. For so small an engine as here under consideration this diameter is, of course, prohibitive. At the same time, it is almost prohibitive to use a seven-bearing shaft for a twelve-cylinder automobile engine on account of the excessive length. The only alternative left for the designer of such engines is to sacrifice rigidity.

The torsional deflection of a crankshaft is directly proportional to the torque moment. In a seven-bearing crankshaft a torque moment of the magnitude $M = T \times r$ occurs in the main bearings only. This torque is determined by the tangential force T acting on the crankpin and by the crank radius r, which is one-half the stroke of the engine.

In a three-bearing crankshaft a similar but more intense torque occurs, not only in the main bearings but also in the crankpin, as illustrated in Fig. 14. The momentum of the torque in this case is determined by T and by the shortest distance between T and the center of the twisted crankpin, which is denoted by R. From Fig. 15 we find that $R = r + r \sin 30°$ or $R = 1.5\ r$. Consequently, in this case, $M = T \times 1.5\ r$. This permits us to draw the conclusion that the torque moments or torsional deflections of a three- and a seven-bearing crankshaft stand to each other in the relation of 1.5 to 1. It must further be mentioned that the twist in a crankpin is a more serious matter than the twist in the main bearings. We must consider that the only way to reduce the vibrations set up by a twist in a crankpin is by an increase in its diameter. The deflections in the main bearings may, however, be minimized by vibration dampers.

The same line of reasoning which we have established in connection with the three-bearing shaft must be followed in investigating a four-bearing, six-throw shaft. The distance between two bearings is about 1.75 times as great as in the case of a seven-bearing shaft, and consequently the transverse deflection is about five times larger. With regard to the torque in the crankpins, the same figures as before established apply, except that in this case a smaller number of crankpins are subject to twist.

As excessive transverse deflections must be detrimental to the bearings as well as to the operating smoothness of the engine, it is quite reasonable to expect that balance weights will be an advantage for the latter two types of crankshafts, which are inherently weak. Seven-bearing crankshafts, when well designed, are inherently strong enough so that they cannot be improved through the addition of balance weights. We can predict, therefore, that the use of balance weights will be limited to shafts with a smaller number of bearings than would be desirable from the viewpoint of strength. Balance weights are like the flywheel the symbol of some imperfection. If we compare shafts of equal strength we will further find that the weight of a three- or four-bearing, six-throw crankshaft that is properly balanced will by no means be less than that of a seven-bearing shaft.

The total piston displacements of different engines designed with a constant stroke-bore ratio are proportional to the cube of the cylinder bore. For instance, if the bore of an engine is b, and its stroke is $1.667b$, the piston displacement of this engine per cylinder is $(b^3\pi/4) \times 1.667b = 1.309b^3$.

The explosive impulses of different engines are proportional to the square of the cylinder bore, providing that the same compression is used throughout. Denoting the bore of a six-cylinder engine with b_6 and that of a twelve-cylinder engine with b_{12}, we find for two engines of equal total piston displacement the following relation:

$$6 \times 1.309 \times b^3_6 = 12 \times 1.309 \times b^3_{12}$$

From this it follows that

$$b_6 = \sqrt[3]{2} \times b_{12} \qquad [3]$$

The explosive impulse E of an engine is proportional to the square of the cylinder bore. between the explosive impulses of a six- and twelve-cylinder engine the following relation therefore exists:

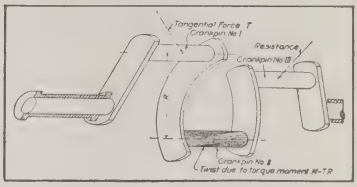


Fig. 14. Part of crankshaft illustrating torque in crankpin in case of three- and four-bearing six-throw crankshafts.

$$\frac{E_6}{E_{12}} = \frac{b^2_6}{b^2_{12}}$$

When substituting for b_6 the value given in [3], we obtain

$$\frac{E_6}{E_{12}} = \frac{(\sqrt[3]{2})^2 \times b^2}{b^2_{12}} = \frac{(\sqrt[3]{2})^2}{1}$$

In practice we invariably find that the small-bore engine is working under somewhat higher compression. This results in a higher explosive force per unit of piston area. To give an example, we may assume, for the two types of engines to be compared, that the large-bore, six-cylinder engine may work with a compression pressure of 85 lb. per sq. in., and the small-bore twelve-cylinder engine with one of 90 lb. per sq. in. Substituting this in the above given relation, we obtain

$$\frac{E_6}{E_{12}} = \frac{85}{90} \times \frac{(\sqrt[3]{2})^2}{1} = 1.5 \text{ to } 1$$

From this we learn that for a certain standard of engineering the explosive impulse of a six-cylinder engine is about 1.5 times as large as that of a twelve-cylinder engine of equal total piston displacement.

In conclusion, a few words may be said about lubrication, although this can be considered a problem all by itself. To obtain absolutely satisfactory conditions, the oil delivery to the bearings must be in direct proportion to the work converted into heat by the bearings. We should

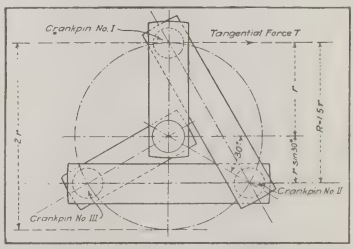


Fig. 15. Part of crankshaft showing maximum leverage in case of three- and four-bearing six-throw crankshafts.

lay out a series of diagrams, as previously discussed, for different engine speeds and for different power outputs. The values of pv obtained from the various diagrams would give us a clear picture of how the oil delivery should be regulated. Scientific oiling would eliminate scraper rings, and thus permit lighter pistons. It would also eliminate sooted spark plugs, carbonization, preignition, and would permit higher compression.

SOME OF THE AMERICAN DE HAVILAND PLAN



IN a despatch to the *New York Evening Sun*, Thomas M. Johnson, their special correspondent, describes the recent mammoth Allied air drive, in which a large number of American machines participated, as follows:

"The American air service dealt the Boche one of the heaviest blows of the entire war October 19 in a gigantic bombing expedition in which 142 aeroplanes swooped down upon railroad depots and junctions behind the German lines, dropping many tons of bombs and firing thousands of rounds from their machine guns, spreading death and confusion.

"Among them were many Liberty planes which again proved their worth. One single American plane was lost and nine Germans were brought down.

"Some fast scout planes reported that the village of Bayonville, at the junction point of six roads southeast of Buzancy, was jammed with German traffic and troops pouring in from the converging roads.

"'There's our meat!' said the bombers.

"Soon there was a great buzz of activity around the aerodromes and then the throb of motors, as one by one the machines of the great fleet took flight and circled about for a short time, testing motors and assembling. It then formed an arrowhead formation and sped for the German lines.

"It was just at 3:30 o'clock, the time set, when the planes arrived over Bayonville. One look was enough to show that the scout told the truth. The village was fairly seething with German soldiers, wagons and trucks.

"The men were floundering through the mud and all converging roads were jammed. For the moment Bayonville was a veritable 'Forty-Second street and Fifth Avenue.'

"The first to come upon the scene were



De Haviland Planes produced by the Dayton Company,

THE RECENT MAMMOTH ALLIED AIR DRIVE



two squadrons of low-flying planes that skimmed along from twenty-five to eighty yards above the ground. They saw the white dots of terror-stricken German faces upturned and saw the men afoot, running, as the drivers had jumped from the trucks and wagons.

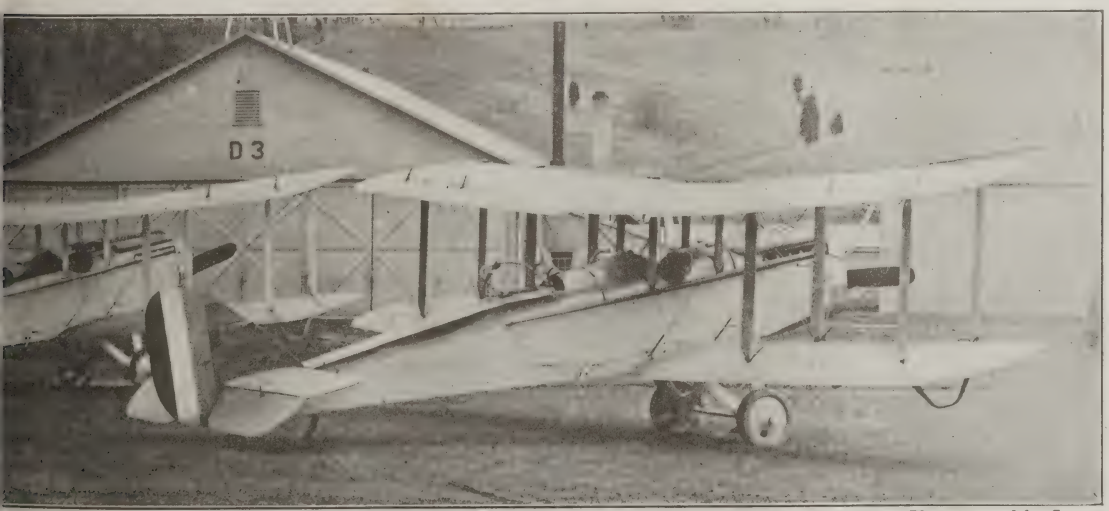
"Then some launched small light bombs that burst the instant they struck, scattering myriads of steel fragments. Others flew back and forth along the swarming roads, scourging the enemy with machine gun bullets as the confusion became greater.

"The second layer of American aeroplanes arrived, flying a little higher and armed with small and large bombs, which were dropped in their turn. They were specializing on the roads just outside the village, where the Germans were trying to escape from the wrath on high.

"Hardly had the last red flash arisen to mark the fall of their bombs when with a mighty drumming, as of the wings of a plague of a million locusts, came the heavy bombers in Liberty planes. They had been flying as high as 4,000 yards, bearing the most terrible weapons of all—monster bombs that reduce a solid stone house to a heap of rubbish and dust or blast a crater in a road twenty feet across.

"They came down lower and the airmen deliverately chose their targets, such as the main cross roads and the centre of the town bridge over the Agron on the western edge of the town. As they pulled the levers the bombs sped downward with a wicked, whistling, rushing sound into the crazed and roaring streets of Bayonville.

"In a few minutes the fast scout planes that had flown above the heavy bombers to protect them swooped down to see the results and beheld a terrible sight. Bayonville was in flames and clouds of smoke were seen along the roads, which were filled with wrecked wagons, dead horses and the bodies of gray clad men."



aking efforts to deliver 4,000 planes by Christmas

Photos passed by Censor.

ARTILLERY OBSERVATION

ARTILLERY observation from the air, at the beginning of the war somewhat haphazard, has become one of its most scientific branches, and at the present time no shoots are conducted by big guns without the co-operation of aeroplanes. Indeed, in a shoot aimed at the destruction of an enemy battery, machine gun emplacement, or concentration of troops or ammunition, the battery of heavy artillery is absolutely under the command of the aeroplane which is doing the observing. A "shoot" may be described as a period of fire of a battery of heavy artillery. As there are various kinds of shoots, it will be well to describe the various types of guns used for each. They are as follows:

Guns

1—13 and 18 lb. guns, U. S. 3 in., and French 15 m.m; used for short barrage, breaking lines of communication, and breaking barb wire entanglements.

2—4.7 in. and 60 lb. field guns; used for "neutralization fire," long barrage, and breaking lines of communication.

3—6 in., 9.1 in. and 12 in. Used against villages, railway stations, etc.; employed at long range against observation towers. The 6-inch gun is used also for long range counter battery work.

Howitzers

4.5 in. Howitzer; bombards weaker defenses, enfilades, trenches, and shoots against badly entrenches troops. Used for long distance wire cutting. Also used for counter battery work against guns without head cover. (The trajectory of the howitzer is peculiar in that it goes up in a high arc, and falls almost perpendicularly. This perpendicular drop makes it very valuable for use against trenches as the corrections needed at the point of fire will be very slight.)

6 in. Howitzer; trench bombardment, counter battery, and entrenched troops often behind the first lines.

8 in and 9.2 in. Howitzer; counter battery work against guns with strong head cover, and destruction of strong defenses.

12 in. and 15 in. Howitzer; this, the strongest howitzer on the list, is used with great effect for counter battery work, and is employed for the destruction of the strongest of the enemy's defenses. The duties of a pilot observing for counter battery work are many and varied. He must locate enemy batteries, and report at once those seen active.. He must reconnoitre enemy battery positions, especially those roughly located, or reported from other sources, and must find exact position if possible. He must observe fire, if so ordered, on hostile batteries seen active. He must locate machine gun emplacements, new trenches, and hostile works generally. He must observe and record any movement of troops or supplies, and report them immediately to headquarters.

The work of the artillery observer is usually mapped out before his flight, and he is given a map of the position, and generally some photographs.

There are two main kinds of shoots; registration, and destruction. In the former the artillery officer is in command, and in the latter the observer is in command. The registration shoot, as the name implies, is simply to "draw a bead" on some enemy position, or battery, and then destroy it at some future time. the destruction shoot is continued until the enemy battery or position has been utterly destroyed. Single rounds are generally sufficient for the initial observation and the finding of the range by the aeroplane, but on cloudy days a salvo is fired, or time shrapnel is fired.

Wireless is the mode of communication from the aeroplane to the ground, and the artillery officers below generally respond by ground strips. The wireless, of course, is entirely in code, and must be changed constantly to prevent the enemy's reading the messages.

In co-operation between artillery and aeroplanes, there are two types of shoots,—the Prearranged, and the Impromptu. The majority of the shoots belong to the second classification. The following essentials constitute a prearranged shoot: the pilot knows the position and arc of fire of the particular battery for which he wishes to observe, and knows the exact location of the enemy battery on which he wishes to train the guns. Perhaps it will be well at this time to describe the method of locating enemy positions and the way shots are "spotted."

According to the importance of the sector, one or more squadrons of observation aeroplanes are assigned. Each sector of enemy territory is mapped out in the following manner: The sector is first divided into 24 squares, and lettered in capitals: each square is then subdivided into a number of squares,—36 for example, and numbered. Each numbered square is divided again, and given small letters. Each small numbered square is subdivided by the mean of co-ordinates 1 to 10, running vertically and horizontally. Thus, in the smallest of these squares, the number 4-5 would mean four co-ordinates down on the vertical side of the square, and five co-ordinates horizontally. Thus we might locate a German battery by the means of our pin point system somewhat like the following: H 23 n 4-5. We then would look at our map. We find the battery in large square H, subdivision 23, further subdivision n, and co-ordinates 4-5. Thus we have it located almost to the foot. Next we consider our target as the center of a series of radiating circles, each circle lettered a, b, c, and so on. We then considered that the numerals of the clock are superimposed on each radiating circle. Now if we say a shot has fallen on circle *a*, at 6 *o'clock*, (having first assigned the distances the circles measure from the center), we know just the distance the shot has fallen, and which way the gun must be moved to correct the error. This clock process is continued until the range is found exactly by the artillery, and then the aeroplane is ready to observe for another battery.

We described above the classification of a prearranged shoot. The impromptu shoot is as follows:

Impromptu Shoot, 1st Class. Pilot finds Enemy battery and knows which of his own batteries he wishes to train on it.

Impromptu Shoot, 2nd Class. Pilot finds enemy battery, ammunition train, etc., but does not have any particular battery of his own to train upon it, and must signal for it.

Having found an objective, which he thinks worthy of a shoot for registration or destruction, the pilot must call up his battery, observe the shots, and direct the fire, by means of a wireless code, which is answered from the ground usually by means of ground strips, or the shutter.

We will consider, for example, that our pilot has found an enemy battery firing, which has not been accurately spotted. We will consider that the signal used to cover the words "Enemy Battery firing in position at" consists of the letters *XYZ*. The pilot will send the following signal by wireless. "XYZ H 23 n 4-5." The artillery officer of the sector in reality has the following message: "There is a battery of enemy guns firing in large square H, subdivision 23, smaller square n, and co-ordinates 4-5. I am ready to observe for fire." The artillery officer takes his map of the sector and locates exactly the place which the pilot has named. He then puts out a strip of cloth on the ground, its certain shape conveying a message to the pilot overhead, who is watching the ground in the vicinity of that battery. He places, for instance, a triangle, which may mean "Guns ready in five minutes."

The pilot continues his flight, until another ground strip is put out, meaning "Guns ready to fire." He repeats the designation of the target, and then signals, by means of code, "FIRE," and the guns respond. Keeping his map in front of him, he gives his observation according to the clock, *B 8*. If the circles are spaced fifty yards apart beginning from the center, or pin point location, the artillery officer knows that his shot has fallen 100 yards from the target on figure eight of the clock, and makes his corrections accordingly. This process is continued until a succession of shots indicates that the range is found, when the pilot signals "O. K., go ahead," but makes only occasional corrections, if any at all.

Different signals are used for the various objectives or targets which may be found during an observation, such as an ammunition train, mechanical transports, column of troops, etc., and the pilot may call for the type of shell to be used against them. When, for instance, he is unable to spot the shot, he may call for time shrapnel, which bursts in air, and is easier to spot in certain conditions of light than concussion sheels.

A two-seater machine is always used for artillery observation. The observer sits in a seat giving him an unobstructed view (and arc of fire in case of attack), and sends his wireless messages from a trailing aerial. He makes his observation while going toward his target, and sends his message while returning toward his battery.

When "winning the war in the air" is spoken of, it is taken to mean by the well informed, that the war can be won when the Allies have aeroplanes in such superior numbers that they can observe for their own artillery fire without hindrance of the enemy, and at the same time prevent the enemy from observing for their own artillery. Napoleon once stated that "God is one the side with the heaviest artillery," and from the lessons learned from this war it is evident that an infantry attack without artillery preparation is useless. Artillery fire without proper aerial direction also is useless. The sudden attack and success of the British at Cambrai was turned almost into disastrous defeat because of the fact that artillery preparation had not been made, and once the position was won artillery backing was not forthcoming. Observation for artillery is the most important work of the aeroplane in the present war,—this can be stated without contradiction.

(*Continued from page 370*)

aeroplane mail shall be fully prepaid, with special aeroplane postage stamps, or with ordinary stamps. When the latter are used the mail should be endorsed, "By aeroplane."

Something May Be Expected

This is illuminating. It would not be surprising if the Americans were to develop the aerial postal service rather vigorously at a comparatively early date. So far there has been little said on the financial side of the proposition. It will not be long, however, before some of the geniuses of Wall Street propound some important scheme. But not before the war is ended, because new capital issues are regulated by the Government there just as stringently as, if not more so than, in this country.—*The Aeroplane.*

(*Continued from page 373*)

date selected, late in October, will give the pilot the advantage of a full moon, and weather conditions over the Southern States are expected to be ideal at this time of the year. The start will be made from San Diego at about 3 o'clock in the afternoon.

Hall-Scott aeroplane engines of the A-5a type, two of which are in the Loughead aircraft, were developed especially for the United States Navy. This company has perfected an earlier model, designed as the A-5, with which numerous altitude, distance, and endurance records for seaplanes were made up to the spring of 1917, when the Government authorities took over the Hall-Scott production for naval purposes. The A-5a engine is a six cylinder motor, developing 160 horse power at 1,350 revolutions per minute, and has a bore and stroke of 5¼ x 7 inches. It weighs 595 pounds, or 3.75 pounds per horse power. On the Loughead twin motored F-1-A, these Hall-Scott engines will swing a propeller eight feet, eight inches long. The motors have been shipped to the Hall-Scott factory at West Berkeley, California, for a thorough overhauling before the transcontinental flight is begun. Prior to the start from San Diego for Washington, D. C., a number of cross country flights from Santa Barbara to Los Angeles and a final flight along the coast to San Diego will be made by the Loughead aviators.

Non-Gran Personnel

Matthew C. Dittmann, vice-president and treasurer of the American Bronze Corporation, Berwyn, Pa., has been appointed general manager at a recent meeting of the board of directors. This action is in recognition of Mr. Dittmann's nine years' association with this organization.

E. G. Anderson, sales manager, has been appointed advertising manager.

C. H. Baker, formerly auditor of the Timken Roller Bearing Company, Canton, Ohio, has been appointed assistant to Mr. Dittmann in charge of the financial and accounting departments.

These changes were brought about by the recent appointment of John W. Watson, president of the American Bronze Corporation, to the duty of assistant chief of the Hispano-Suiza Section of the Bureau of Aircraft Production of New York.

Silk Required for War Uses

The large part that the silk industry of the country is playing in the prosecution of the war is outlined in the semi-annual report of the Silk Association of America.

After telling how the entire spun silk branch of the industry has practically been turned over to the Government for the production of silk noil cloth for use in munitions fabrics, and outlining the extent to which powder bags of silk cloth are used in the firing of modern artillery, Secretary Ramsey Peugnet of the association says:

"Another important employment of silk in warfare is for parachute flares with star shells attached, often of 100,000 candlepower. These devices have played an important part in the present war, as all who have followed events know. The parachutes are about sixteen feet in diameter and are composed of lightweight habitual silk. They are dropped from aeroplanes, and when the flares are lighted the entire battlefield is illuminated for several minutes at a time.

"Silk tubular powder bags, or ballistite rings, as they are also known, are used in controlling the direction of projectiles.

"Other uses are in small bags for carrying explosives in trench warfare, and silk for fuse disks. It is quite likely that silk will come to be used to a greater extent in aeroplanes, balloons and parachutes.

"Sewing silks are extensively used and it is to be especially noted that all uniforms in the navy are sewed with silk. Silk neckerchiefs, silk braids, banner silks, and silk hat-bands are, of course, required extensively, both in the army and navy."

Secretary Peugnet also points out that it is estimated that 65 to 70 per cent of the producing capacity of the looms and spindles throughout the silk producing centers of the country is at present employed. This in itself, he says, means considerable curtailment, but it should be observed that it has been brought about by economic conditions rather than by Government order.

Standard Aero Flies for Liberty Loan

To stimulate subscriptions to the Fourth Liberty Loan, which have been exceptionally affected by the Spanish influenza epidemic, the Standard Aero Corporation of this city conducted two Liberty Loan flights on October 16.

The well-known aviator, O. M. Bounds, with an assistant, flew one of the latest types of Standard machines over the Oranges and surrounding towns in New Jersey, during the middle of the day. He started from the Standard Aero Corporation field promptly at noon, and covered wide territory.

A second flight was commenced at five o'clock, and this time Aviator Bounds covered the territory surrounding Elizabeth.

The aeroplane was loaded before starting on both trips with large quantities of Liberty Loan literature which was dropped to the public, urging every effort towards an over-subscription to the Loan.

32 Foe Aeroplanes Fall to Our Guns

With the American Army in France.—Thirty-two enemy balloons and aeroplanes have been brought down by the American anti-aircraft cannon and machine guns since the beginning of the St. Mihiel offensive, according to figures just compiled. The guns which have achieved this result were distributed in the rear areas, at the front and with moving infantry units.

Eight German planes were accounted for on the morning of October 4 near Montfaucon by two sections of the anti-aircraft artillery alone.

Of the thirty-two German aircraft brought down, twenty were accounted for by machine guns and twelve by the heavier guns. The machine guns average one success in every 2,500 shots.

The latest American Ace is Lieut. William Erwin, who, though an observer and therefore not supposed to engage in fighting, has just downed his fifth German aeroplane. Lieut. Erwin was mentioned in army orders for his latest performance.

The lieutenant was on an observation trip with Lieut. Esterbrook, also cited, when he met an enemy plane and forced it to retire. A moment later he met three Germans over Varennes and forced them to retire. Then he ran into two more German machines directing infantry liaison, and finally a biplane over Sommerance. Lieut. Erwin wounded or killed the observer and Esterbrook closed with the plane. It was sent crashing down.

Returning to his observation mission, Lieut. Erwin carried it out successfully, but on his return met a single Halberstadt, which he drove into flight.

All five victories have been officially confirmed.

The First American Aviation Pursuit Squadron completed its 100th successive victory on October 10 with a "Boche strafing raid," which netted six machines. Of these, Lieut. Edward Rickenbacher, of Columbus, O., got two, bringing his official total to fifteen, with three more which probably will be confirmed soon.

Lieut. Hamilton Coolidge of Boston, Mass., and William Palmer of Bennettsville, S. C., downed one between them; Lieut. James A. Meissner of Brooklyn, Lieut. Ralph A. O'Neil of Nogales, Ariz., and Lieut. Waters, one among them; Lieut. Reed M. Chambers of Memphis, Tenn., and Lieut. Wilbert W. White of New York, one each.



The De Haviland 4, built by the Dayton-Wright Aeroplane Co. Photo passed by censor.



THE FORCEFUL SUGGESTION OF "PLANE TALK"

FROM our spirited contemporary "Plane Talk" we excerpt the following choice bits.

WHEN SHIP 1000 ARRIVED—

AIR SERVICE, S. O. S. PRODUCTION AND MAINTENANCE DIVISION

The Dayton Wright Airplane Company and 6,000 Employees: The Good Old U. S. A.

Gentlemen: Number —— plane arrived at 4:50 this morning. Thirty minutes after it was uncrated on our assembly floor, the flag draped over the top and a hundred men standing around it thinking of home.

Assembly Crew No. 1 of the Night Force was disappointed because they were not permitted to stay overtime without breakfast and assemble the plane. They left the enclosed memorandum requesting that the job be saved for them for the next shift. It will be difficult to keep the day assembly crews off of it but we shall try. We "eat them up" now as fast as they arrive on the railroad siding and if you will give us the next thousand we will put everyone of them into the air before the end of September.

Personally this plane has brought many pleasant recollections. I am a Dayton man and I was with the N. C. R. when George Shroyer bought the millionth register and paraded with it through the streets. I wondered if No. —— had just such a trip, though of course if it did, it met with greater acclamation and enthusiasm.

You will undoubtedly hear more from this ship after it has been assembled and flown but I could not resist sending you this first word of appreciation and thanks for the wonderfully good work you are turning ou tand sending to us. The Air Service has met with a lot of criticism but we are getting our stride now and soon the Hun will holler so loud it will be heard in Dayton.

More power to you all and my personal regards to all my friends "back there."

Cordially yours,
C. E. LLOYD,
1st Lieut., A.S.S.C.U.S.,
Asst. O.I.C., Assembly Plant 1-A.

LATER—Two of my Sergeants who found and turned in the cigarettes just came into the office and saw this letter on the desk. Sergt. Brown asked me to send his regards to "Magdalene" and Sergt. Chambers said, "Send mine to 'Maude' of the Final Assembly. I always did like that name." I do not know exactly what they meant, but I always do everything I can for the boys so here they are — the regards, not the boys. We need the boys till about next Summer when we will be on the way home.—C. E. LYOYD—*Plane Talk.*

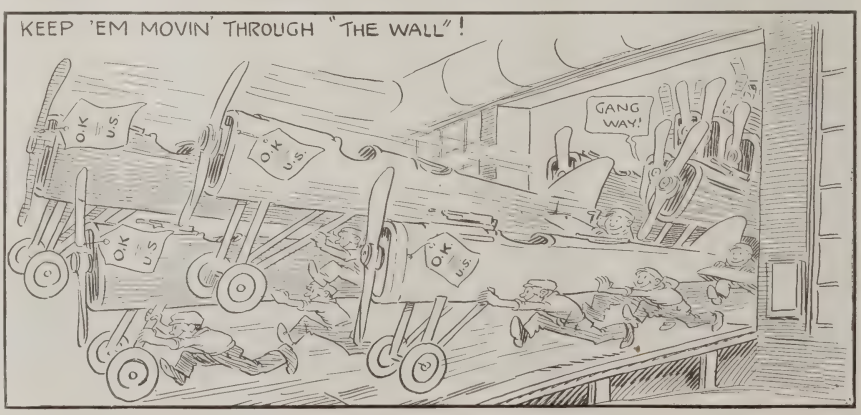


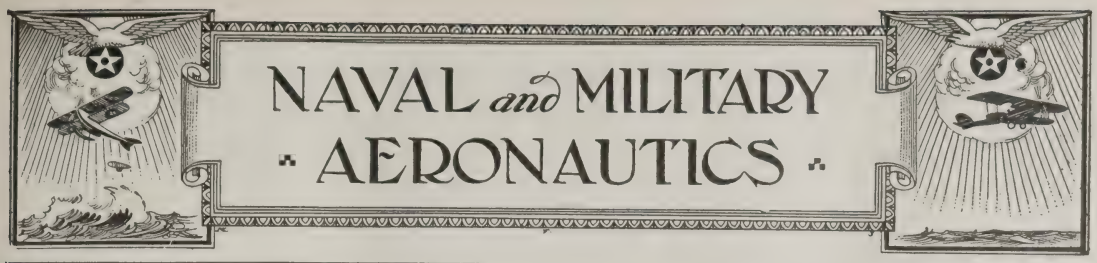
A WORD FROM THE ENGINEERING DEPT.

On Decmeber 24, we are going to give Uncle Samuel as a Christmas present with best wishes from the employees of The Dayton Wright Airplane Company, the four thousandth battle plane manufactured by this company. The Engineering Department has done its work and it is now up to each and every one of us to "go to it." Follow the drawings closely and remember, No objections. They are the Kaiser's delights.

The Engineering Department has spent much pains and effort in producing the necessary drawings to enable us to proceed with our product. It may be interesting to note that the total number of drawings necessary for the De-Haviland Four machine amounts to approximately 3,000. Do you know what this means and represents? It means that it took our engineers anywhere from less than an hour to two weeks to make each of these drawings and represents just so much brain work, to say nothing of the midnight oil that was necessary for this accomplishment. Can you not see the necessity, therefore, in following the instructions and drawings issued from the Engineering Department in every detail in the performance of your work?

No, we don't claim to know it all and that is the very reason why we are asking your co-operation. If you have any suggestions or any constructive criticism to make, let's talk the thing over. It may be that you have the right idea, but for God's sake don't knock. Let's all work together and push this thing through.—J. M. SCHOONMAKER, JR.—*Plane Talk.*





Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to Dis. Mgr. of Production, 480 Lexington Avenue, New York City.

Note 3—Take station at District office, Buffalo, N. Y. Wire DAP.

Note 4—Report to O i/c Aviation Fields, Chamber of Commerce Bldg., San Antonio, Tex.

Note 5—Report to Students Army Training Corps, Rensselaer Polytech, Troy, N. Y.

Note 6—Report to Aviation Officer, 90 West Street, New York City.

Note 7—Report to Chief Technical Section, Dayton, O.

Note 8—Report to Commanding Officer, Supply Depot, Middleton, Pa.

Note 9—Report to Naval Air Station, Miami, Fla. .....

Note 10—Report to Madison Barracks, Sacketts Harbor, N. Y.

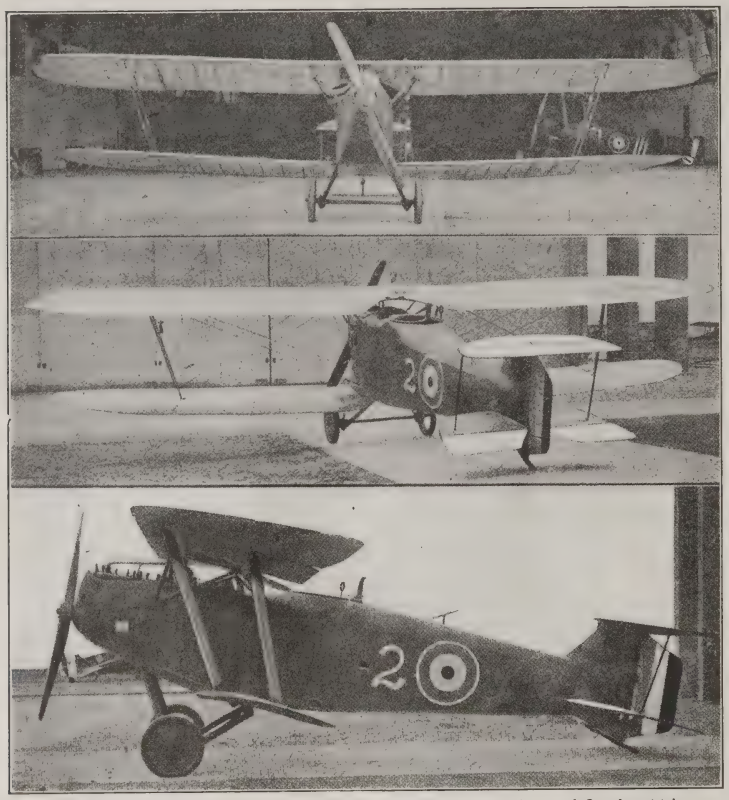
Special Orders Nos. 228-233 Inc.

A

Appleman, Earl ....CGC
Ashe, Clarence Fulton....SLA; TMA
Ayers, George Raymond....SLA; ELA
Anson, Emil Ferdinand....SLA; VBW
Abernethy, Claude S....CGC
Arthur, William H....CGC
Allison, Elmer C....BST
Anthony, James G....CPA
Andrews, Francis S....LDT
Applequest, Jerome A....SLA; RSD
Armstrong, Orland Kay....SLA; CRI
Alexander, Marvis Lamar....SLA; KST
Amis, William Noel....SLA; RWT
Allen, Porter Weakley....SLA; CRI
Arbenz, George H....SLA; AAD
Anderson, Emil S....SMA
Agremonte, Mariano I....EOT
Alford, John G....CGC
Allen, Charles M....CGC
Alpine, Arthur D....CGC
Appleby, Louis E....KST
Alway, James Douglas....SLA; GLC
Aten, Courtenay N....SMA
Acheson, John H....DMA
Austin, Fred ....CPA
Abernethy, Thomas J....FRF
Anglin, Charles H....CGC
Auble, Carmon J....LDT
Alcox, Purl E....CJW
Allen, Carl B....LHV
Alvord, Lincoln ....SLA; TFT
Allen, George E....SMA
Allen, Truman W....CPA
Arneson, Sorren R....CRI
Allen, Richard C....CGC
Athey, Gerald B....LDT
Abels, Charles August....SLA; FOB
Andrews, John P....CGC

B

Bruegger, Erwin Kehr....SLA; GLC
Bowman, Charles E....SMM
Brehm, Harry L....Note 6
Beck, Thomas Edward....SLA; KST
Baum, Charles E....CGC
Bradley, Thomas Earl....SLA; LHV
Bussert, Leonardo Money....SLA; BFT
Berndes, Walter O....LHV
Browne, Robert Edward....SLA; KST
Baldwin, Harold Page....SLA; CJW
Bullock, Wiley Oliver....SLA; ELA
Buttrick, Alden C....ASM
Bailey, Joseph P....BST
Birchler, Oscar August....SLA; GLC
Bonney, George Lester....SLA; GLC
Beehler, George H....CGC
Byers, Ralph R....SLA; PWM
Bailey, Theodore Layton....SLA
Brunson, Clair B....LDT
Britton, Ralph R....AGC
Blodgett, Charles Lenox....SLA; FOB
Brown, George H....SLA; TFT
Brunner, Frank J....SLA; TFT
Beckwith, Clifton W....EOT
Bauer, John H....FLA
Bradley, Raymond F....SLA; TFT
Boole, Timothy Dwight....CPA
Bryan, James T....SLA
Badenhausen, Carl W....EOT
Beattie, Harold G....LDT
Bisgood, Frederick W....CGC
Brown, Harold L....CGC
Bermant, Lester C....SLA; TFT
Brown, Ray B....SLA; TFT



Three views of the Hannoveraner Biplane described in our issue of October 14th

Brown, Clifford A.....SLA; TFT
Batchelder, Charles S.....LDT
Born, Jacob.....LDT
Brooks, Ivan H.....LDT
Baker, Foster K.....LDT
Bettis, Cyrus.....LDT
Buckley, William J.....LDT
Bly, Merwin C.....EOT
Brown, Howard C.....EOT
Berg, Lawrence F.....LDT
Brawley, William F.....LDT
Burr, Robert T.....LDT
Brown, Ronald W.....CGC
Buttrick, Winthrop Parkhurst.....CPA
Bonn, Wesley Copeland.....SLA; ELA
Brown, Charles Alfred.....SLA; AAD
Barrett, James T.....TFT
Brown, Sidney Forster.....SLA; GLC
Blain, Howard W.....AGC
Borneman, Raymond T.....AGC
Bailey, Edward G.....LHV
Bowe, Charles J.....MAT
Butler, Morgan.....CPA
Bradley, Leslie K.....CGC
Budd, Denison M.....AGC
Bailey, William M.....CPA
Brooks, Rodger E.....HHN
Busk, Stephen L.....TFT
Baker, Harry S.....LHV
Bartlett, Walter A.....PMT
Braak, Gail V.....CGC
Boyden, William E.....LDT
Barrett, Vinton E.....CGC
Braun, William P.....CGC
Blackburn, Border.....CGC
Bastian, Frederick R.....CGC
Berg, Charles F.....CGC
Brown, Nugent E.....CGC
Butler, Judson R.....CGC
Bradley, Francis Marion.....SLA; CFT
Baldwin, John Francis.....SLA; CWT
Blakeslee, Herbert George.....SLA; SAG
Billie, Brewer Astor.....SLA; VBW
Bricka, Walter W.....LHV
Blanchard, Wells.....SLA; DMA
Blood, Wayland P.....DIK
Brown, William V.....LHV
Burns, Leroy W.....SRC
Brand, Smart.....RSD
Brannum, Claude J.....SMM
Buehler, Fred J.....UTA
Bohen, Mark D.....KST
Barlow, Stephen M.....LHV
Bruner, Donald L.....SMA
Beers, Donald.....DIK
Buel, Ed Allen.....SLA; Note 8

C

Callan, James Anthony.....SLA; FOB
Carlson, Charles Arthur.....SLA; HHN
Curtis, Harold B.....SLA; DAP
Coles, Norman Edward.....SLA; PMT
Carter, Frank Henry.....SLA; DMA
Churchill, Henry S.....DAF
Carroll, Howard R.....SLA; CGC
Clark, John L.....DMA
Crawford, Frank H.....AGC
Coombs, Cyril L.....CGC
Conlogue, John A.....SMA
Clark, William J.....SMA
Cluck, James Culver.....SLA; FOB
Condit, Kenneth Hamilton.....CPA
Coleman, Leighton Hammond.....SLA; CRI
Church, Warren G.....RWT
Cunningham, Edward G.....SLA; LDT
Cahall, Ralph J.....SMA
Cutler, Harvey D.....SMA
Chase, Philip Bradford.....SLA
Cary, Malcolm C.....LDT
Carter, Jewell L.....CPA
Crummey, James Michael.....CPA
Colton, Ralph M.....SLA; TFT
Crane, George A.....SMA
Chichester, Frederick S.....TFT
Clements, Otis.....TFT
Cargill, Charles Roger.....SLA; ELA
Curry, James T., Jr.....EOT
Clark, George D.....BST
Coulter, Walter A.....SMA
Charrion, Arthur B.....AGC
Chalfant, Harvey O.....AGC
Churchwell, Daisy L.....LDT
Curry, James P.....EOT
Cooper, Edwin J.....CGC
Cummings, Charles M.....CGC
Curtiss, Dwight W.....SLA; TFT
Camblin, Roy W.....CGC
Cassidy, John A.....LDT
Crisler, William N.....KST
Cochran, Edward Robert.....SLA; ELA
Costello, Elmer George.....SLA; SMM
Cole, Perry Commodore.....SLA; KST
Carter, Champe G.....DMA
Cauffiel, Paul W.....BST
Costar, Lloyd.....AGC
Collier, Trezevant.....AGC
Carson, Joseph A.....RSD
Crary, Roy J.....LDT
Carey, Walter R.....RSD
Cavannagh, Thomas E.....SLA; SBI
Cimmino, Frank.....CMV
Connolly, Cecil H.....SRC
Cameron, Robert F.....CJW
Claiborne, Harry C.....CFT
Corbitt, Marsh M.....SMM
Colman, Ben.....LHV
Coulter, Joseph R.....LHV
Cleaver, Carl D.....LDT
Cerreta, Joseph M.....LDT
Clemens, Edward H.....AGC

D

Dinger, Jean T.....CGC
Duke, Will Britton.....SLA; SBI
Daumont, Louis B.....SMA
Dammann, Carl W.....CPA
Davis, John Williams.....CPA
Dawson, Joseph Meadows.....CPA
Drexel, William R.....CPA
Davis, Paul O.....SMA
Denison, George K.....LHV
Draper, Carroll Henry.....SLA; TMA
Davis, Norman Alexander.....SLA; LDT
Dillin, Forrest H.....SMA
Duchac, Carl O.....LHV
Davis, Arthur Oudry.....SLA; ELA
Duke, Daniel F.....AGC
Denbo, George W.....FRF
Devore, Kenneth L.....AGC
Duke, Leslie B.....SMA
Durand, Eugene.....CGC
DeCamp, John S.....SLA
Dyke, Curtis E.....SLA
Dowman, Charles H.....CGC
Davis, William K.....LDT
DeForrest, Edward E.....LDT
Davies, Ward Jackson.....ELA
Davidson, Robert M.....LHV
Denny, Cary F.....CGC
Duncan, James C.....LDT
Dudley, George L.....LDT
deMilhau, Louis J.....CPA
Davis, William R.....SMA
Dowman, Charles H.....SMA
Davis, Paul A.....SMM
Dussere, Louis.....SMM
Drury, Aubrey.....DMA
Draper, Carrol H.....PWM
Diamond, William Montgomery.....SLA; SAG
Dillon, Edmond Whitney.....SLA; SAG
Dillon, Lynn G.....LHV
Davis, George Hutchinson.....SLA; MIT
Dennie, Fred C.....CGC
Doyle, Frank B.....CGC
Donohue, Gerald.....LDT
Davis, Jefferson.....FLA; DMA
Davis, Paul H.....UTA
Dodge, Harold W.....LDT
Dight, Frederick B.....LHV
Diemer, William S.....AGC
Dunavant, Raymond.....PWM
Decker, Harold J.....SAG
Danner, David Reese.....FLA
Dole, Eleazer J.....LHV
Duncan, Delbert James.....SLA; VBW

E

Elleman, Clifford.....SLA; GLC
Evans, George E.....PWM
Emmerich, Edmund Monroe.....FLA
Evans, Elmer Lloyd.....FLA
Elhart, Earl W.....AGC
English, Connell A.....CGC
Edwards, Ellis Eggleston.....SLA; AAD
Eubank, Carr Neal.....CRI
Erickson, Harry A.....CGC
Ely, Alfred.....MJA
Elston, Welcome B.....SMA
Elsasser, Hugh Herman.....SLA; EOT
Erdmann, Robert W.....RSD
Elliott, Daniel W.....LDT
Ennis, Elton Derry.....SLA; GLC
Eddy, Charles P.....LDT
Elm, Ienar Wald.....SLA; PWM

F

Furrow, George C.....Note 9
Fairbairn, George Robert.....SLA; PMT
Farris, William Clayton.....SLA; SAG
Finlay, George D.....DMA
Ford, Harold Ramsdell.....SLA; ELA
Fox, Joseph William.....SLA; AAD
Farthing, William E.....CGC
Fotterall, Walter William.....SLA; FOB
Fuller, Edward R.....CGC
Fay, Wallace M.....LHV
Fernald, Reginald Goodwin.....FLA
Foster, Traverse S.....LHV
Feltyberger, Ralph Davis.....SLA; KST
Fulke, Frank L.....CRI
Finn, Matthew E.....CGC
Fry, John O.....CGC
Flinn, Earle F.....AGC
Foote, John M.....CPA
Flowers, Leslie D.....FLA
Farrell, John B.....AGC
Ferguson, Edgar Terhune.....CPA
Freeman, Jesse K.....CPA
Ferris, James J.....AGC
Furness, Dwight Rodgers.....FLA
Farmer, Charles R.....AGC
Fay, George H.....CGC
Fluor, Peter E.....CGC
Faust, Leroy H.....CGC
Feast, Harry C. L.....CAF
Farnsworth, Harold T.....EOT
Flangan, Charles V.....EOT
Frankfort, Frederick.....CGC
Friday, Ellsworth C.....SMA

Foulk, Albert C.....SMA
Fitzpatrick, Arthur .....SLA; GLC
Fithian, Joel Remington.....CPA; DAP
Ford, Thomas William.....SLA; DMA
Fleming, James Russell.....FLA; UIU
Fuller, James Edgar.....SLA; PWM
Fenn, Charles J.....RSD
Fogarty, John L.....RSD
Frazier, Frank D.....LHV
Feldman, Hans A.....SMM
Feeney, Francis Joseph.....SLA; PWM
Frecar, Hiram L.....LDT

G

Gilfillan, William E.....CGC
Gasaway, Kenneth .....SLA; GLC
Graham, Harland B.....AGC
Gleason, Augustus Wilhelm.....SLA; VBW
Goettell, Phillip Churchill.....SLA; HHN
Gerald, William Joseph Fitz.....SLA; TMA
Garoni, Rudolph .....CGC
Gooding, Carlos C. V.....CGC
Gray, Ralph Egbert.....SLA; CUI
Griffee, Jan H.....DMA
Geraty, Thomas J.....EOT
Griffith, James H.....EOT
Grevemberg, Marion Elmer.....SLA; ELA
Gallagher, Benjamin Harold.....SLA; KST
Gardiner, Chandler B.....CGC
Grady, Anthony J.....CGC
Green, William S.....LDT
Gaines, Francis S.....CPA
Geiger, William Dodd.....CPA
Greene, William J.....CPA
Graybiel, Lloyd Erwin.....SLA; ABC
Gray, Bryce .....SLA; SMM
Gibbons, Francis Cromwell.....SLA; GLC
Gross, Paul Livingston.....FLA; LHV
Gill, Thomas Harvey.....FLA
Greeno, John Converse, Jr.....FLA
Gilman, Arthur R.....TFT
Grolman, Aaron D.....LHV
Gibson, Howard L.....SLA; LDT
Green, John C.....KST
Griffin, Courtland B.....EOT
Goldberg, Louis .....ELA
Gregory, Alexander S.....PWM
Gardner, Lester Durand.....MJA
Goddard, Fred C.....AGC
Gifford, Frank R. S.....AGC
Griswold, Wallace Newton.....SLA; FOB
Gove, Robert R.....LDT
Glover, Ray F.....LHV
Gray, Leslie R.....LDT
Gatherings, James C., Jr.....AGC
Getchell, Charles W.....RSD
Grimm, John E., Jr.....SMA
Gay, Ernest H.....CGC
Gould, Clifford B.....LDT
Guild, Bartlett .....SLA; LDT
Gary, Francis Phinizy.....SLA; PWM
Graves, William Middleton, Jr.....SLA; AAD
Gentry, Benjamin Alexander.....SLA; PMT
Gregory, Ralph L.....LHV
Gibson, Norman W.....LHV
Goggans, Joseph Terrell.....SLA; PMT
Gibson, Frank Harrison.....SLA; ELA
Gallup, Floyd Hale.....SLA; PWM
Garner, Bernard Russell.....SLA; KST
Gowans, Louis L.....SRC
Gates, William Allman.....SLA; SAG
Gould, Clifford Burt.....SLA; CWT
Gallagher, Harry Purcell.....FLA
Gilbert, Lester Frederick.....CPA
Gilvin, Willard Sherman.....SLA; ELA
Gibson, William Edward.....SLA; AAD
Glennon, Herbert L.....MAC
Gemmill, William Billings.....SLA; ABC

H

Harman, Edwin T.....FRF
Hegenberger, Albert F.....SMA
Harris, Henry Frazer.....DMA
Hebbard, Albert Faitoute.....SLA; FOB
Hanchett, Frederck W.....EOT
Hogue, Mark C.....AGC
Hill, Stuart Merriam.....SLA; ABC
Harris, Ray G.....SLA; LDT
Hardy, Richard L.....LHV
Harley, Wilbur H.....LHV
Horton, Charles M.....HHN
Hammes, John S.....LDT
Hollander, Robert B.....CGC
Hebbard, Charles B.....AGC
Hood, Daniel G.....FRF
Hamilton, Pierpont Morgan.....FLA
Hammond, Clarence Bray.....CPA
Hale, Laurence Ivan.....FLA
Halliday, Morris Samuel.....FLA
Hutchins, Don Lee.....FLA
Hutchison, Frank Y.....EOT
Harrison, George H.....CGC
Hill, Charles .....CGC
Heckler, Russell G.....CRI
Harris, Henry H.....LHV
Heege, Homer Richard.....SLA; ELA
Horn, Glenn D.....LHV
Harwell, Gordon Lee.....PWM
Hunt, Lorry George.....SLA; FOB
Hart, Joseph Luther.....SLA; BFT
Hyden, Victor M.....KST
Hagemeyer, Frank H.....LHV
Hughes, Edwin D.....CGC
Hanlon, William J.....AGC
Horrell, William A.....CPA
Hayes, Benjamin H.....LHV
Harris, Theodore .....SLA; TFT
Hersloff, Sigard N.....SLA; TFT
Hellman, Isaac H.....SLA; TFT
Huffman, William E.....CJW
Hinckley, Burt E., Jr.....BST
Harrington, John P.....LHV
Haddorff, Carl L.....CGC
Hiatt, Louis E.....CJW
Hunt, Mark B.....LDT
Heege, Homer R.....PWM
Hallberg, Lloyd C.....CGC
Hunter, Thomas O.....BST
Houghton, Henry S.....LHV
Hill, Hartwell Chailacombe.....SLA; ELA
Harrison, William Henry.....SLA; KST
Hamilton, Ferris F.....LHV
Holliday, William J.....DIS
Hinkley, Burt Eardly, Jr.....SLA; KST
Higgins, Walter J.....CGC
Hopkins, Andrew S.....CGC
Hillhouse, John G.....SMM
Haynes, Roy M.....LHV
Hoyt, Richard H.....RSD
Heitz, Frank F.....LHV
Hayden, Thomas H., Jr.....FRF
Henderson, Finley Dewey.....SLA; SAG
Hewitt, Clarence L., Jr.....ELA
Horney, Reid B.....CRI
Haskins, George W.....SMA

I

Iverson, Roderick M.....CGC
Ireland, Clarence Leo.....SLA; SBI
Ingram, Emmett L.....DIK

J

Jones, Edward P.....LDT
Jones, Arthur H.....FRF
Jones, Henry S.....FRF
Jones, Elmer H.....AGC
Jones, Almer Voss.....SLA; AAD
Jones, Vivian M.....AGC
Jones, Lee B.....CJW
Jarvis, Brewster Hovenden.....SLA; WFO
Johnson, Paul Oliver.....SLA; PMT
Johnson, Bayard.....SMA
Johnson, Cortlandt S.....AGC
Johnson, Everett B.....CGC
Johnson, Walter R.....SLA; TFT
Johnson, Albert L.....RSD
Johnston, Clifford .....SMA
Johnston, Neil S.....CGC
Jevon, Victor A.....KST
Jackman, Charles H.....CGC
Jakway, Clyde C.....CGC
Jaeger, Otto .....CGC
Jackson, Oliver P.....SMM
Jackson, Leslie L.....UTA
Johnson, Carl E.....ELA
Jesse, William R.....BFT

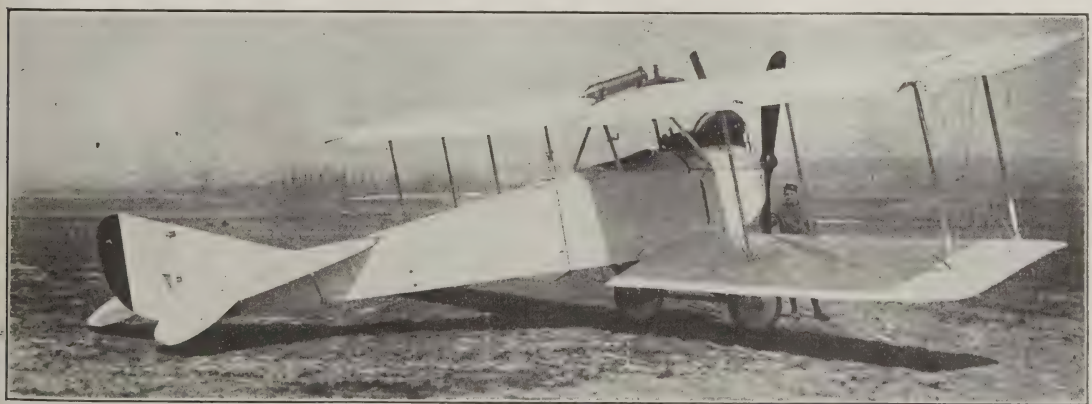
K

Kessler, Edwin Stebbins, Jr.....SLA; FOB
Kilburn, George W.....SMA
Knight, Everett S.....EOT
Keck, John Hamilton.....CPA
Kleinknecht, Clifford C.....EOT
Katzman, Leo .....EOT
Kresge, Clyde L.....EOT
King, George E.....KST
Kohr, Hugo J.....CGC
Krieger, John E.....CGC
Kunkel, Henry William.....SLA; ELA
Kuehl, Adolph A.....LDT
Kerr, Henry D.....DMA
Krull, James Stephen.....FLA; BST
King, Lawrence S.....LDT
Kendall, Harold L.....LDT
Kuechler, Gustave H.....LDT
Knight, Herbert G.....CPA
Knickel, Walter C.....AGC
Keltus, John A.....LHV
Kittredge, Albert Ray.....FLA
Kloke, Carl P.....CGC
Knight, Frederick H.....LDT
Kirkpatrick, James D., Jr.....CGC
Klotz, Dominic G.....TFT
Kilander, Carl F.....SLA; PWM
Kyle, William F.....LHV
Kenney, Cornelius J.....CGC
Knoeppel, Charles J.....SLA; PWM
Keith, William S.....CGC
Kinney, Kenneth K.....LDT
Kitchel, Allan F.....LHV
Kattlemann, Carl Henry.....SLA; APR
Kincaid, Robert Leland.....SLA; KST
Kerr, Robert Wendell.....SLA; CWT
Klyce, William H.....SMA
Kunzelman, Charles .....CGC
Kelsh, Harry T.....LHV
Knode, Thomas E.....CFT
Kittinger, Charles C.....LDT
Kane, Hoyt R.....DIK
Kraus, Edwin J.....SMM

L

Loomis, Robert Henry.....SLA; FOB
Langin, James J.....LHV
Logan, George .....SLA; CRI
Lehrbas, Lloyd Allen.....SLA; AAD
Lane, Emory Wilson.....SLA; DAF
Larned, Edward P.....SLA; KST
Layne, Edward G.....LDT
Loehr, Theodore E.....LDT
Lippencott, Wallace Crowell.....SLA; ELA
Lynch, Russell W.....LDT
Lehardy, Franklin M.....LHV
Lawrence, Arthur Brewster.....CPA
Logan, Charles Ritchie.....FLA
Latta, Franklin W.....LHV
Lawson, Dudley B.....EOT
Lippman, Joseph L.....EOT
Lindsay, Harry Bernard.....FLA
Lane, Abbott Atwood.....CPA
Lindsley, Dan Leslie.....AGC
Lemley, Russell W.....LDT
Lawton, Merritt L.....CGC

(Continued on page 392)



A training biplane of Boche origin at one of the French aerodromes

FOREIGN NEWS

GREAT BRITAIN

The British official statement of October 4 said: British airmen have taken part during the week of September 29-October 4 in the American operations in Lorraine. They made a special point of attacking vital enemy railway communications south of Luxemburg. Thus in the twenty-four hours ended at dawn September 27 fifteen separate raids were carried out upon the railway triangle at Metz-Sablon, two upon the junction at Thionville, two upon the railway at Mezières, one upon Audun-le-Roman, one upon Ars, and two upon the aerodromes at Frescati and Plappenville, near Metz.

Other British airmen in the course of air-fighting over Northern France and Belgium last week destroyed 124 enemy machines, drove down 46 out of control, and shot down 34 German kite balloons in flames. Ninety British machines were reported missing last week.

Photographic reconnoissance over the enemy's lines has also been carried on simultaneously with the fighting, and an aeroplane authority, in discussing this matter, laid great stress on the fact that at the height of a conflict of unprecedented magnitude, during which immense exertions are demanded of the air service, British airmen should be quietly and systematically preparing the way for further advances by photographing the enemy's vital positions far behind the battle lines.

The duties of the air force, indeed, combine active participation in actual battles with preparation for operations yet to be undertaken. Last week between 8,000 and 9,000 air photographs were taken, of which more than 5,000 were made in fifty-six hours.

Bombing squadrons have also been busy during the last week. Nearly 300 tons of bombs were dropped upon German railways and other military organizations between the coast and the Somme, and the Belgo-British operations in Flanders were greatly assisted by attacks from the air on railway communications at Thourout, Cortemarck and Lichtervelde, on the direct routes from Bruges and Ostend to the retreating German line. Moreover, enemy reinforcements as they came up were attacked with bombs and machine gun fire.

The roadbed was destroyed in many places. Three trains were partly destroyed by fire, and direct hits were made on four others. Three large enemy ammunition dumps were exploded, and columns of horse transport were stampeded, while heavy casualties were caused by bombs bursting in the midst of massed troops.

As darkness fell on October 8 the sky was dotted with British aeroplanes, some hovering over the smoking and flaming battlefield, while others were on their way to add to the general confusion behind the enemy lines by dropping bombs on all sorts of targets. Throughout the day the British had had complete control of the air, bombing roads, barracks, massed troops, and batteries. German aeroplanes were seldom seen. The few enemy machines that did venture forth to places where they were not wanted were quickly engaged, and in aerial fights a considerable number of them were brought down.

The British Naval Air Force has been dropping seven tons of bombs every day upon the Zeebrugge bases for some time, which was a reason why the Germans decided to give them up. The blockading ships are still in the channel, but the Germans cut a hole through the wall and have managed to get some of their submarines out.

British aviators on October 9 bombed railways at Mezieres, Metz-Sablons and Thionville and aerodromes at Frescaty and Morhange, according to the statement issued by the Air Ministry.

Metz-Sablons was attacked October 10.

British airmen and gunners on the western battlefront destroyed 383 German aeroplanes in September. In the last seven days British airmen alone have destroyed 89 German machines and driven down 27 out of control. These figures take no account of French, American, and Belgian successes.

The fighting of the British airmen during the last week has been of a remarkable character. During the earlier part of the week the brunt of the air fighting fell upon British squadrons operating between Lens and Le Catelet, especially over the great network of railways of which Valenciennes, Douai and Cambrai are the vital junctions. Taking advantage of every possible opportunity both by day and by night, the British airmen maintained a virtually continuous offensive against these centres, including the station at Mons and the smaller though vitally important junctions at Aulnoye, south of Valenciennes, and at Busigny, where the line forks toward Cologne and Brussels.

Prior to the early hours of October 8, when the British infantry attack between Cambrai and St. Quentin was launched, 163 tons of bombs were dropped by British airmen upon these and other military objectives.

Fifty-three British machines were reported missing in the course of the last week.

It is understood that the Germans are no longer attempting to use the Flanders coast for sea operations of any description. They have stripped their bases there of all vessels and have left virtually no seaplanes.

The mouth of the harbor at Ostend has been blocked by the Germans, and there is little doubt that similar steps will be taken at Zeebrugge.

The independent air force on October 15 bombed the Frescati aerodrome and blew up a Zeppelin shed, according to an official announcement.

Two large Swiss flags were borne by the Swiss balloon destroyed near Berne by a German aeroplane. In addition, two federal crosses were painted on the balloon. Two aeroplanes were discovered coming from the east and following the German-Swiss frontier. The observer signalled to have the balloon drawn down. This operation had begun when the aeroplanes, whose German marks were seen, flew several times around the balloon. One aviator fired a machine gun at the balloon and threw a bomb, which set fire to it. The aeroplanes then disappeared. The German Minister has expressed his regrets and promised punishment of the guilty aviators.

The British and Australian airmen on the Turkish front and the infantry had forced the enemy into the road just as the guns began to shell the retiring transport. The airmen swept down to an altitude of 200 feet and bombed the head of the column. Once that was accomplished at the front, only time was required to finish the job. It was done with surprising thoroughness, one flight following another until the whole column was a vast broken mass.

The enemy troops, seeing that escape for the vehicles was impossible, fled to the hills and fell into the hands of the cavalry or sought refuge in our lines. The Irish and Indian troops in thirty-six hours marched twenty-one miles as the crow flies, over a succession of mountains and rocky valleys, fighting incessantly.

The airmen were busy on September 23 in the Es-Salt and Amman area, bombing the enemy, and also attacked the station at Mafrak and the aerodrome. Direct hits included one hangar, which burned.

An official statement on the operations of the independent air forces issued October 22 says:

Two of our squadrons attacked the barracks and railways at Metz Monday. Another squadron set out to attack the factories in Rhine towns, but the formation was split up by the dense fogs. Seven machines have not up to the present been located. Monday night we dropped heavy bombs on the stations at Mezieres.

FRANCE

The French official report on aerial operations on October 9 says:

October 8 atmospheric conditions unfavorable for flying permitted us to carry out only restricted work. Three enemy planes were brought down and two captive balloons were burned.

During the night the weather improved and our bombing squadrons took the air. They dropped more than twenty-six tons of projectiles on the stations at Marle, Mont Cornet, Rethel, Asfeld-la-Ville, Juniville and Chatelet sur Retourne and on the railroads between the stations. Fires and explosions were caused at various points.

A very large number of aerial reconnoissances were made well over the enemy lines with success on October 9. Important assemblages of the enemy were reported in the region of Etraye, Manvillers and Mourey.

French bombing machines operating in mass formations threw down with most satisfactory results 32,600 kilograms of bombs and fired several thousand cartridges against enemy troops and convoys. In the course of these operations twenty-one enemy aeroplanes were destroyed or put out of commission. In the course of the night a very heavy fog made it impossible for us to drop more than 5,300 kilograms of projectiles on the railroad stations at Longuyon, Dommarie-Baroncourt and Audun-le-Roman.

The official communication dealing with aerial operations says:

On October 10 our bombing squadrons carried out important operations, dripping more than 35,000 kilos (77,000 pounds) of projectiles on enemy concentrations and convoys in the region of Vouziers and on a munition depot, which exploded.

Numerous combats were fought, in the course of which seventeen enemy machines were brought down or fell disabled, and eight balloons were burned.

Our observation machines continued to fly behind the enemy lines, reporting numerous fires which the enemy had set in the course of his retreat.

During the night our bombing squadrons continued their work of dropping 24,000 kilos of explosives on bivouacs in the region of the stations at Longuyon, Hirson, Attigny, Pauvres and Mont Cornet, and on convoys and trains.

ITALY

On October 4 our bombing squadrons bombarded with great success the enemy's lines of communication, and at a low altitude machine-gunned the aviation field at Tirana. The renewal of favorable atmospheric conditions increased the aerial activity. In an aerial fight four enemy machines fell.

On October 5 the activity of our bombing squadron was considerable during the entire day, making their effects felt on depots and on concentration camps. The results of the numerous aerial fights were four enemy machines sent to earth.

On October 6 our aviators were very active. Enemy squadrons attempted to pass the lines at Val Lazarrina, but they were faced and put to flight. One enemy machine fell on Lusegana.

The enemy aviation fields at Alto Adige were bombarded with great success by our squadrons, and with incendiary bombs the destruction of the hangars were accomplished. Other squadrons bombarded the rear of the enemy's lines on the Alsipiano di Asiago.

During the nights of the 6th and 7th our dirigibles bombarded with great effect the enemy's aviation fields in the Venetian Plains and the military camps of Premolano and Uscine. During the numerous aerial flights two machines fell to the earth.

GERMANY

Great headquarters has issued the following:

During September 773 enemy aeroplanes and 96 balloons were destroyed on the west front. In spite of enemy superiority in numbers, we lost only 170 aeroplanes and 103 ballons.

British Aeroplane Takes 65 Germans Without Landing

London.—Two British aviators, flying low in one machine, recently brought about the surrender of sixty-five Germans, and without leaving their aeroplane shepherded the party across No Man's Land to the British lines, according to a story from the battlefield made public on September 24.

The pilot and his observer had been attacked from a trench and sunken road. The pilot dived and replied to the enemy fire with his machine guns killing one and wounding three. The Germans in a panic ceased firing and hoisted a white handkerchief.

As there was no British infantry in that neighborhood, the pilot descended to within fifty feet of the ground and motioned the Germans out of the trenches, circling around them to insure that none escaped. All were safely brought in and handed over to the nearest British troops.

The aviators then resumed their patrol.

Famous French Ace Missing

Paris.—Sub-Lieut. Boyau, one of the famous French aces, is reported to have been missing since September 28. He is credited with thirty-two aerial victories.

Sub-Lieut. Boyau began to figure in the reports of exploits of the French aviators in the present year. By the month of June his record of aerial victories had reached a total of fourteen. It jumped rapidly during late June and July, until on August 1 it was reported as twenty-nine. Particular mention was made of three victories he scored in late July, each of which was won in not more than ten minutes.



MODEL NEWS

Edited by John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Model Aeroplane Building as a Step to Aeronautical Engineering

The Designing and Building of a Man-Carrying Aeroplane

WE now enter into the most difficult and intricate part of our work, as every part of the aeroplane must be designed to do its work with the maximum of efficiency and must be of the greatest ultimate strength, at the same time weighing as little as possible. The writer does not intend to cover the whole course of aerodynamics or aeroplane design, as this alone would take a large book, but we will design a light horse powered machine and select from tables and data given in authoritative books those figures which we will need to apply to our machine. In this way the reader will grasp the method used by aeronautical engineers in laying out the plans of a machine.

That these theoretical figures are correct was proven by the fact that a certain aeroplane was designed to weigh 1300 pounds with a 150 horsepower motor and to travel at the rate of 135 miles per hour, with a landing speed of 60 miles per hour, and when built and flown it did not vary from the figures 5 per cent.

Tables of the lift and resistance of different wing sections at angles of incidence varying from zero to 16 degrees are available, also skin friction, resistance of bodies, struts, bracing wires, etc.

The reader will remember that the angle of incidence becomes smaller as the aeroplane gains speed. For instance, if the angle is 16 degrees at a speed of 45 miles per hour, it will gradually become smaller as the speed of the machine increases until the machine reaches 95 miles per hour, when the angle is only a fraction over one degree. It is also worth while to remember that the greater the angle of incidence the greater the resistance. (For further reference I would advise the reader to get the book on Aeroplane Design by Judge, Barnwell, Rathbun, or Klemin at the Aeronautic Library, 299 Madison Avenue, New York City. These books contain all the data necessary to design an aeroplane. If the reader is not well up on mathematics, I would advise Klemin & Huff's Book on Aerodynamics and Aeroplane Design.)

The machine shown in the accompanying illustration is powered with a 35 h.p. motor and was built by E. H. Holterman, former civilian instructor in the Government Service. The data and drawings of this machine was furnished by the writer. The spread of wings is 26 feet, the overall length being 20 feet and the weight only 550 pounds.

The machine we are about to build will be lighter and with a different wing curve than the one shown in the illustration, as Mr. Holterman wanted speed, while we will strive to get a medium fast machine to carry a small useful load.

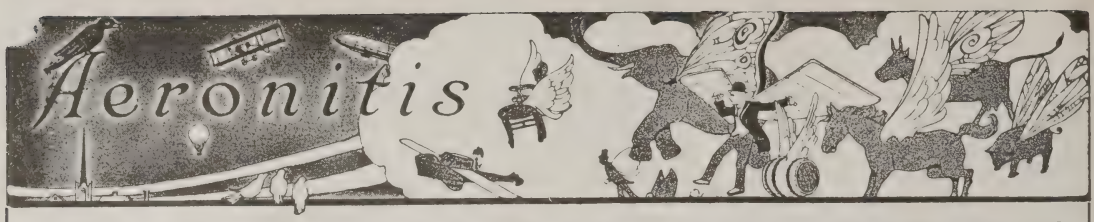
The cost of building a small machine runs about $300.00 or so, according to the work done by the builder. If the parts are bought from a Supply House the cost will be about twice the amount, but of course the workmanship will be better.

I would advise making full or at least half size drawings of each part of the machine before attempting to build it, because each part of the machine must be exact or the assembly of the machine will be impossible.

We will accept standard practice and copy the machine shown below as closely as possible, except placing the radiator over the engine instead of in front to assist the less experienced reader in building the machine.



Mr. E. H. Holterman, former Civilian Instructor and tester for the U. S. Government, and his Ford-motored aeroplane



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

I Ain't Got It

Y'all ask me don't I want to go afloatin' troo de sky,
Askimming like a buzzard, or a-buzzin' like a fly?
Well, Boss, my laigs is good, and what it takes to want to die—
I ain't got it.

Uh, uh, I ain't no slacker what's afraid to go to war;
I done been married twice myself, so I been there before.
But what it takes to drop them bums above the cannon's roar—
I ain't got it.

Dis nigger ain't partic'lar good, he's gettin' old an' fat;
His teeth an' hair an' wind's done gone, an' little things like that.
But 'less I takes to drinkin' milk—get crazy like a bat—
I ain't got it.

I'll yell, "Come on and get it," good an' loud three times a day,
An' help to lick the Kaiser in my bes' chow-chuckin' way;
But ridin' in a airyplane? please, Boss, jes' let me say—
I ain't got it.

Some day when I is dead an' gone, an' wearin' reg'lar wings,
An' wearin' out a pair o' bones with other angel things,
Jes' come an' fly up to de sky an' lissen, while I sings—
I ain't got it.

"General Staff"

A passenger train arriving with 200 soldiers, many of whom were officers, attracted the attention of two negro bootblacks. As the officers walked by "Sambo" and "George" would exclaim—"Dat's a capting" or "He's a leftenant," as the case might be.

At last a French soldier in his natty blue-gray uniform passed by.

"What's he, Sambo—a kunnel?" asked George.

"No, George, dat's dis yere General Staff."

The Spinning Nose-Dive

The simplest stunt a pilot tries
Yet half the blooming time he flies
The damn thing gets him by surprise—
a spin.

Too steep a bank—too flat a turn,
Then like a rolling butter churn
Friend bus will pitch and twist and turn.
So save your blighted neck and learn
To spin.

R. I.

Owed to a Night Bomber

Hear! Mecano, ere you crank,
This foolish looking flying tank!
Let me on your mind impress
With the utmost earnestness,
Grasp this order without fail,
Don't get tangled in my tail.

Knight o' the sparkplug, hear my vow,
There will be one hellva' row.
Take it even now from me,
It'll be the end of you an' me.
If you'd escape my rage
Guardez vous mon empennage.

Flying Indeed!

A shrill whistle sounded from the orderly tent, and our Sergeant Kellar yelled, "Who wants to go flying?" Out of six tents there madly rushed twelve enthusiastic individuals, each eager for his first trip.

"We do!" they cried eagerly, crowding closer.

"Good!" said Kellar, as he handed each crestfallen youth a wire fly swatter, "I guess the best place for flying is in the mess hall; there are plenty there."

Tommy Atkins Scores

Private (*to newly promoted lance-corporal*) What 'they gives such blokes as you stripes for beats me.

Lance Corporal—Not for bein' lazy, anyhow.

Private—No; I knows all about that, 'cos if they did you'd look like a bloomin' zebra.

MUTT AND JEFF---Jeff Put Frankfort Train Service on the Bum Without Dropping a Bomb. . . By BUD FISHER

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Courtesy N. Y. Globe.

Thomas

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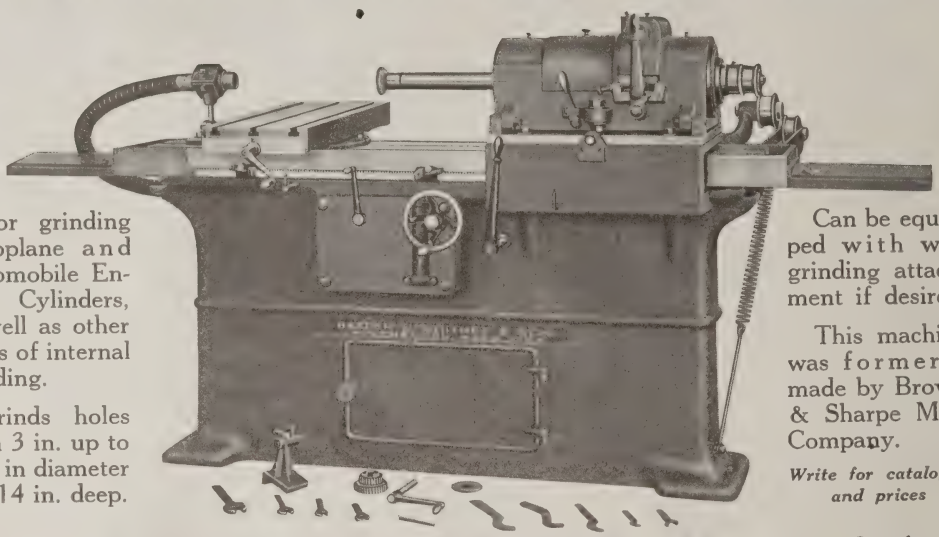
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(*Continued from page* 387)

Lewis, Burton F.....EOT
Lawnin, Nelson.....CGC
Lloyd, Thomas L.....LDT
LeVitt, Morse D.....CGC
Lowry, James T.....SRC
Lyall, Paul C.....AGC
Lynch, John J.....RSD
Lipari, Attilio Felix.....SLA; DMA
Leman, Edwin A.....LDT
Loud, Lingard.....LDT
Lungren, Edgar E.....SMM
Leazar, Augustus.....SMA
Love, Homer Brown.....CPA
Lane, David W.....CGC
Leader, Ross J.....CGC

M

Moore, Henry Nelson.....FLA
Menrath, Joseph E.....FLA
Morfitt, Neil Lewis.....SLA; GLC
Muir, Leonard Scott.....SLA; KST
Magruder, Abbey Wailes.....SLA; KST
Merrill, Leland H.....SLA
Moose, William L., Jr.....DMA
Moon, Ruthven Keith.....SLA; AAD
Metz, Harold W.....LHV
Moulton, Carl J.....BST
Morse, Charles L.....SMA
Maloy, John Sharpless.....SLA; PMT
Martin, Joseph H.....LDT
Mayers, Howard W.....SAG
Moss, Harold Smith.....SLA; HHN
Mills, Charles F.....DMA
Moses, Lester E.....SMA
Miller, Roy G.....SMA
Maenner, Theodore H.....CPA
Matz, Carl Dusenbury.....CPA
Merrill, Mazel M.....SLA; LDT
Murphy, James B.....SLA; LDT
Miller, Harry B.....CGC
Munchof, Theodore J.....CGC
Messinger, Joe Prout.....SLA; AAD
Monteith, Charles N.....SMA
Mahan, William J.....AGC
Maywald, Frederick.....SLA; CRI
Miller, Dewey H.....LHV
Muter, Leslie Frederick.....SLA; RWT
Myers, George G.....AGC
Major, Cederic A.....FLA
Moery, Ralph.....EOT
Millard, Joseph H.....SLA; TFT
Murphy, Clement J.....SLA; TFT
Muse, Donald P.....EOT
Marsh, Ralph A.....AGC
Martin, Oliver H.....LHV
Morrissey, Raymond A.....LHV
Mathews, David R.....CGC
Morgan, Dwight C.....EOT
Mason, Henry H.....TMA
Martin, William, Jr.....LDT
Moor, Robert D.....CGC
Murphy, Cyrus W.....SMA
Meyer, Henry F.....BST
Marshall, Robert J.....SLA
Martin, Dan C.....SBI
Marx, Arthur C.....LDT
Miller, Heber C.....LDT
Moore, Kenneth L.....CPA
Murphy, Francis H.....CPA
Marquette, John J.....KST
Marsden, Ross S.....LDT
Maguire, Cornelius John.....SLA; PWM
Middleton, Mortimer.....SMA
Means, Leland M.....SMA
Moran, William King.....SLA; PWM
Mehagahan, Donald B.....WFO
Meizner, Howard F.....KST
Miller, Wallace H.....RSD
Mulvihill, Bernard H.....LHV
Maher, Cornelius Creedon.....SLA; PWM
Mills, Ogden L.....CPA
Maxwell, Robert T.....DIK
Magovern, John E.....CGC
Merser, Charles P.....CGC
Morse, Arnold S.....UTA
Moor, Robert Dudley.....SLA; PWM
Murray, John D.....BFT
Miller, Charles E.....SMM
Minor, Richard P.....KST
Magee, Richard H.....RWT
Mann, Asa C.....SAG

Mc

McCluer, Darius Heald.....SLA; KST
McCoy, Harold James.....SLA; VBW
McKinney, William H.....AGC
McKenna, Raymond F.....SLA; LDT
McQuown, William K.....FLA
McGowan, George Jessee.....SLA; ELA
McClellan, Hez.....SLA; KST
McCully, Coleman C.....LDT
McCormick, Alexander L.....RSD
McNees, Joshua M.....LDT
McKee, Ralph S.....LHV
McNeill, John F.....LDT
McCullough, Howard J.....LHV
McPheeters, Chester J.....LHV
McEachin, James S.....LHV
McGregor, Kenneth C.....BST
McClure, Samuel Merwin, Jr.....SLA; SAG
McLafferty, George H.....CJW
McMillin, Byron D.....LDT
McQuitty, Lee O.....CPA
McKenny, Samuel M.....CGC
McKnight, Roy A.....SLA; TFT
MacKay, Charles H.....LHV
MacManus, Clare C.....GLC
MacGregor, Perley Everett.....FLA
McLeod, Willard Wise.....SLA; CRI
McCormack, Thomas H.....FRF
McLaughlin, John E.....LHV
McDow, Cleo Blanford.....SLA; TMA

N

Nason, George Horace.....SLA; SAG
Neeley, John E.....LHV
Nail, James Gay.....SLA; CRI
Noyce, James Everett.....SLA; ELA
Norris, Leonard Scott.....SLA; KST
Norman, Sverre F.....SLA
Nelson, Arlen C.....CGC
Noyce, James E.....PWM
Nelson, Luther.....CGC
Neal, Paul M.....GLC
Niles, Edward A.....PWM
Nichol, Edward H.....Note 5
Nelly, Herbert V.....CGC
Newbold, Edwin E.....Note 9
Nelson, James Thomas.....FLA; HHN

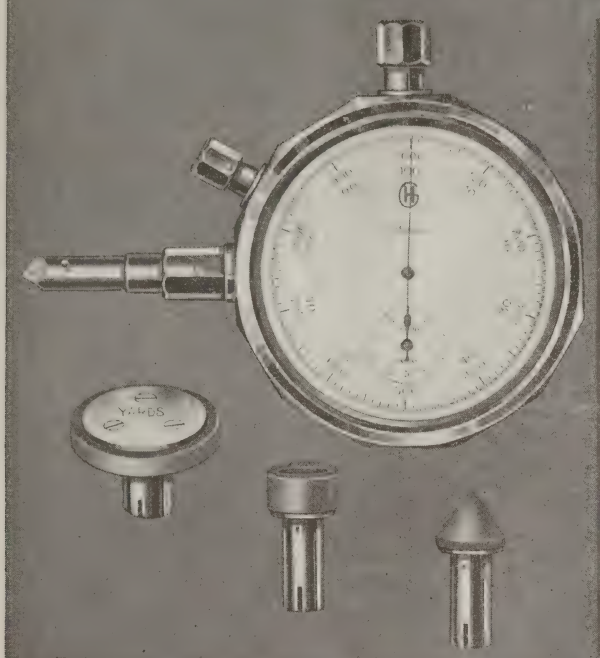
O

Osborn, Thomas W.....CGC
Oertel, Robb C.....CGC
Orr, Alexander Barrington.....SLA; MAC
Olson, Eugene F.....SMA
O'Neill, Ralph A.....FRF
O'Connell, John J.....HHN
O'Leary, Arthur C.....SLA
O'Brien, Thomas F.....CGC
O'Shea, Edward M.....CGC
O'Brien, Martin J.....MJA
O'Connor, Joseph P.....PWM

P

Pedrick, William John, Jr.....CPA
Pieper, Clifford E.....AGC
Plummer, Harold O.....AGC
Porter, Earle W.....AGC
Percy, Leroy P.....BST
Plummer, Franklin A.....KST
Pingenot, Augustus C.....LDT
Pearson, William Davis.....SLA; BFT
Phillips, Eldon Paul.....CPA
Pirisky, Joseph.....CPA
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Phillips, George C....EOT
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Parker, J. Brooks B....REL; DMA
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R

Rogers, Francis A....SRC
Rogers, Edward B....LDT
Reid, James Donald....LA; CRI
Rogan, James S....SLA; CRI
Robertson, Rupert....SLA; FOB
Reed, Carroll C....CGC
Richards, Homer M....PWM
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Rogers, William Dayton....CPA
Rogers, Harry Sinclair....SLA; KST
Ritchie, Franklin M....AGC
Richardson, Baxter K....EOT
Rice, Hyland P....SLA; LDT
Russell, Selwyn E....CGC
Russell, Franklin B....AGC
Russell, Horace W....LDT
Ragatz Edward G....AGC
Rady, William J....SLA; TFT
Roane, James F....GLC
Readio, Rodger F....LDT
Rieck, William T....PWM
Ryder, Gerald A....CGC
Richardson, Ralph E....AGC
Rundle, W. B....CGC
Richey, Robert G....LDT
Reinbrecht, Downing A....EOT
Ruiter, Raymond Nelson....SLA; CGC
Rogers, George Murray....SLA; SAG
Rowe, Maurice Broaddus....SLA; PWM
Riblet, Philip D....CGC
Rogers, Edward D....RSD
Robinson, Archbold H....CGC
Roper, George M....DIK
Repman, Chester A....KST
Rogalsky, Fred A....Note 5
Rinehart, John B. G....LHV
Record, Harold J....RSD
Russel, Scott....RSD
Roberts, Kirk M....CGC

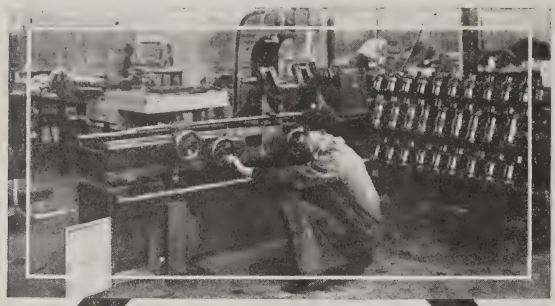
S

Still, Glenn Maurice....SLA; FOB
Stewart, James L....CGC
Smith, Wesley Leland....CGC
Smith, Horace Jeremiah....CPA
Smith, Orus Wilder....CPA
Smith, George V....CPA
Smith, Robert Cowan....SLA; KST
Smith, Lotha A....CGC
Smith, Herbert C....LDT
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Sedgwick, Alfred....AGC
Stauffer, John L....LDT
Sattler, Walter F....EOT
Spainhour, Carl M....EOT
Sullivan, Dennis J....EOT
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Swedberg, Ernest W....CGC
Schreiber, Harry Carl....SLA; BFT
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Sarthou, Alexander E....CGC
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Sasnett, Bolling H....LDT
Stepp, John W....FLA; DMA
Starkweather, Raloh....CGC
Swertfeger, Florian F....CGC
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Sullivan, James Henry....CPA
Symonds, Merrill E....AGC
Soule, Harold G....SLA
Scott, Townsend, Jr....TFT
Sallee, Philip Richard....SLA; ELA
Stranahan, George Golder....FLA; CAF
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Spurgin, William Herbert....SLA; ELA
Sprague, Lloyd D....SLA; LDT
Shank, Harry E....LDT
Swift, Chester H....LHV
Sawyer, George Wissinger....FLA
Sloane, Charles B....SLA; TFT
Stratton, Edwin L....LDT
Seeligson, Lamar G....KST
Stallings, Alcy L....LDT
Stover, Allen Roswell....Note 3
Shook, Charles H....Note 4
Schroth, Herbert Henry....SLA; Note 10
Shannon, Ralph Leonard....SLA; CFT
Suttle, David MacIlvaine....SLA; SAG
Sale, William E....SLA
Smith, Stanley....SRC
Sonday, Frederick J....LDT
Schauweker, Arthur A....LHV
Spalding, Charles T....LHV
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Tyssowski, Joseph G....LHV
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(Continued on page 395)



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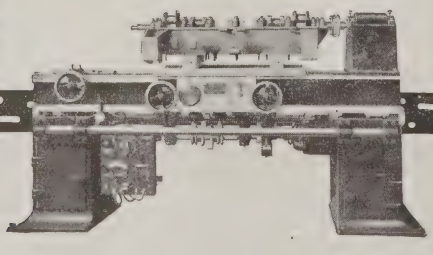
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Tuohey, Ellsworth Bernard.....SLA; KST
Thompson, Lyman H.....PFO
Templeton, Robert Lyman.....SLA; BFT
Taylor, George Francis.....SLA; ELA
Thomson, Henry.....EOT
Teegarden, Chester H.....CPA
Townesend, Ervin Nathan.....SLA; TMA
Trinler, Newland DePauw.....SLA; AAD
Taylor, Thomas P.....LHV
Ticknor, Lewis Delmar.....CPA
Tate, George L.....SLA; TFT
Titzell, George G., Jr.....EOT
Tilley, Milton.....SMA
Tieman, Frederick A.....LDT
Thursby, Sydney, Jr.....TFT
Tuttle, Howell A.....CGC
Tracy, Linwood W.....PWM
Templeton, John W.....SMA
Terry, Daniel G.....6SLA; LDT
Tiernan, John P.....CGC

U

Utt, Joseph Hawley.....SLA; KST

V

Van Tuyl, Anthony.....GLC
Von Hake, Richard A.....LDT
Van Auken, Wendell G.....LDT

W

Ward, Paul William.....SLA; MAC
Ward, Lot Reznor, Jr.....SLA; ABC
Whitney, Alvin McClew.....CPA; FOB
Warde, Arthur F.....CGC
Webb, Sigel G.....CGC
Winch, George A.....CGC
Welsh, William W.....CGC
Walker, James K.....LDT
Washburn, Laurence G.....AGC
Wheeler, Robert E.....AGC
Wilkinson, William H.....CJW
Woodward, Ernest W.....TFT
Wurmstick, Arthur P.....TFT
Wiley, Clarence D.....CGC
Weiser, Victor A.....AGC
Wilbur, Jerry Francis.....SLA; KST
Wright, Merton L.....CJW
Weiler, Raymond L.....EOT
Wilde, Robert J.....EOT
Wicker, John Jordan, Jr.....SLA; AMV
Wilsen, Frederick Chaplin, Jr.....SLA; GLC
Weiss, John J. R.....BST
Walker, Byron B.....KST
Wilcox, Charles H.....FRF
Williams, Glenn E.....AGC
Walker, James K.....LDT
Wooley, Cecil C.....LDT
Williams, Walter Wood.....SLA; CRI
Wallace, Karl E.....SLA; AAD
Wright, Bailey Ayers.....SLA; CRI
Wadsworth, Edward Arthur.....CPA
Walser, Havelock.....CPA
Weir, Charles R.....PWM
Williamson, Cleburne M.....AGC
Walker, Harry W.....LDT
Wright, Francis M.....WFO
Webber, Stanley H.....EOT
Witney, William R.....LDT
White, James Frederick.....CPA
Walsh, Charles V.....PWM
Warwick, John S.....LDT
Wolongiewicz, Frank I.....LDT
Wightman, Norman H.....CGC
Wright, Joseph H.....CGC
Wiswall, George H.....CGC
Wiltberger, Alfred S.....BST
Wentz, Allen W.....LDT
Watkins, Lowry.....CGC
Wood, Walter J.....SLA; TFT
Wright, Harry J.....EOT
Werneth, Louis S.....TFT
Walsh, Clarence E.....LDT
Wlaser, Havelock.....CSO
Willis, Ned T.....CGC
Woodworth, Harold E.....CGC
Woolf, Julian S.....CGC
Wallace, Melvin.....SLA; CGC
Ward, Harold Amos.....SLA; ABC
Williford, Carl L.....DMA
Wellman, William A.....RSD
Weisenborn, Stanton M.....ELA
Wheeler, Robert Edward.....SLA; EOT
Wykert, Leland Fred.....SLA; FOB
Wiley, Barton L.....LHV
Weed, Frederick B.....UIU
Wilson, William Carroll.....SLA; Note 2
Wallen, John V.....RSD
Wisdom, Everett S.....RSD
Wolfe, Kenneth B.....SAG
Whitehead, Fred E.....CRI
Worley, George A.....TFT

Y

Yule, George Gordon.....SLA; FOB

Z

Zipf, Oscar R.....SLA; TFT
Zangler, Herbert.....SLA; ELA

American Ace Gets His Eighth Plane

Paris.—Continuing his remarkable air exploits, Sergt. Major Edwin Parsons, the American flying ace attached to the French escadrille, has just shot down another German machine, this making his eighth. Parsons met his latest adversary well over the German lines and peppered him with machine gun bullets before the German pilot had time to turn and fire at the American.

The enemy machine immediately burst into flames and fell crashing to the earth.

Rio Newspaperman Now a Cadet Here

Cadet Annibal Bomfim, of Brazil, who at present is taking the flying course at Kelly Field, with the view of returning to his native land and teaching the art to his fellow countrymen, is an experienced newspaper man, having been a member of the staff of *A Noite*, the largest evening daily published in Rio Janeiro. Since coming to the United States, Mr. Bomfim has written a number of articels describing his native country for the Philadelphia *Public Ledger*, which shed new light on the "land of the Southern Cross," as he affectionately terms it.—*Kelly Field Eagle.*

American Flyer Dies of Pneumonia in France

Paris.—Lieut. Walter S. Rheno of Martha's Vineyard, Mass., an aviator in the Lafayette Escadrille, died on October 13 at the American Hospital in Neuilly of pneumonia. He had to his credit several German aeroplanes and had been decorated with the French War Cross.

Mail Flier Makes Forced Landing

Pilot Maurice Newton, of the Aerial Mail staff, was on a special trip from Philadelphia to Belmont Park to test the mail carrying capacity of a plane on October 18 when he discovered that his gas pressure was low. He was over South Jamaica and about two miles from Belmont Park when he sought to land on the links of the St. Albans Golf Club. Trees prevented his landing and he came down in a field at Merrick Road and Locust Avenue, landing rapidly on very rough ground. The plane was only slightly damaged.

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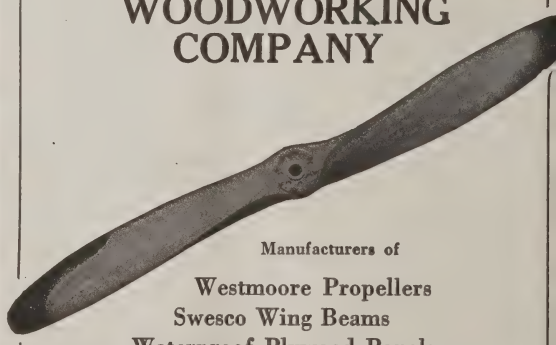
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AERIAL AGE WEEKLY

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An Avro Aeroplane snapped from an F. B. A. Flying Boat while making a bank

140 AMERICAN PLANES BOMB GERMAN CONCENTRATION CAMPS

AVIATION CARNIVAL AT BELMONT PARK A STUPENDOUS EVENT

ED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
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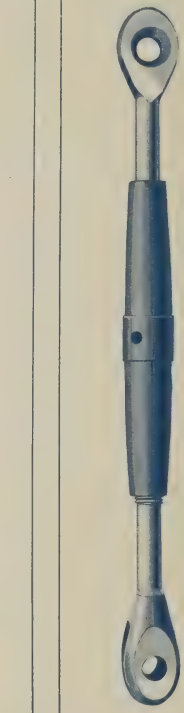
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AERIAL AGE WEEKLY

VOL. VIII NOVEMBER 4, 1918 No. 8

TABLE OF CONTENTS

PAGE

140 American Planes Bomb German Concentration Camps 413

Aviation Carnival at Belmont Park a Stupendous Success..... 413

News of the Week 415

U. S. Aerial Mail 418

The Aircraft Trade Review 419

Largest Formation Flight at March Field 420

Radical Increase in Balloon Corps.. 421

Preparing the Pilot for Battle Acrobacy 422

The London Enemy Aircraft Exhibit 424

Aero Club Awards Medals of Merit 428

General Kenly, Col. Brant and Col. Davis Up in a Balloon..... 429

Naval and Military Aeronautics.... 430

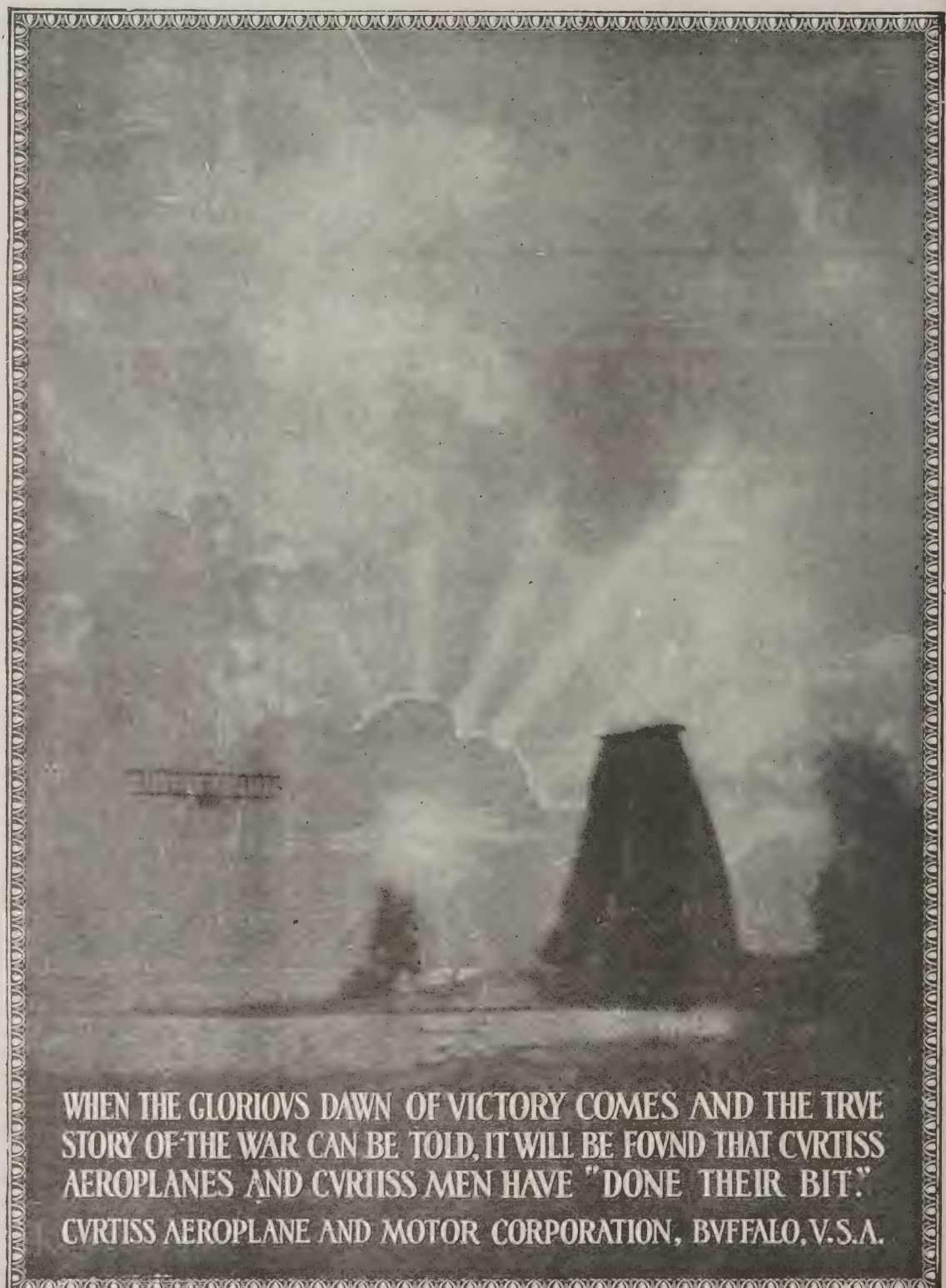
Foreign News 432

Model News 433

Aeronitis 434

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879


WHEN THE GLORIOVS DAWN OF VICTORY COMES AND THE TRVE
STORY OF THE WAR CAN BE TOLD, IT WILL BE FOVND THAT CVRTISS
AEROPLANES AND CVRTISS MEN HAVE "DONE THEIR BIT."
CVRTISS AEROPLANE AND MOTOR CORPORATION, BVFFALO, V.S.A.

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AERIAL AGE WEEKLY

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Nov. 4, 1918

Subscription Price, $4.00 a year. Foreign, $6.00 Telephone, Murray Hill 7489

VOL. VIII NEW YORK, NOVEMBER 4, 1918 NO. 8

140 AMERICAN PLANES BOMB GERMAN TROOP CONCENTRATION CAMPS

THE following Associated Press despatch indicates that the American air forces are participating in hostilities on the Western Front on a huge scale:

"German troop concentrations in the region of Briquenay, north of Grand Pré, were bombed this afternoon by about sixty all-American bombing aeroplanes, with about eighty pursuit planes protecting them. Formations of from fifteen to twenty German machines attempted to drive off the Americans, and several aerial combats resulted.

"Lieutenant Edward Rickenbacher was among the airmen in pursuit planes accompanying the bombing squadron. He engaged in two aerial combats and brought down a German machine within the American lines near Exermont. Rickenbacher followed the enemy machine close to the ground until he saw the enemy aviator land and fall into the hands of American infantrymen. Returning to his aeroplane, Rickenbacher heard the news of his promotion to a Captaincy.

"The weather was fairly clear when word came that German troops were arriving at Briquenay by trains and that they were marching and being transported toward the Bourgogne Wood. An expedition was quickly organized and was soon on the wing.

"In addition to bombing Briquenay and the railroad, the bombers dropped a few bombs in woods near by, and the pursuit planes attacked enemy troops with small bombs and machine guns. The bombers report excellent results, direct hits being obtained upon railroad sheds.

"Two American planes are reported missing. Over Grand Pré the left wing of a plane was struck by a German anti-aircraft shell and the machine fell in flames within the German lines. The identity of the machine is uncertain, but it is believed to have been an American.

"To be shot down twice within a week by German airmen has been the experience of Lieutenants Arthur Newell of Berkeley, Cal., and Walter Ten Eyck, Jr., of Brooklyn. Both times the Americans landed within their own lines. They declare they brought down two German machines in their encounters with the enemy. Lieutenant Newell acted as observer and Lieutenant Ten Eyck as pilot.

"Accompanying the all-American bombing squadron on Oct. 18 their machine was attacked from the rear by five Germans. Lieutenant Newell, at the machine gun, saw one of the Germans fall. The others continued firing and the gasoline tank of the American machine was pierced twice, but the momentum of the aeroplane prevented the gasoline from escaping and catching fire.

"Lieutenants Newell and Ten Eyck were members of a day bombing squadron which flew over Buzancy last Wednesday. On the return they were attacked by three German machines and brought down one of them. The engine of their machine was pierced by a number of bullets and put out of commission, but the Americans landed safely south of Brieulles. In the fight a bullet grazed Newell's nose, while another bullet bruised Ten Eyck's cheek."

2,500 Planes Sent Over in 5 Months

Production of American aircraft has reached a state where it is limited practically only by facilities for transporting the aeroplanes to France. The production of Liberty motors during October reached one thousand a week—a goal which had not been hoped for at the soonest until December.

The latest official compilations show that since June 1 approximately 2,500 fighting aeroplanes of all descriptions have been shipped to the American forces in France.

AVIATION CARNIVAL AT BELMONT PARK A STUPENDOUS EVENT

THE greatest aerial carnival ever held, an event such as would sell a billion dollars of Liberty Bonds, was the Carnival organized by Mrs. Charles A. Van Rensselaer, the chairman of the National Aeronautic Committee, and held at Belmont Park on October 26th.

It would take many pages to give a complete account and lack of space prevents it.

A billion dollars or more in Liberty Bonds could have been sold because the event was so stupendous that about 50,000 people were enthused and wrought up to the highest pitch.

It was the eighth anniversary of the first international aviation meet, which was held at Belmont Park at the end of October, 1910. Then John Moissant and Grahame White raced to the Statue of Liberty for the $10,000 prize offered by Mr. Thomas Fortune Ryan through the Aero Club of America. The race to the Statue of Liberty on October 26 was for the trophy and Liberty Bond offered by the Aero Club of America to assist Mrs. Van Rensselaer in her great work of supplying aviation fields with athletic equipment, swimming pools, etc.

This race was only one of many events, but was the one event for which everybody waited impatiently. The different aviation fields had been grooming their pilots and machines for this event and as much practice and test took place as if the squadrons were preparing to bomb Berlin.

When the seven De Havilands started for the race, they disappeared like many darts, and the roar of the big Liberty twelve motors grew fainter and fainter, the excitement grew more and more intense, and the fifteen minutes and thirty-one seconds which it took the winner to make the trip of thirty-six miles appeared as many hours.

When the first two planes appeared the crowd roared in excitement and enthusiasm and army aviators hugged each other on discovering that the plane with the white arrow, piloted by Sergeant Frank Coombs, of Hazlehurst Field, was first and planes from Roosevelt Field were second and third. The names of the pilots were not announced.

The crowd had cheers for all. It certainly was an enthused crowd—and the only regret was that there were no Liberty Bonds to sell.

Then Sergeant Coombs and Lieutenant Breeze were rushed over to the official stand, to be received by the officials who included Mrs. Van Rensselaer, Colonel F. M. Davis, who represented General Kenly; Mrs. Henry A. Wise Wood, Mr. Alan R. Hawley, president of the Aero Club of America;

Henry Woodhouse, Augustus Post, Lieut. Colonel I. Jones, Walter Camp, Major Thomas Hitchcock, Major J. S. Phipps, Major John J. O'Connor, Surgeon Gen. M. O. Terry, of New York, Captain and Mrs. Wharton, Mrs. Clinton Gilbert and some of the military aviators, including Lieut. Earl Carroll.

Exactly eight years before Messrs. Hawley and Post had been received in exactly the same way on their arrival at Belmont Park on their return from the historic balloon trip from St. Louis to Canada, after having been lost for six days in the wilds of Canada, and John Moissant had been received the same way for winning the Liberty Race.

Mr. Hawley officially pronounced Sergeant Coombs the winner and Colonel Davis said something to him which doubled his pleasure.

Of the seven DeHaviland machines which took part in the race, four were made by the Standard Aircraft Corporation, two by the Dayton-Wright Co., and one by the Fisher Body Corp. The machine that finished first was a Standard machine. No. 2 was a Dayton-Wright machine.

The other events were run off perfectly except that Lieut. Meany, after easily winning from Louis Chevrolet a race in which automobile was hopelessly matched against aeroplane, spiralled suddenly when too near the ground in an attempt to land and bumped into old Mother Earth head on. One of the wings broke the force of the fall. Lieut. Meany climbed out and waved back an ambulance which clanged across the field. He said he was not hurt, which proved to be the case, and the plane was not damaged irreparably.

Plenty to See

Late arrivals missed an opportunity to have their hair raised. The gentleman who supplied this opportunity was Capt. Jacques Boyriven of the French Aviation Mission. Capt. Jacques suddenly bobbed up with the tiniest machine on the field, a bright red Nieuport, which compares with the Caproni about as a chipping sparrow with a condor. Its wing spread is less than thirty feet; the Caproni's about seventy-five. In action, guided by Boyriven, it is a flying minnow; that is, if anybody ever saw a bright red minnow. It darted hither and thither, up and down, like a demented bug, and these metaphors are no more tangled than the Nieuport threatened to be with the crowds of gasping spectators whom Capt. Jacques delighted to scare.

Every little while this tantalizing scarlet apparation disappeared behind the stands. Then, when the people felt safe once more, it came buzzing past the stands, the whole length of them, not more than twenty-five feet above the heads of the crowd on the lawns. It seemed to dive straight down at the crowd in front of the field stand, and then, just when they were bursting their shoe laces in a scramble to get away—Zoom! Up Capt. Jacques's red beetle shot toward the zenith. Twice it came winging between the field and grand stands, lower than their roofs. The second time it did this a man on the ground not more than twenty feet beneath the Nieuport tossed up his derby hat. Just by luck the hat missed being drawn into the propeller.

An encounter with even a small bird is dreaded by an aviator, the catastrophe that might be caused by collision with a shell-proof derby hat can be imagined. The Nieuport kept away from the crowds after that, and contented itself with skimming the inner field, darting straight at the old judge's stand and then, when everybody closed his eyes to shut out the smash, frisking upward and over the little building with a flirt of its saucy tail.

Captain Williams of the United States Army was meanwhile manœuvring in stately fashion in the big Caproni. The Nieuport cut disdainful circles around him. Altogether Captain Jacques and his zoological wonder, be it minnow, bug, flying flea or hoptoad, certainly enjoyed themselves on this pleasant afternoon.

Bombing is Demonstrated

Later the thousands of eager witnesses saw just how bombs are dropped at the front. There was a circle marked by four white flags near the middle of the infield. The planes flew over it and a smoke bomb dropped within the circle was a "hit." Two squadrons of aviators, in the machines actually used for this kind of warfare, competed, one machine of each squadron releasing the bombs while the others protected it from imaginary attackers. On hitting the ground the smoke bombs that were used exploded with a bright flash and a burst of smoke. There were eight of them and all seemed to strike within the circle.

At the same time rival teams were playing pushball, Roosevelt Field beating Mitchel Field and Lufbery Field beating Hazlehurst Field.

In the air and land race Louis Chevrolet drove the same Frontenac with which he won the Harkness trophy at Sheepshead Bay last year by making 110½ miles an hour for 100 miles. Lieutenant Meany, the airman in the race, piloted a Thomas-Morse plane with Le Rhone motor, the single-seated machine in which fighters are trained. Chevrolet had no chance anyway and dust on the track was ankle deep. Lieutenant Meany chivalrously held his mount back from time to time so that the little red automobile might run a dead heat, as in the good old circus chariot races. But after birdman and groundman had circled the 1½-mile track three times the biplane scudded home away ahead.

While blue and orange and crimson aeroplanes cavorted on high officers from Mitchel and Hazlehurst fields stripped to running clothes and had a relay race. They're in the army now, but not so long ago they were college headliners. For Hazlehurst there ran Captain Holden from Yale, Captain Babcock from Worcester Tech, Lieutenant Joy from Holy Cross and Lieutenant Billy Queal, once a professional runner and coach of the Yale cross-country team. For Mitchel Field the colors were carried by Stallenwerck from Johns Hopkins, Higgins from Cornell, Hinman from the University of Chicago and Fred Kelly from the University of Southern California, winner of the high hurdles event in the last Olympic Games and a famous sprinter as well. But Kelly was the last man to run for his team in the relay. His team was behind and he could not close the gap.

Motorcycle Relay Race

Ten of those motorcycles with side car attachments also had a relay race, two men to a machine, one piloting it, the other riding in the side car and plunging out of it and into the car ahead when the relay point was reached. Roosevelt won, Hazlehurst was second and Henry J. Damm Field third.

The stunters got busy overhead. A flock of little Thomas-Morse scouts flip-flopped through most of the loops, turns, falling leaves, barrel rolls, tail spins and various dives in the curriculum of the master aviator.

Fifty-three biplanes set hearts throbbing again when they rose for formation flying. Whole squadrons were exhibited in concerted stunts. The climax was superb. The whole fifty-three straightened out in the sky and descended at once. It looked as if they couldn't possibly do it within the Belmont Park enclosure, but they did. Within twenty seconds from the landing of the first machine the last one was motionless on the ground.

UNCONDITIONAL SURRENDER

"Sublimist word in English tongue
  Is Duty," said the peerless Lee,
And Duty's bravest flag is flung
  That all the world may yet be free.
Our Duty to our God and land
  Was never so distinctly set,
There never was a chance so grand
  To do so much without regret.
Then force the Vandals to their knees,
  Remove the fangs that tear mankind,
Keep sending freemen o'er the seas
  And strike the foul beast dumb and blind.
"Surrender Unconditional"
  Is blazoned on our battle flag
No half way measure shall enthrall
  The earth now free as mountain stag.
And untold millions raise the skies
  In loud acclaim unto our Lord
That after all our sacrifice
  The beaten foe must drop the sword.

—George L. Upshur.

Oct. 9th, 1918.



THE NEWS OF THE WEEK



One Thousand Officers and Twenty-five Thousand Men Wanted for the Balloon Service

One thousand officers and twenty-five thousand men are wanted for the balloon service. Application should be made to the Training Section, Balloon Branch, Bureau of Military Aeronautics, Washington, D. C.

The Balloon Service affords a splendid opportunity for front line service, not only for the officers, but also for the enlisted men, because the balloons are operated near the front line and every member of a balloon company is, therefore, near the front line.

Colonel A. L. Fuller, the head of the Balloon Service, and Colonel James Prentice, Major J. C. McCoy, Major Thomas S. Baldwin, Major A. B. Lambert, A. Leo Stevens, Major Max C. Fleischman and other pioneers in the balloon game are justly proud of the Balloon Service. It has done splendid work overseas under the able direction of Colonel Charles de F. Chandler, Colonel Frank P. Lahm, Colonel Ira Fravel, and the other able officers in charge of the Balloon Service overseas.

General Harbord Makes Air Flight

Paris.—Major-General James G. Harbord, head of the supply service of the American Expeditionary Forces, visited the aviation school on October 10. He made the trip with Colonel Kilner, chief of the school, in an aeroplane.

The two officers had met at the supply service center and during their talk General Harbord said that the proper way to visit an aviation school was to fly there. Half an hour later he left his headquarters in an aeroplane equipped with a Liberty motor and piloted by Colonel Kilner. At their arrival at the school, sixty miles away, they were met by Colonel Bingham, who is in command there. They inspected the camp and motored to nearby centers, the nature of which are not disclosed at present. After lunch they returned by aeroplane in time to finish the day's work. No one at the supply service headquarters knew the General had been away.

Fliers' Bombs Make Big Catches of Fish

Aviators training at Rockaway for the purpose of excavating a large part of the Kaiser's real estate holdings with high explosive bombs are aiding the residents of that section to get their food supply. Likewise, they are conserving fish worms, live frogs and fishermen's time.

Shortly after the new fort was established at Rockaway Point, the aviators began flying over the water and dropping explosive bombs guaranteed to put a submarine on the fritz, or to make a dent in any German town where they happened to fall.

Fishermen learned that when the bombs went off they killed large numbers of fish, so they geared up their motor boats and proceeded to wait at a safe distance until the practice bombs were fired. Then, when the column of spouting water told the story of a newly fired bomb, the boats were sent at top speed to the scene and all the fishermen had to do was haul in the catch.

The scheme was unfolded when two fishermen came into Freeport, L. I., with 600 pounds of fish that brought record prices. All were caught with an aviator's bomb.

Chaplains Take 'Plane to Mass

Paris.—Aeroplanes and tanks are being used by volunteer chaplains and field secretaries with the Knights of Columbus, to serve the American soldiers over here.

Two chaplains, the Rev. John Moran of Eugene, Ore., and the Rev. John Sullivan of Tuckahoe, N. Y., were the first priests to make their rounds by the air route. The Rev. Mr. Sullivan uses aeroplanes several times a week, and thus is able to visit field hospitals within a redius of 200 miles of his camp.

Aeroplane transportation was used by the Rev. Mr. Moran for the first time when he received two calls to say field masses one Sunday morning. The call came from villages fifty miles apart, where troops were billeted. An aviation pilot solved the problem for Chaplain Moran by offering to take him to both places, and he went. The result was a field mass at one village at 6 o'clock in the morning and another mass in the village fifty miles farther on at 7.30 A. M.

U. S. Aviators Maintain Night Patrol at Front

With the American Armies Northwest of Verdun—American aviators, by inaugurating night patrols along the Meuse, have attracted much attention among the airmen of other nations. Under the present plan the air forces are always subject to call from the front, where observers or listeners report by wire when the motor of a German aeroplane is heard approaching the American lines.

As soon as one of these reports is received the American searchlights begin sweeping the sky. The American night patrols arrive at the same time. In event the German machine is located by the ray of a searchlight the American machines attack until the enemy is downed or makes his escape.



Ensign Robert Stocker, son of Captain Stocker, U. S. N., and his observer ready to start out on patrol

Fliers to Drop Smokes to U. S. Prisoners

With the American Army in France.—Americans are planning to supply American airmen now prisoners in Germany with cigarettes by dropping packages over the enemy line at regular intervals, addressed to individuals known to be in the various camps.

A card has been received at aviation headquarters from Lieutenant Alan F. Winslow, of River Forest, Ill., asking the American airmen to send him cigarettes as soon as possible.



Signor Eugenio Chiesa, Secretary of Italian Aviation, getting ready to take a flight

Chicago Flier Downs Hun

With the American Army Northwest of Verdun.—Aviator Will Ervin, of Chicago, had a busy day Friday. Early in the morning he brought down a German aeroplane near Fleville. Later he participated in the all-American raid behind the German lines, acting as one of the scouts protecting the bombing machines.

Our Aviators Downed 261

With the American Army in France.—Between September 12, when the St. Mihiel drive began, and October 19 United States Army fliers brought down 261 German planes, which represented one-seventh of the total flying strength of the enemy from the Swiss border to the sea.

Sky Full of Aeroplanes

October 24 was marked by perhaps the most active aerial warfare we have seen. The sky was filled with machines all day. More than a hundred American bombing machines dropped several tons of bombs on German positions. The Germans retaliated with weak day bombing, but that night bombed the back areas of the American forces with vigor.

There were many air battles along the front. Four of our lieutenants—Woolsey, Manning, Humes, and Colson—met four Fokkers at a height of 3,800 metres. The Germans accepted the challenge, and in view of thousands of soldiers the four German machines were seen to come down. None of our airmen was hurt.

An idea of what our day bombers are doing may be gained by the statement that two tons of bombs were dropped on Buzancy to-day. Many fires were started in German depots.

Wounded Aviator Wants More Fight

Lieutenant Eddie Rickenbacker, the American flier who zoomed into fame through a series of daredevil flights over the German lines, is in a hospital in Paris suffering from an injury received in the cloud battle in which he downed his eighth Boche plane. Both of Rickenbacker's eardrums are split. Recent despatches mentioned the fact that the aviator had been injured, but failed to supply details.

Lieut. Frobisher Killed in Aerial Combat

Lieutenant J. Edwin Frobisher, Jr., of the American Aviation Section, died on September 10 of wounds received while he was in combat with a superior force of German aeroplanes. He was one of several American fliers who went aloft to drive off a squadron of German planes which had attacked the American lines. In the fighting which followed, and which ended in victory for the Americns, Lieutenant Frobisher was wounded. He was twenty-three years of age and a native of Arlington, N. J.

Best Day for Our Airmen

With the American Army Northwest of Verdun.—American bombing aviators on October 18 attacked Bayonville, Buzancy, Remonville, Briquenay, Verpel, Cery-Le-Grand, Aincreville, and Imecourt, each town being a German supply point or an army unit headquarters. They downed ten German machines.

Simultaneously with the bombing expedition two squadrons with small bombs and machine guns attacked German infantry along the roadways leading to Landreville and Landreset-St. Georges.

The day is considered the most successful in the history of American military aviation.

Syllabus of Observer's Course

Washington.—Men of good education, sound judgment, quick perception and action and iron nerve are required by the United States Air Service for duty as aeroplane and balloon observers in France.

General Pershing recently called for an increased number of observers, and the War Department, on behalf of the Air Service, announced the qualifications necessary for the work, and what the supplementary courses of instruction will be after the candidate has been accepted. The different courses of instruction will cover about twenty-three weeks.

Civilians applying for work must undergo the same rigid physical examination as pilots. Accepted applicants are first sent to a ground school, where instruction on general military matters is given and work on wireless telegraphy, machine guns, and in the interpretation of aerial photography is begun. The course lasts eight or nine weeks.

From the ground school successful applicants are sent to one of the Schools of Fire—the Field Artillery at Fort Sill, Okla., or the Coast Artillery (heavy) at Fort Monroe, Va.

Completing the artillery course of seven weeks, the men will be sent to the observers' schools at Fort Sill or Langley Field. This course will cover about five weeks, but will fit the men for any duty required of observers.

To complete their training, just before sailing, the observers will be sent to Selfridge Field for a three-week course in aerial gunnery. No definite age limit has been fixed for observers.

Lieut. Winslow a Prisoner

It has been reported by the American Red Cross that Lieutenant Alan F. Winslow, American Air Service, France, is now a prisoner of war in Camp Lazarett, Germany.

Lieutenant Winslow achieved the honor of being the first American aviator with the A. E. F. to bring down an enemy plane, April 14, 1918, which action was immediately duplicated by Lieutenant Douglas Campbell, of Harvard University and California.

Until the recent report from the Red Cross Lieutenant Winslow was believed missing in action since July 31, after a fight in the air northeast of Fere en Tardenois. His father, W. H. Winslow, a munition manufacturer, of Chicago, Ill., has also been advised by the Red Cross in Paris that his son is a prisoner at Tier in Germany, where he is doing nicely, although his left arm has been amputated.

Confirmation of Lieutenant Winslow being a prisoner has also been received from his brother, Lieutenant Paul S. Winslow, American Air Service, London.

American Aviation Abroad

Hon. Franklin D. Roosevelt, Assistant Secretary of the Navy, who recently returned from a long tour of American naval bases and stations, to-day gave to the press the following review of United States naval activities abroad:

All the way from the Spanish border clear around to the English Channel we have established aviation stations so spaced that the entire coast line is covered by seaplanes and dirigibles. Nearly all these stations are located at out-of-the-way points, some placed on uninhabited islands, others in fishing vessels on peninsulas. Labor was almost impossible to get, so these stations were built almost entirely by our own sailors. At each station there is an average of from 200 to 300 men. This aviation force and our patrol vessels have been doing such splendid work that for the past six months there have been practically no sinkings within fifty miles of the French coast. We hope to extend this patrol zone to a hundred miles, so that the submarine will be driven still further out, increasing the difficulty in attacking vessels. We have on one of the lakes close to the coast a large aviation school for bombing practice and the general training of aviators. At one point we have an immense assembly and repair base which employs over five thousand men. An instance of the way in which every bit of material has been utilized was at this base, where, before the erection of permanent quarters, the men took the packing cases in which the planes were shipped and converted them into barracks which were very comfortable.

In northern France, in coöperation with the British and Belgians, we established what is known as the Northern Bombing Group, composed of a number of aviation units. This was organized originally for bombing the submarine bases on the Belgian coast. It was in active operation all summer and did much to prevent the use of Zeebrugge and Ostend by the Germans. After the British had blockaded the entrance to those harbors Germans were prevented from clearing the channel by the constant activity of these aviators, who daily and nightly dropped tons of explosives on the German submarine bases.

American Airmen in France

"Aerial Age" Editor Gets Distinguished Service Cross

Washington—The Commander in Chief of the American Expeditionary Forces has awarded the Distinguished Service Cross to the following officers for the acts of extraordinary heroism described after their names:

Second Lieut R. E. Decastro, Air Service, 1st Aero Squadron, pilot.—For extraordinary heroism in action near St. Mihiel, on September 12th. Because of intense aerial activity on the opening day of the St. Mihiel offensive. Lieutenant Decastro, pilot, and First Lieutenant A. E. Esterbrook, observer, volunteered to fly over the enemy's lines on a photographic mission, without the usual protection of accompanying battle planes. Notwithstanding the low-hanging clouds, which necessitated operation at an altitude of only 400 meters, they penetrated four kilometers beyond the German lines. Attacked by four enemy machines, they fought their foes, completed their photographic mission, and returned safely.

First Lieutenant A. E. Esterbrook, Air Service, observer, 1st Aero Squadron.—For extraordinary heroism in action near St. Mihiel on September 12th. Because of intense aerial activity on the opening day of the S.. Mihiel offensive, Lieutenant Esterbrook, observer, and Second Lieutenant R. F. Decastro, pilot, volunteered to fly over the enemy's lines on a photographic mission, without the usual protection of accompanying battle planes. Notwithstanding the low-hanging clouds, which necessitated operation at an altitude of only 400 meters, they penetrated four kilometers beyond the German lines. Attacked by four enemy machines, they fought off their foes, completed their photographic mission, and returned safely. Home address, Major E. P Esterbrook, father, Fort Flager, Washington.

Lieutenant Decastro was previous to his joining the Air Service, Associate Editor of Aerial Age.

First Lieutenant William P. Erwin, Air Service, 1st Squadron.—For extraordinary heroism in action in the Chateau-Thierry and St. Mihiel salients, France. Lieutenant Erwin, with Second Lieutenant Byrne E. Baucom, observer, by a long period of faithful and heroic operations set an inspiring example of courage and devotion to duty to his entire squadron. Throughout the Chateau-Thierry actions in June and July he flew up under the worst weather conditions and successfully carried out his missions in the face of heavy odds. In the St. Mihiel sector September 12-15, he repeated his previous courageous work. He flew as low as fifty feet from the ground behind the enemy's lines, harrassing German troops with machine-gun fire and subjecting himself to attack from ground batteries, machine guns and rifles. He twice drove off enemy planes which were attempting to destroy an American observation balloon. On September 12-13 he flew at extremely low altitudes and carried out infantry contact patrols successfully. Again on September 12th, he attacked a German battery, forced the crew to abandon it, shot off his horse a German officer who was trying to escape, drove the cannoneers to their dugouts, and kept them there until the infantry could come up and capture them.

120 American Planes Bomb Moving Troops

With the American Army, Northwest of Verdun (Associated Press).—American bombing aeroplanes and aerial machine gunners were busy on October 23rd in checking German troop movements towards the fighting front. At midday two squadrons of bombers attacked Buzancy with excellent results. Later about 120 machines attacked enemy troop concentrations in the woods in the region of Remonville.

Several formations of Fokkers attacked both groups of the American bombers, but were driven off in each instance.

Lieutenant Edward V. Rickenbacher was credited with one boche before breakfast.

Other reports of air victories continued to reach the officials all day. At least twelve German machines were brought down.

Lieutenant Sidney Grant of Orange, N. J., observer, and Lieutenant F. B. Foster of Boston, Mass., pilot reported two Boche machines as their morning's work, returning to thei own lines with twenty-three bullet holes in their wings as evidence of the fight.

Three Fly from Texas to Capital Despite Storms

After battling storms, heavy rains, and smoke from forest fires, three young army aviators are safe in Washington with the coveted honor of being the first men ever to fly from Texas to the national capital.

They flew the 1,700 miles in a total flying time of a trifle less than thirty hours, an average speed of about fifty-six and two-thirds miles an hour.

The holders of this new air record are Lieutenants W. P. Bancker, Jr., Z. P. Lee and C. M. Cone. Flying in two training planes, they left Ellington Field, Houston, Tex., on October 17, and from then until they "taxied" their planes safely on the ground of Washington they were almost constantly in bad weather.

Their longest single flight was from Indianapolis to Delaware, Ind., a distance of 170 miles, which they covered in exactly two hours. The longest day's flight was 350 miles, from Dexter, Mo., to Indianapolis.

While on the way up they aided local Liberty Loan committees in towns and cities in Texas, Arkansas, Missouri and Ohio, dropping Liberty Loan literature and attending patriotic rallies.

On October 22 they flew from Dayton, Ohio, to Washington, Pa., then, as Lieutenant Bancker said, "We flew from Washington to Washington." They landed at Bolling Field, Anacostia, at 6 o'clock on October 23.

"Our trip was uneventful except for bad weather," said one of the officers. "While on the way north from Memphis, Tenn., we ran into the smoke from those forest fires in Minnesota. This bothered us, so that we had to make a detour of about one hundred miles to avoid it.

"On the way we stopped at six of the army flying fields.

"Our flight from Texas to this city proves beyond doubt that the training planes used by the army are capable of long, sustained flights under bad weather conditions."

Our Fliers Down 15 Planes

Washington.—Continued progress by the Americans on the battlefront north of Verdun was reported on October 24 by General Pershing.

Fifteen enemy aeroplanes and one observation balloon were shot down in the course of many combats, in which three American balloons were destroyed and six planes failed to return.



The Bristol fighter used by Captain R. W. Schroeder in his world's record altitude flight at the Wilbur Wright Aviation Field, equipped with Hispano-Suiza motor

Le Matin on Airnats

Le Matin, the leading daily journal in Paris, during the week commented on the new nickname for the men of the Air Service. It read in part:

"Airnats, a clear, nice and neat word. That is the surname adopted by the flying corps of the United States Army.

"This choice was made recently through a competition organized by the *Plane News* after a very laborious balloting.

"A prize of one hundred francs was to be given to the best choice of a name and there were several tempting titles on the list: Sky Jockies, Eagles, Larks, Skyscrapers, etc. Airnats, submitted by Swafford of the 665th Aero Squadron, had the majority of votes and was finally adopted.

"The word does not mean much by itself, being an abbreviation of Aeronauts, but it is really lively, and our friends intend that Kaiser Bill will soon hear about it at his expense.

"Airnats, Doughboys and Rednecks are all animated by a strong resolution: get plain victory, because they know that they must make the world a place where anyone can live."—*Plane News.*

7,000,000 Soldiers' Letters Distributed Rapidly in United States

More than 7,000,000 letters from American soldiers were received at Atlantic ports between July 29th and August 9th, and the Postoffice Department announces that every one of them was started for its destination within twenty-four hours after its arrival.

One ship, it is stated, brought 2,823,000 letters and another 300,000 on August 2, and a ship arriving August 5 brought 2,031,000.

Of all this mail, the department said, 80 per cent was sorted as to railroad routes in America before it left France.—*Plane News.*

More Boche Bow to Fonck

Lieut. Fonck, the French ace of aces, has scored two more air victories, which raises his total to 62. He has an unofficial total of 92 victories. The recent victories of the greatest of all aces was a double victory, he attacking two enemy planes, getting both.

Paint Iron Crosses Over Bullet Holes

American pilots in defiance of the Hun "lead" are painting small iron crosses over holes made in their wings by German bullets. Planes of some of the American aces are covered with the ugly black signs, however the crosses are greatly overshadowed by the radiant American insignias expressing the fliers' faith.—*Plane News.*

137 Aeros Felled by American Unit

With the American Army on the Lorraine Front.—"The American flying circus" is the nickname by which the most notable American aviation pursuit group will be known in the future, after having enhanced its record notably during the St. Mihiel offensive.

This group consisting of several pursuit squadrons, is the oldest in the service. It did inestimable work in the Marne fighting, and it may be said to have fully established its claim to the title by 34 clean-cut victories with minimum losses during the past ten days.

One hundred and thirty-seven officially confirmed victories had been credited to the group with seventeen more confirmations under way and perhaps twice as many victories achieved but not countable officially because of the strict American and French method of reckoning as victories only those planes and balloons seen to have been destroyed by witnesses other than the aviators taking part in their destruction.

D'Annunzio Wins High Decoration

Italian Headquarters in the Field.—King Victor Emmanuel on Sept. 20th presented to Major Gabriele d'Annunzio, as the head of the airmen who made the raid on Vienna, the high decoration of an officer of the military order of Savoy. A dozen British fliers on this front received the Italian silver medal for valor.

After the ceremony there was the largest review that has ever been held of the Italian Flying Corps; certainly one of the most striking spectacles seen anywhere since flights became practical. The pilots' skill and mastery of their machines were such that they played all sorts of tricks above and all around the royal party, which included the Prince of Wales, the Duke of Aosta, the Count of Turin, General Diaz and all the Italian General Staff.

From Resnati's Father

The youthful soldier of the United States of America, strong and beautiful, is today on the fields of glorious France rushing to victory, and today, in the name of human honor and liberty, he enters the glorious trenches of Italy, once more and forever vindicated.

Silvio Resnati, who is now dead, thus dreamed when alive.

Let us, sir, keep this alive within us, so that the end of the war may find Latin geniality bound to the bold, bounding, free energy of America—for thus he had often written me from that land which he loved as his second country. The soul of Silvio Resnati will exult in the mutual benefits, in the grandeur of our countries, and in the radiant triumph of a peace wrought from the love of humanity. He was not only a daring, yet modest, scientist of the air, but also a well-poised thinker, an uncompromising wisher for the intimate union of our two peoples.

You wished him well, both for himself and for the beautiful Italy which he was representing, just as he wished well all the American people, who intuitively understood him and felt that he was theirs, entirely theirs.

Say to your fellow-countrymen all the expressions of thanks which his mother, his sisters, his aviator brother, brave but unfortunate, which his father—all overwhelmed but infinitely proud—have not the words to utter, nor having could utter them.

DR. LUIGI RESNATI.

Milan, Aug. 13, 1918.—New York *Times.*

Emerson Field, a new Air Service flying field at Jackson, S. C., was opened on August 1. It is named in memory of Lieut. William Emerson, Field Artillery, who was the first artillery officer killed while serving with an American aero squadron at the front.

The field, which was authorized on May 2, is to operate in conjunction with artillery, and for this purpose includes both aeroplanes and balloons. *Taylor Field Propeller.*

D'Annunzio Flies Across the Alps

Paris.—Gabriele d'Annunzio, the Italian author-aviator, landed in France on September 26 from an aeroplane in which he had flown from Italy across the Alps. He had flown 290 miles.

Capt. d'Annunzio left Turin at 9 o'clock on September 26 and arrived at Chalons, behind the French front, about noon. He made the passage of the Alps quickly, although the conditions among the mountain air currents were unfavorable. He used the same machine with which he had flown over Vienna last August dropping propaganda pamphlets, and the same pilot, Capt. Palli, guided the machine.

D'Annunzio, after landing at Chalons, joined Gen. Albricci, commanding the Italians on the French front.

Named for Downing Foes

With the American Army in France.—A large number of American aviators have received official credit for having brought down one German machine each.

Among them are Major Kenneth Marr of San Francisco, Lieut. Quentin Roosevelt of New York; Capt. Herbert Hall of Palo Alto, Cal.; Lieut. Alexander H. McLanahan of Philadelphia, E. X. Rucker of Fayette, Mo.; Waldon Heinrichs of Granville, O.; Tyler O. Bronson of New York City, Cleveland McDermott of Syracuse, N. Y.; Kenneth Porter of Dowagiac, Mich.; Robert C. Cates, Jr., of Spartansburg, Penn.; William E. Brotherton of Guthrie, Ill.; and Hamilton Coolidge of Boston.



Members of the National Advisory Committee on Aeronautics. From left to right: Messrs. John R. Freeman, C. E.; Charles F. Marvin, M. E.; S. W. Stratton, Sc.D.; Charles D. Walcott, Sc.D.; Rear Admiral D. W. Taylor, U. S. N.; Joseph S. Ames, Ph.S.; Lieutenant-Commander J. H. Towers, U. S. N.

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville

Denver to Have Aerial Mail

The Postmaster General on October 21st in the following telegram to Senator John F. Shafroth of Colorado announced the decision of the department to extend the aerial mail service, after the war, to Denver:

"Referring to conferences with me relative to extension aerial mail service to Colorado points, I have directed the extension immediately after war of aerial mail service to Denver in connection with the transcontinental route from New York to San Francisco. I will take up matter of further extension of service in your state upon your return to Washington."

While the general extension of the aerial mail service, outside of the Washington-New York route now in operation and the New York-Chicago route to be inaugurated this winter, is being held in abeyance until the termination of the war, the Postmaster General is giving some time to the laying out of important trunk lines which will act as feeders to the chief east and west line that will run from New York to San Francisco. The telegram to Senator Shafroth announces the decision reached to extend the service into the State of Colorado, which has been discussed for some time between Senator Shafroth and the Postmaster General.

Aero Mail Pilot Eats Lunch En Route

William Dishler Warner, the inventor of the Warner Knee Control, has received an immensely interesting letter from Pilot Robert F. Shanle, of the New York-Philadelphia-Washington aero mail service. It follows:

"Mr. Charles King, chief mechanic of this field, equipped the planes I fly in the New York-Philadelphia-Washington air mail service with the 'Warner Knee Control.'

"The Warner control allows me the free use of both hands, and as schedule leaving time is twelve noon every day, I now take my lunch with me and eat it while en route.

"I consider the knee control a great advantage to cross-country fliers."

The French Aerial Mail

The Paris correspondent of the *Daily Telegraph* writes on August 18:

A postal service by air has been started for the first time in France between Paris and St. Nazaire, Aeroplanes, carrying mails, left Le Bourget Aerodrome, near Paris, shortly after ten, and one of the two machines, the other having had an accident, reached St. Nazaire at 8:30 p.m., after a stoppage at Le Mans.

SCHEDULE OF AEROPLANES. NEW YORK-WASHINGTON ROUTE AND CLOSE TRAIN CONNECTIONS THAT ARE BEING MADE

Leave New York 12.00 noon
Arrive Philadelphia 1.30 p. m.
Arrive Washington 3.30 p. m.

Tr. 7, Phila. & Read. R.R.—For post offices between Philadelphia and Williamsport, Pa.

Tr. 13-17, Atlantic City R.R.—For post offices between Camden and Atlantic City, N. J.

Tr. 463, N. Y., Phila. & Norf. R.R. and tr. 423 Penn. R.R.—For all post offices in Delaware.

Tr. 627, Penn. R.R.—For post offices between Philadelphia and Harrisburg, Pa.

Tr. 21, Penn. R.R.—For post offices in Pennsylvania west of Harrisburg, Pa., and for West and Southwest States

Trs. 1477-1279, West Jersey & Sea Shore R.R.—For post offices between Camden and Millville, N. J.

Tr. 1113, West Jersey & Sea Shore R.R.—For post offices between Camden and Cape May, N. J.

Tr. 4543, Penn. R.R.—For post offices between Philadelphia, Pa., and Perryville, Md.

Tr. 570, Phila. & Read. R.R.—For post offices between Philadelphia, Pa., and Boundbrook Junction, N. J.

Tr. 372, D. L. & W. R.R.—For post offices between Philadelphia and Stroudsburg, Pa.

Mails arriving at Washington by aeroplane at 3.30 p. m. will make connection with train 1, B. & O. R.R., leaving Washington at 4.00 p. m., serving post offices between Washington and St. Louis, Mo., and train 21, Southern R.R. for post offices between Washington and Harrisonburg, Va.

Leave Washington 11.30 a. m.
Arrive Philadelphia 1.30 p. m.
Arrive New York 3.30 p. m.

The same connections will be made at Philadelphia northbound as are destribed above for connection with the southbound aeroplane, and the following connections will be made at New York:

Tr. 26, N. Y., N. H. & H. R.R.—For post offices between New Haven, Conn., and Boston, Mass., leaving New York 5.11 p. m.

Tr. 19, N. Y. C. R.R.—For post offices in Vermont, Massachusetts, Northern New York, Canada and States west and northwest, leaving New York 5.31 p. m.

Tr. 288, N. Y., N. H. & H. R. R.—For post offices between New York and New Haven, Conn., leaving New York 5.30 p. m.

Tr. 183, Erie R.R.—For post offices between Jersey City, N. J., and Middletown, N. Y.

Tr. 26, Long Island R.R.—For post offices between Jamaica and Montauk, N. Y.

Tr. 214, Long Island R.R.—For post offices between Jamaica and Greenport, N. Y.

In order to make the connections at New York above enumeraied by railroad, the mail would have to be despatched from Washington by Pennsylvania tr. 118, leaving at 11.00 a. m., arriving at Philadelphia at 2.20 p. m., and arriving at New York 4.45 p. m.

This schedule would also make the last afternoon delivery over the entire city of New York, while it would be necessary to despatch mail from Washington by train 114, leaving at 9.00 a. m., to make the same delivery.

THOMAS G. PATTEN, *Postmaster.*



The aero mail planes, which carried Douglas Fairbanks, the "movie" star, as first class mail matter, from Washington to New York. The result of the trip was that "Dougie" was able to sell several million dollars worth of Liberty Bonds

The AIRCRAFT TRADE REVIEW

Munitions Patent Board Established

For the purpose of co-ordinating the policies of the War Department and the Navy Department in patent matters, the Secretary of War and the Secretary of the Navy have established the Munitions Patent Board. The membership of this board consists of the Hon. Thomas Ewing, who has been jointly selected by the Secretary of War and the Secretary of the Navy; Max Thelen, the representative of the War Department, and Pickens Neagle, representing the Navy Department.

The Munitions Patent Board has been formed to consider clauses in contracts of the respective departments dealing with patents; questions as to the validity or infringement of patents and the patentability of inventions; questions as to the amount of compensation to be paid for patents or for the use of patents; and all other miscellaneous questions as to patents which may arise in the two departements interested. The board is empowered to recommend, from time to time, to the Secretary of War and the Secretary of the Navy, suitable action to be taken or policies to be adopted in regard to all patent matters which are brought before it for consideration. The action of the board in matters which come before it in so far as they apply to the War Department is subject to the final approval of the Secretary of War, and in matters for the Navy is subject to the final approval of the Secretary of the Navy.

Archibald Black Goes to Navy Department

Mr. Archibald Black, recently aeronautical engineer of the L-W-F Engineering Company, College Point, N. Y., has accepted an appointment as aeronautical engineer with the Bureau of Construction and Repair, Navy Department, Washington, D. C., and began his duties there October 21st, 1918.

Mr. Black was born in Scotland thirty years ago. After some years in the electrical line there he came to America, just at the time when flying was in its infancy. His interest in aviation dates back a decade and the optimism he has held for its future during these years has spurred him on to study and keep in close touch with the business.

After coming to this country, Mr. Black remained in his old line, working for the New York Edison Company, Detroit Edison Company and other electrical concerns. Early in 1916 he took a position in the engineering department of the Curtiss Aeroplane Company in Buffalo where he remained until coming with the L-W-F Engineering Company in August, 1916. Various L-W-F machines have been built under Mr. Black's direction, noteworthy among which was Model F in which was installed the first Liberty Motor to fly.

American Bronze Makes Changes

Berwyn, Pa.—The American Bronze Company has made a number of changes in its organization. Matthew C. Dittman, vice-president and treasurer, has been appointed general manager, and C. H. Baker, formerly auditor of the Timken Roller Bearing Company, Canton, will be his assistant. E. G. Anderson, sales manager, has been appointed advertising manager.

Detroit Priorities Office Opened

Detroit—A priorities section of the production division of the Army Ordinance has been established in Detroit under the direction of F. J. B. Sevald. Heretofore it was necessary for Michigan manufacturers to apply for priorities to Chicago.

Watson Heads Hispano-Suiza Section

Washington—John W. Watson, president of the American Bronze Company, Berwyn, Pa., has been appointed assistant chief of the Hispano-Suiza engine section of the Aircraft Production Board, of which B. D. Gray is chief. Mr. Watson will make his headquarters in New York.

Oakland Gets Bugatti Cylinder Order

Pontiac, Mich.—The Oakland Motor Car Company has been asked to supply the United States Government with cylinders for the Italian Bugatti 16-cylinder engine. Production on this contract is to start at once in the former Northway motor plant.

Limit Imports of Varnish Gums

Washington—Hereafter varnish gums can only be imported into the United States if they have been shipped from abroad prior to October 10th, 1918, if for use by the United States Government, if from Mexico or Canada, if as returned cargo from Europe or Mediterranean Africa when the loading can be done without delay, if Manila gum from the Philippine Islands and if Kauri gum not to exceed 3,000,000 lbs. for the present calendar year. Varnish gums other than the above are banned for importation.

License Pyrites from Spain

Washington—The War Trade Board will authorize licenses for the importation of 56,400 tons of pyrites from Spain for the remainder of the calendar year. Original regulations restricted imports of 125,000 tons up to October 1, 1918, but since licenses have not been issued for the full amount the Board has arranged to allow the 56,400 tons to enter during the last months of the year.

Sweeney Goes to Firestone

Detroit—J. B. Sweeney, formerly assistant advertising manager of the Paige-Detroit Motor Car Company, has joined the advertising department of the Firestone Tire & Rubber Company, Akron.

Personal Pars

S. V. Norton, manager of the truck tire sales of the B. F. Goodrich Company, Akron, is one of the several men to whom Gov. Cox of Ohio has assigned the task of working out a plan that will accelerate the development of motor truck transportation.

C. T. Schaefer, formerly chief engineer of the Globe Motor Truck Company, is now chief engineer of the Anvac Manufacturing Company, Anderson, Ind.

Castor Beans to be Threshed this Month

The 5,000 acres of castor beans planted by the Chamber of Commerce will be threshed the latter part of the month. Machines for the threshing are now in storage at the warehouse. Three machines will be attached to one engine. It has been impossible to estimate the crop. The drought has made it considerably less than was expected, but as some of the seeds were planted in irrigated land the total crop will be large.

When the total crop has been cut by the farmers it will be brought to San Antonio and threshed. It will then be sold to the Government at cost and the oil will be used to run aeroplanes.

The Chamber of Commerce accepted the Government contract for the castor beans and are doing the whole work on a patriotic basis without profit. Farmers under Government contract are given 50 cents per bushel in other parts of the country. The Chamber of Commerce took the contract for this portion of the country.

Leaflets from Plane

Workmen at Camp Meade were "bombed" by an aeroplane, 18,000 leaflets containing cheery messages being showered down upon them from a plane which left Bolling Field at 11:25 o'clock on October 24.

This was the first "bombing" plane sent out by the construction division of the army in its campaign to disseminate messages among workmen at the national cantonments.

The first plane was driven by Lieutenant E. B. Chandler. Lieutenant W. H. Lamprechter of the construction division threw down the messages.

"The quick finish of this job here will help Uncle Sam finish the kaiser over there," read one of the leaflets.



An interior view of part of the famous Pomilio aircraft factory in Italy



One of the many remarkable formation flights at the Belmont Park Aviation Carnival

LARGEST FORMATION FLIGHT AT MARCH FIELD

IRREFUTABLE proof that America has taken her rightful place in aviation was demonstrated to the people of Los Angeles and Southern California Saturday, October 12th, when 103 American-made aeroplanes, piloted by officers and cadets from March Field, flying in battle formation, the largest aero fleet ever to have been assembled in one flight in this country, bombed that neighboring city with Liberty Loan literature.

With Major John C. P. Bartholf, J.M.A., Commanding Officer of March Field at the peak; Major Ernest Clark on the right wing and Capt. Wm. Alden Smith, Jr., on the left wing, this gigantic formation taxied off, circled the course, assembled in ten separate and distinct units and finally headed in one solid formation for Los Angeles, 60 miles distant. The one hundred three (103) planes got into the air in a period of six minutes. The course followed the Foothill Boulevard, the planes maintaining an altitude of from 3,000 to 6,000 feet. Landing was made at El Segundo, just 78 minutes after leaving March Field.

The Arcadia Balloon School was advised by wireless of the approaching squadron and two ships were sent out to escort the formation over the city. A realistic battle-front feature of the flight was accomplished when this gigantic air fleet passed over the balloon school, seven huge observation balloons having been in the air at the time. The planes at this point were traveling at about the level of the Mount Wilson Observatory.

While thousands of persons craned their necks to get a glimpse of this great American armada the planes suddenly swept down from the mountain peaks giving Los Angeles a realistic imitation of a real air raid. Bombs were dropped and from them fell leaflets saying: "What if we were Germans? Buy Liberty Bonds." Copies of the camp newspaper, *The March Field Fly Leaf*, were also dropped from the planes.

Accompanying the air fleet was a hospital ship with Capt. M. Bannister, flight surgeon, as the passenger. Still another plane carried an official photographer, representing the Ince studios of Los Angeles. Moving pictures of the entire trip were taken both from the ground and en route. The films are to be sent to Washington.

All of the planes on this remarkable flight were of the Curtiss JN-4D training type. The ships returned in formations of 10, several of the units returning to March Field by more distant routes after visiting numerous Southern California towns and cities in the interest of the Liberty Loan.

Never before has such a flight been attempted in this country. Previous to this great air adventure the largest number of planes visiting an American city was 68, when in formation under the command of Lieut. Col. C. K. Rhinehardt, J.M.A., members of the First Provisional Wing of the American Air Service, flew over New York City. The more credit, however, is due the March Field squadron in that half of the pilots participating in this remarkable journey were cadets, pilots in training, while the remaining pilots other than unit leaders, were for the most part flying officers who have been commissioned at this field since July.

With but one exception, all of the planes to leave March Field returned on scheduled time, this feat in itself being a remarkable record, the entire trip devoid of accidents. Lieut. Ralph Watson made a forced landing in the outskirts of Los Angeles when his motor "froze" in the air. He landed in a beet field at Sixtieth and Budlong Streets. No damage.

Particular credit is due the Engineering Department on account of the fact that thirty of the ships were using motors which had had more than one hundred hours' service in the air since their last overhaul.

The highest commendation is due Major Bartholf, Commanding Officer; Major Eglin and Major Clark, officers in charge of flying; Capt. Wm. Alden Smith, Jr., Adjutant, and the numerous lieutenants who acted as unit leaders, as well as each individual pilot who made possible this air journey without a mishap to aviators or machines.

Major Bartholf summarized the significance of the achievement in his message of thanks to his command, which read as follows:

Memorandum: To All Concerned:

The Commanding Officer desires to express to the entire personnel of this Command, his appreciation of the very high degree of efficiency and entire cooperation which made possible

(*Continued on page* 421)

RADICAL INCREASE IN BALLOON CORPS

Veteran Balloonists and Observers to Help Colonel Fuller Organize and Instruct New Units

ACCORDING to recent orders the balloon corps is to be immediately increased to approximately four times its original size.

The American balloon companies have rendered unusually efficient service in France and there is a constantly increasing demand for observation balloons.

The original allowance of balloon troops is nearly all serving abroad, leaving only a small percentage of the old staff of experts available for training the new officers and soldiers.

The balloon training service has been placed under the supervision of Colonel A. L. Fuller, originally of the Coast Artillery Corps, who was the founder of the mechanics' school and the Ground Officers' School at Kelly Field.

In the Washington office he will be assisted by Majors R. S. Bamberger, E. Lazar and J. C. McCoy, also by Mr. Frank P. Lahm, the veteran balloonist. In addition the following younger graduates of the balloon schools will assist:

Captain C. E. Smythe, Captain A. Grimm, 1st Lieut. C. J. Schiller, 1st Lieut. W. D. Simpson, 1st Lieut. C. W. Merrell, 1st Lieut. R. S. McCullough.

Colonel J. Prentice, pioneer observer, who has recently recovered from a serious balloon accident of a year ago, is temporarily on duty at Washington. Lieut. Colonel H. B. Hersey and Major Harry R. Vaughn, have also been temporarily in Washington for consultation.

In order to fill the great number of vacancies created for officers, authority has been granted to transfer from the other branches of the army and to induct draftees. It will be necessary to enlist about twenty-five thousand soldiers. Induction of men subject to the draft has been authorized.

The balloon service can use a great variety of skilled tradesmen. Automobile, rope, rubber fabric and telephone experts are the most urgently needed.

Opportunities to rise from the ranks are as good, if not better, in the balloon corps than in any other branch of the service.

Persons interested in the balloon service should promptly visit or address the aviation boards whose addresses are as follows:

Boston, Mass.—739 Boylston St.
Canal Zone—Fort Sherman.
Chicago, Ill.—230 East Ohio St.
Dallas, Texas—Camp Dick.
Fort Sill, Okla.—Post Field.
New York City—104 Broad St.
Columbia, S. C.—Camp Jackson.
Yaphank, L. I., N. Y.—Camp Upton.
Little Rock, Ark.—Camp Pike.
Atlanta, Ga.—Georgia School of Technology.
Los Angeles, Calif.—Marsh Strong Bldg.
Minneapolis, Minn.—University of Minnesota.
Des Moines, Iowa—Camp Dodge.
St. Louis, Mo.—525 So. Euclid Ave.
San Francisco, Calif.—55 New Montgomery St.
San Antonio, Texas—Fort Sam Houston.
Washington, D. C.—Bldg. D, 6th and Missouri Ave.



Veterans of the Balloon Corps who will help organize the unit for the increase. Left to right: Mr. Frank P. Lahm, Major J. C. McCoy, Colonel A. L. Fulton, Major Harry R. Vaughn, Colonel James Prentice, Major E. Lazaire, Colonel H. B. Hersey



Younger officers of the Balloon Staff now in Washington. From left to right: First Lieutenant C. W. Merrell, First Lieutenant R. S. McCullough, Captain C. E. Smythe, Captain A. Grim, First Lieutenant C. J. Schiller and First Lieutenant W. D. Simpson

(*Continued from page* 420)

the flight on Saturday, October 12th on such a comprehensive scale, and which allowed this flight to be characterized by absolutely unqualified success.

Any field might put a limited number of picked planes and pilots in the air for a special performance and make a creditable showing; but this cannot necessarily mean an efficient organization.

On the other hand a school that can put one hundred three (103)*—aeroplanes, eighty-five* (85%)*—per cent of its entire plane equipment, in accurate formation, piloted in large part by cadets who have not yet completed their training, throughout a flight of one hundred and sixty* (160) *miles, including a stop for gas, and absolutely without damage to any plane, must necessarily have an efficient organization and efficient personnel throughout every department.*

A closer inspection of the circumstances attending this flight show: the depleted condition of all squadrons, the fact that this flight was made without any interference of the regular training duties, the fact that twenty (20%) *per cent of the aeroplane equipment was second hand and received in unserviceable condition, the total flying time of approximately* 20,000 *hours without a fatality and without the loss of a single ship from the total received at this field; all of which make this performance all the more remarkable and a performance of which every member of this command may feel justly proud as a record that has never been equaled at any of the forty flying fields in the United States.*

John C. P. Bartholf.
Major, J.M.A., A.S., M.A., Commanding.

PREPARING THE PILOT FOR BATTLE ACROBACY OR TRICK FLYING

The Chassé Flyer Must Master Every Rudiment Before Being Fit to Combat With Enemy

By K. G. PULLIAM, Jr.
Captain, J. M. A., S. C., U. S. A.

(NOTE:—The article printed herewith was written at the request and by authority of Air Service Headquarters, A. E. F., and is considered probably the most complete and comprehensive treatise on acrobacy yet published.)

ACROBACY or trick flying is as necessary to the fighter of the air as a knowledge of his gun mechanism is to the infantryman. Consequently such trick flying has been found necessary to prepare a flyer for combat is now taught in the training schools.

It is extremely necessary that every chasse pilot master the rudiments of acrobacy before he tries air combat, for in such combat he must necessarily forget that he is flying and must devote every faculty to keeping out of the line of fire of his adversary. In thus dodging his enemy's attack the pilot puts his machine into positions which, due to inexperience, result in a vrille or in an upside-down position, and unless he has been taught how to avoid such positions he places himself open to being shot down by his adversary.

The object of acrobacy is to produce each dangerous condition of flight that a pilot may be expected to encounter and to teach how to meet them. Only in this way is it possible for a pilot to become the master of his machine. Thus in a short period devoted to intentional acrobacy a pilot acquires the confidence in his ability to meet all emergencies that no amount of ordinary flying can produce, and as a result he finds it possible to devote his entire time to his work of warfare, the function of piloting being performed instinctively.

At a field where trick flying is taught every student is given individual attention and instruction. Only one "stunt" at a time is explained, which must be repeated by the student, and unless every movement is thoroughly understood he is not permitted to attempt the work.

The Vrille

And so many accidents are attributed to the vrille and since it is considered the most disconcerting of all stunts it is the first to be taught. Any badly executed stunt or loss of speed may result in the machine doing a skid or a wing slip with probably a resultant vrille.

In starting the pilot ascends to at least 1,200 metres and after flying level for several minutes throttles his motor and just at the point where the machine stalls he pulls the control stick quickly back toward him and at the same time to the side, accompanying it by a sudden push of the rudder bar, using the foot corresponding to the side on which the stick is placed.

As a result the machine shoots suddenly up, losing speed, and falls sharply over to the side with a twisting corkscrew-like movement. In every case the twist commences sharply and the student is instructed to place his controls in neutral after the machine has made several turns and to *slowly* push the control stick forward a few inches. The machine ceases its whirl, points forward and dives straight down, the pilot at once redressing his control stick and bringing his machine again to horizontal flight, at the same time switching on the motor.

The pupil is instructed in both right and left hand vrilles, the instructor watching closely every movement made, and when the pilot lands he is told the mistakes he has made.

A vrille can be made with controls deliberately crossed, i. e., right hand rudder with stick to left or left rudder and right hand stick. The effect is the same, though somewhat harder on the machine, as the spin is not so quick and a twisting movement is produced in the fuselage. This crossing of controls is not encouraged, as in recovery the motions are opposite and likely to cause confusion, frequently the pilot redressing too much with the result that the machine goes into a spin on the opposite side.

The Renversement

Although the use of the renversement in actual combat is questionable, it is nevertheless very necessary that the student thoroughly acquaint himself with this stunt, as any pilot who is familiar with the movements of the renversement will be able to control his machine whether or not he is in an upside-down position.

To perform the renversement the pilot ascends to the height of 1,200 metres, flies for a few minutes, then points the machine *very* slightly downward so as to bring the speed up to maximum, pulls the control stick back sufficient to raise the nose of the machine to an angle of 20 or 30 degrees. If a left hand renversement is desired the rudder should be pushed hard to the left. As a result of the above control motions the nose of the machine jerks sharply upward, followed by a roll of the entire machine to the left. Just before the machine is completely on its back the motor is cut and the pilot places his controls in neutral; the plane stops its roll and the pilot pulls back on the control stick, causing the machine to dive and almost at once resume the horizontal, at which time the motor is switched on, the stick placed in neutral and normal flight resumed.

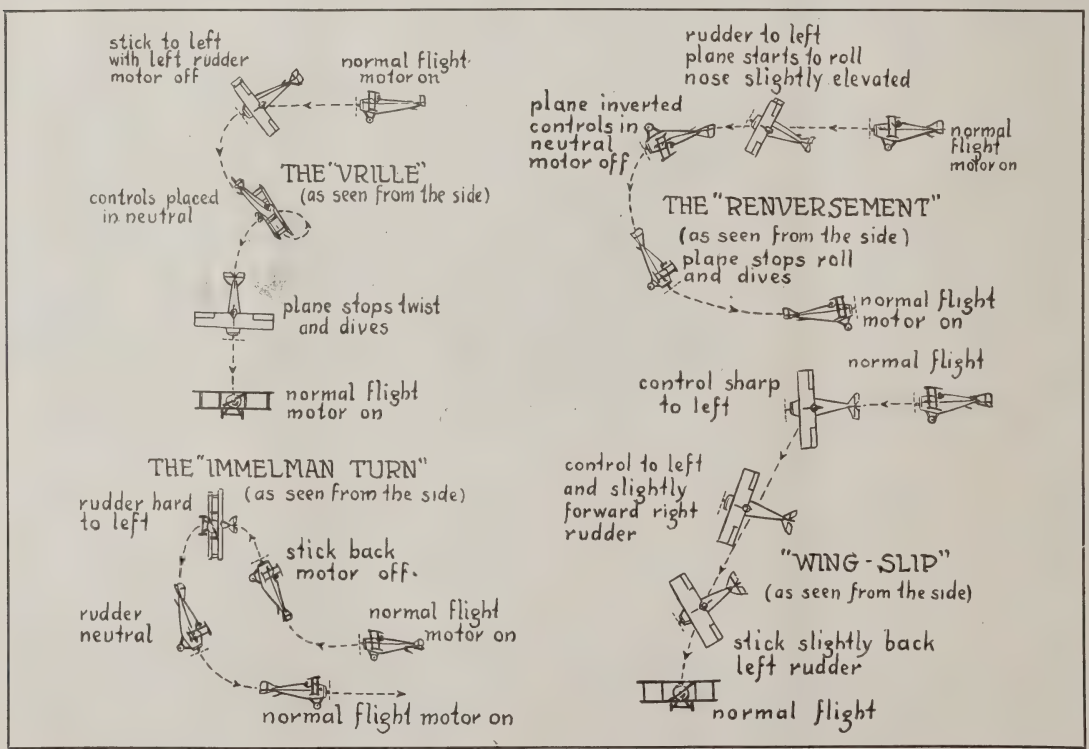
Since the pupil being unfamiliar with the head-down position in which he hangs when the machine is on its back, is not likely to recognize the moment at which the controls should be placed in neutral, he is instructed to immediately neutralize the rudder after he has thrust the control to the left.

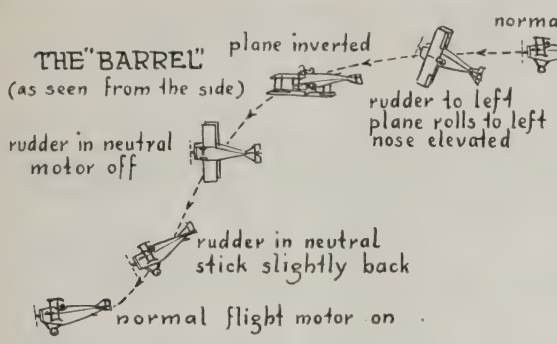
The renversement can be made to the right as well as to the left by use of right rudder instead of left, as described above.

The Immelman Turn

The Immelman Turn was first used in combat by Lieutenant Immelman of the German Flying Corps and has proved very useful as one of the fighting pilot's bag of tricks.

To perform the Immelman Turn the pilot again ascends to the height of 1,200 metres and after flying level for a few minutes he points the nose of the machine down very slightly and then pulls slowly back on the control stick, causing the machine to climb almost vertically. Care should be taken not to pull enough on the stick to cause





the plane to loop. The motor should be cut as soon as the machine starts to climb and as soon as excessive loss of speed is felt the rudder is pushed sharply to one side. The machine falls to the side on which the rudder is pushed and as soon as the machine reaches vertical the pilot places the rudder in neutral, switches on the motor and by pulling back on the stick resumes normal flight. A slight movement of the stick to the side corresponding to the rudder used will help the movement.

When done properly the turn is a very pretty performance and no loss of altitude results. It can be performed to either side with uniform results and after the pilot is thoroughly accustomed to the movement he may use his motor throughout the complete evolution with no loss of speed.

The Barrel

The Barrel might also be called a horizontal vrille and it is performed exactly the same as a renversement, with the exception that the controls are not placed in neutral when the machine is upside-down, but just before the machine again reaches normal line of flight. The first movements of the machine is identically the same as when in a renversement, but the roll continues until the plane has made one roll of 360 degrees, at which time the motor is switched on and normal flight resumed.

The Vertical Virage

The Vertical Virage is nothing more or less than a turn in which the plane is banked until the wings are perpendicular to the ground and the elevators are used for turning. It is used to turn quickly into the opposite direction without loss of either speed or altitude.

Flying level at full speed the necessity to turn suddenly is met by throwing the control stick to the side on which the turn is desired and accompanying it with a little corresponding rudder. When the position is reached in which the wings are perpendicular to the ground the stick should be placed in neutral and pulled hard back. The movement should be accompanied by opposite rudder sufficient to keep the nose of the machine from falling.

As a result of the above movements the machine banks sharply and as the stick is pulled back it seems to spin around, using the tip of the low wing as a pivot. As soon as the desired amount of turn has been made the pilot places his stick to the opposite side from which the machine is banked and the plane levels out and resumes normal flight.

The Side-Slip

Since the Side-Slip allows the pilot to lose an abnormal amount of altitude in proportion to the distance progressed forward, it is a very useful stunt. A pilot in making a forced landing may allow himself to overshoot his landing field and then side-slip off any surplus altitude, thus assuring his reaching the field.

In aerial combat and in dodging anti-aircraft fire it is also very useful, as it is a method of losing altitude very rapidly, and since in a side-slip the direction of motion is not directly forward it is very disconcerting to an enemy firing at the machine.

A side-slip is accomplished by pushing the control stick all the way to one side and accompanying it by sufficient pressure of the opposite foot to hold the nose of the machine up. The control stick is at the same time pushed slightly forward and the machine descends sidewise at a terrific speed.

To recover from a side-slip the control stick is placed in neutral and the rudder corresponding to the direction of the slip is pushed. As a result the machine turns and dives into the direction of the slip and by redressing the stick straight-away flight is resumed.

The Vrille Turn

The Vrille-Turn is very similar to the renversement, but, unlike the latter, it is very useful in air combat. It is performed with full motor and is a very rapid evolution.

The stick is pulled quickly all the way back and completely to the side, accompanied by a sharp kick of the rudder to the left. As a result the nose of the machine jerks up and the plane rolls to the left.

The rudder is immediately placed in neutral and the stick is brought back to the centre but held completely redressed. The neutralizing of the rudder stops the roll and as the stick is held completely reuressed the nose of the machine immediately climbs to level and normal flight is resumed. No loss of altitude results.

As the motor is used throughout the turn the motions are necessarily very rapid and rather disconcerting when first attempted, but the pupil soon becomes accustomed to the rapidity of the twist.

The Loop

The Loop is accomplished by putting the nose of the machine down slightly to obtain maximum speed and then pulling back on the control stick, slowly at first and more rapidly as the top of the loop is reached. Just after the top has been passed the motor should be cut, the machine being allowed to fall of its own momentum through the last half. When the loop is completed the stick should be placed in neutral, the motor switched on and normal flight resumed. When looping with a plane using a rotary motor some left rudder should be used at the top of the loop to prevent falling out of the loop to the right.

A loop improperly done may result in a vrille, and taken as a whole looping is of no value in a fight, for when a machine is inverted the pilot is quite helpless until the machine has passed the "dead point" and starts downward, thus giving an enemy who is following a good target. The machine gun belt is likely to become disarranged and cause the gun to jam.

If the loop is improperly done the reversals of pressure are very severe and are extremely hard on a finely adjusted and very fast machine, but a loop properly done causes very little strain.

The Tail-Slide

A real Tail-Slide should not be accomplished with a machine using either ailerons or wing flaps for lateral control, because when it is properly done the reversal of pressure may cause them to buckle.

A tail-slide should never be attempted by even the most experienced of pilots unless he has an especially built exhibition plane, preferably a monoplane, which is equipped with warping wings and is constructed strong enough to withstand the tremendous reversal of pressure.

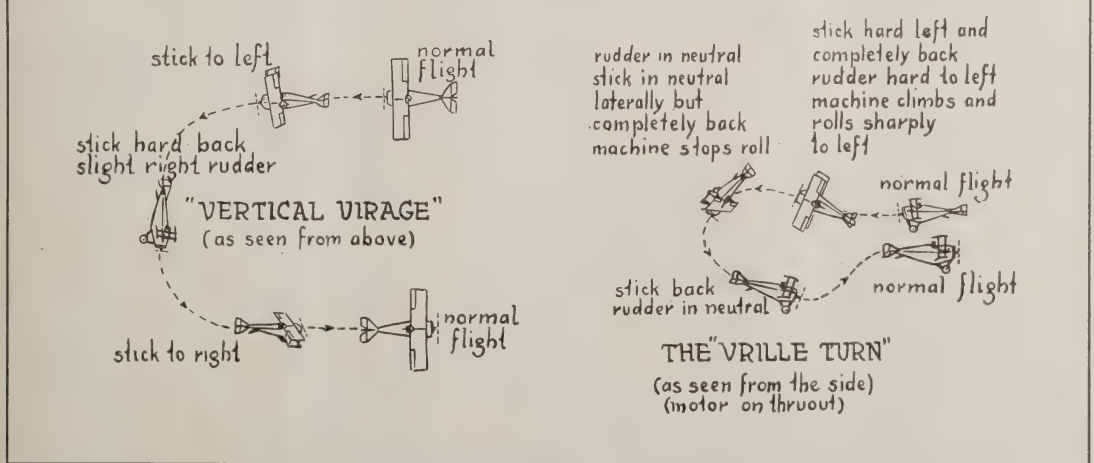
A stall accompanied by a slight drop of the tail, followed by a slipping off to the side into a vrille, cannot be called a tail-slide, for a well performed tail-slide will extend for at least 300 metres.

The Time and Place for Acrobacy

Acrobacy at low altitudes is strictly forbidden at training schools and it should never be done close to the earth except in cases of emergency and actual combat.

A pilot cannot at all times be sure of the condition of the atmosphere which he cannot see and fatal falls often result when overconfidence meets with bad air conditions near the ground.

The number of expert flyers who have met their death in this manner should be a sufficient and convincing argument to any pupil in acrobacy that stunting near the ground is a game that is "not worth the candle."



THE LONDON ENEMY AIRCRAFT EXHIBIT

The Fokker Single Seater Biplane—Type D7

By G. DOUGLAS WARDROP

The British number of the machine is B/2B/14, and the German number is Type D7 F.N. 1,450; maker's No. 2,455.

It was brought down north of Hazebrouck on June 6th, 1918, by a British SE.52, and is a single-seater fighter.

The principal dimensions are as follows:—

Span	29 ft. 3¼ ins.
Chord (upper wing)	5 ft. 2½ ins.
Chord (lower wing)	3 ft. 11¼ inc.
Overall length	22 ft. 11½ ins.
Gap	4 ft. 2 ins.
Area of upper wings (with ailerons)	140.7 sq. ft.
Area of lower wings	78.3 sq. ft.
Area of Aileron (one only)	5.7 sq. ft.
Area of aileron (one only)	5.7 sq. ft.
Area of balance of Aileron	.5 sq. ft.
Area of horizontal tail plane	21.1 sq. ft.
Area of elevators	15.2 sq. ft.
Area of balance of elevator	1.1 sq. ft.
Area of fin	2.8 sq. ft.
Area of rudder	5.9 sq. ft.
Horizontal area of body	35.6 sq. ft.
Vertical area of body	58.6 sq. ft.
Area of plane between wheels	12.4 sq. ft.

This aeroplane presents features of very great interest, whether viewed from the standpoint of aerodynamic design or of actual construction. The machine which has been the subject of investigation was, unfortunately, rather extensively damaged, thus making absolute accuracy of description difficult, and trials of performance impossible.

A similar machine, however, has been tested for performance by the French authorities, who have issued the following report:

Altitude metres	Time of climb	Speed at this height
1000 (3281 ft.)	4 mins. 15 secs.	116.6 m.p.h.
2000 (6562 ft.)	8 mins. 18 secs.	114.1 m.p.h.
3000 (9843 ft.)	13 mins. 49 secs.	109.7 m.p.h.
4000 (13124 ft.)	22 mins. 48 secs.	103.5 m.p.h.
5000 (16405 ft.)	38 mins. 5 secs.	94.9 m.p.h.

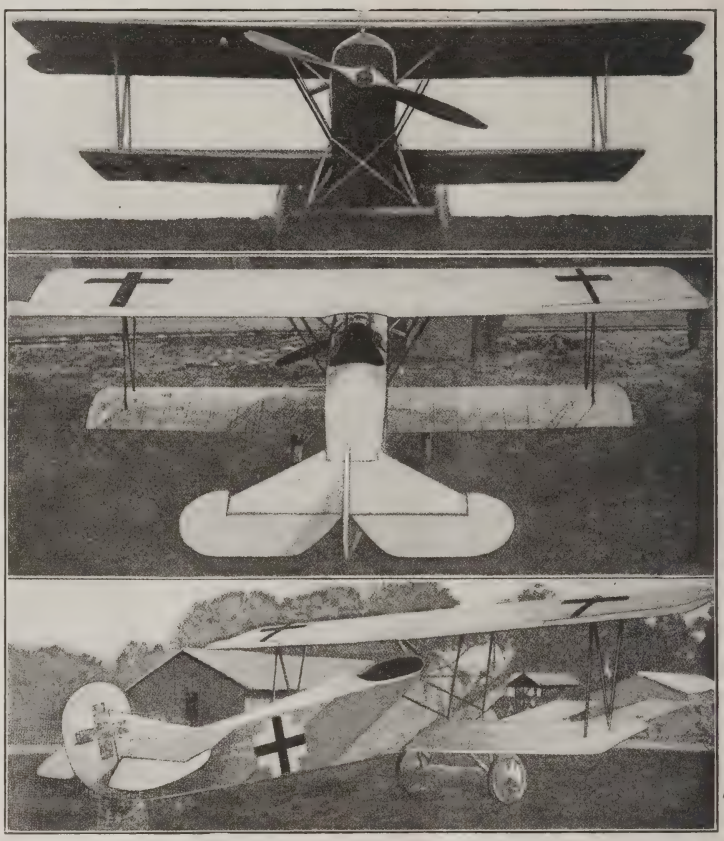
There are many points in which there is distinct divergence from accepted German, and tendency towards British, practice. The undercarriage, position of radiator and aileron control levers, or kingposts, are examples.

This fact is some indication that the designer of this machine has approached the various problems and compromises which confront one who sets out to create such a machine, with a quite open mind, and, if this be allowed, there is a very strong case for a thorough investigation of those features which are in contradiction to contemporary British practice. These points include the wing design, which is without any external bracing, but of especially deep section; the steel-tubular fuselage, and the peculiar bracing of this member.

There is nothing to prevent the adoption of the first and last features; but it should be pointed out with regard to the steel work that experienced welders have expressed the opinion that this art has been developed by the enemy to a high dgree of efficiency. Indeed, the welding is sufficiently good to give rise to the belief that new methods, involving radical changes, have been adopted.

*The following data regarding weights is taken from a French source:—

Weight of fuselage, complete with engine, etc.	1,322.2 lbs.
Weight of upper wing with ailerons	167.2 lbs.
Weight of lower wing	99.0 lbs.
Weight of fin and rudder	6.6 lbs.
Weight of fixed tail plane	17.6 lbs.
Weight of elevators	9.9 lbs.
	1,622.5 lbs.



Three views of the Fokker Single Seater

*The schedule of principal weights given on page 1204 is the result of weighing the actual components mentioned, which were taken from the aeroplane allotted G/2B/14.

A different French report gives the following figures, which are taken from inscriptions found on one of the Spandau guns on a captured Fokker of the same type:—

Weight, empty	1,540 lbs.
Permissible load (useful load and fuel)	396 lbs.

Wings

As in the Fokker triplane, the extreme depth of wing section and the absence of external bracing are distinctive features. Both upper and lower wings are without dihedral, and are in one piece. The way in which the lower wings are fitted into their place is described in detail under the heading "Fuselage." Both upper and lower chords are set parallel to the crankshaft, i.e., at no angle of incidence, and the description "Angle of incidence, 0°" is painted on the upper plane.

Wing Construction

In sharp contradistinction to the fuselage, which is constructed of steel even including members where wood is almost universally used, the wings contain no metal parts, if we exclude strut fittings and other extraneous features. There are no steel compression members, but where the internal wiring lugs occur, special box-form compression ribs are fixed. The leading edge is of very thin three-ply, which has a deeply serrated edge, finishing on the main spar. The ribs are of three-ply, and are not lightened, although holes are, of course, cut where necessary, to accommodate the control and bracing wires. A rib from the top center section, and one from the root of the lower wing, are both drawn to scale. See Fig. 1.

The extreme thinness of the three-ply has given rise to a new method of fixing the flanges on the ribs. Instead of grooved flanges tacked on so that the tacks run down the length of the three-ply, two half flanges of approximately square section are tacked together horizontally with the ply sandwiched between. See Fig. 2.

Spars

As may be seen from the various sections drawn to scale in Figs. 3 and 4, the spars are made up of fairly narrow flanges at top and bottom, joined on either side by thin three-ply webs. They are placed approximately 30 cms. apart. The flanges are made of Scots pine, and consist of two laminations. The three-ply has the two outer layers of birch and an inner ply which is probably birch also.

The three-ply webs are tacked on to the flanges, and fabric is glued over the joint. The cement is an ordinary gelatine glue.

The spar webs are glued to the flanges by a

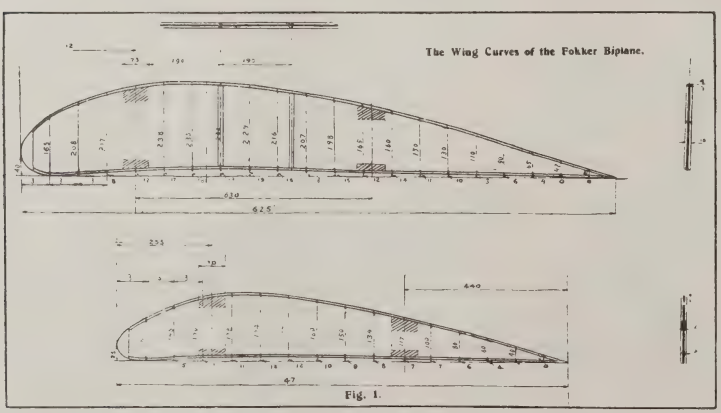


Fig. 1.

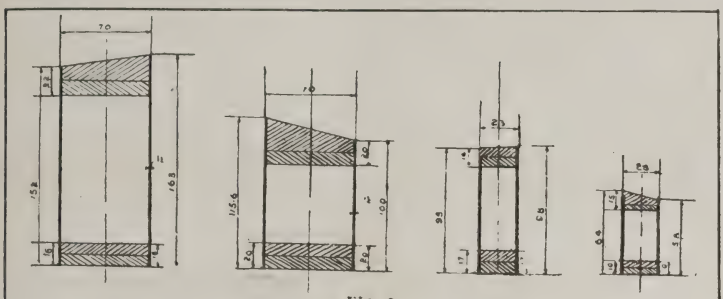


Fig. 3.

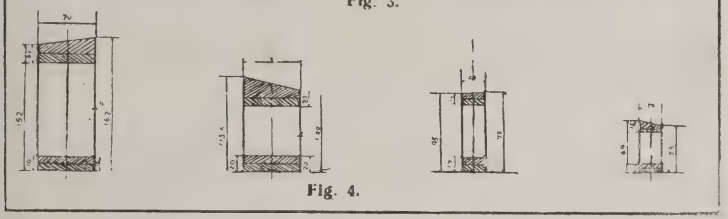


Fig. 4.

waterproof casein cement, which is proved to contain gelatine, while the plywood adhesive—also a casein cement—is waterproofed and of sufficiently good quality to withstand four hours' immersion in boiling water.

The trailing edge is of wire, and tape crosses from the top of one rib to the bottom of the next in the usual way. This tape lattice occurs about half-way between the trailing edge and the rear spar.

Fig. 3 shows the sections of the front and rear upper plane spars, taken in the centre section and at the interplane struts, while Fig. 4 gives the corresponding lower spar sections.

The ribs are stiffened between the spars by vertical pieces of wood of triangular section. There are two such pieces on each rib in the upper plane, and one in the lower plane.

All the woodwork of the wings is varnished, and fabric is bound ronnd the flanges of the ribs and glued to the top and bottom of the spars.

The workmanship is decidedly good, and the finish neat and careful.

Ailerons

As in the triplane, ailerons are fitted to the top wing only, and are of the same narrow shape. They are constructed of welded steel tubing. They conform to common German practice, in as much as they are fitted to a false spar well behind the rear spar, and are balanced. The welded up control lever follows British ideas, and does not work, as in most German designs, horizontally in a slot cut in the plane. All the tubing is lacquered.

Struts

The struts are all of steel tubing of streamline section, and the centre section system is particularly worthy of attention. All those three struts which meet at a point on the front spar of the upper wing are welded to the fuselage framework, and are thus not removeable when the machine is dismantled (see Fig. 5). The strut which joins the rear upper spar to the front lower spar, however, is not welded but is fastened by a ball and socket joint, which is the subject of Fig. 6. It will be noticed that the ball forms the extremity of a threaded bolt which is screwed into the end of the strut, thus making it possible to adjust the length of the latter. Both ball and socket are drilled and a bolt locked through the hole. The attachmen. of upper centre section struts to the wing spar is shown in Fig. 7.

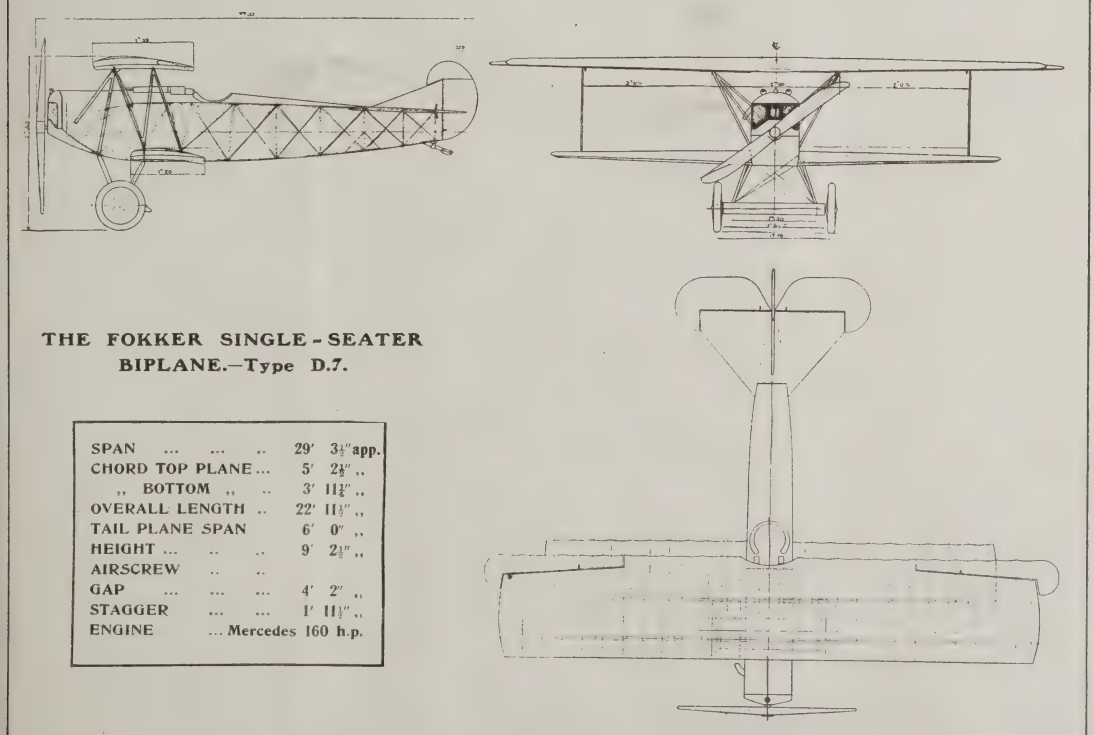
As is made clear in the scale drawings, the interplane struts are of N shape when seen from the starboard wing tip. The three members of the N are welded together, and all four free extremities have the adjustable attachment described above. It has already been mentioned that there is no external bracing, the wing construction being made sufficiently strong against lift stresses to obviate its necessity, and the form of the interplane struts is interesting in this connection.

Fuselage

This is exactly similiar in design and construction to the triplane body—allowing of course, for the difference in type of engine and for the fact that both wings have two spars instead of one. The longerons and cross struts are of circular section steel tube welded in place, and carrying at the corner the small quadrant of steel tube which carries the bracing. The diameters of these tubes vary from 22 mms. to 18 mms., and the steel was of 24 gauge in the places where the tubes had been pierced by bullets.

This bracing well repays attention. All sides of each section are cross-braced with piano wire, which is simply passed round the two lugs to be joined and has its extremities connected by means of a turnbuckle. This method has the great advantage that only two loops are required in the wire instead of four, and in consequence this bracing can be very rapidly assembled. It is also possibly lighter in relation to its strength than the usual arrangement of single wire bracing. Fig. 8 shows how a lifting handle is clipped on to the lower longerons.

The front part of the body is a particularly good piece of welding, and includes the engine and radiator supports as well as the arrangement by which the continuous spars of the lower planes can be placed in position. This is done by removing two fork-ended tubes (one each side of the body), and replacing these when the wings are in position. Fig. 9 shows how the



THE FOKKER SINGLE-SEATER BIPLANE.—Type D.7.

SPAN	29′	3½″app.
CHORD TOP PLANE ...	5′	2½″ ,,
,, BOTTOM ,, ..	3′	11¼″ ,,
OVERALL LENGTH ..	22′	11½″ ,,
TAIL PLANE SPAN	6′	0″ ,,
HEIGHT	9′	2½″ ,,
AIRSCREW		
GAP	4′	2″ ,,
STAGGER	1′	11½″ ,,
ENGINE ... Mercedes 160 h.p.		

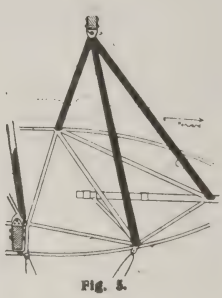


Fig. 5.

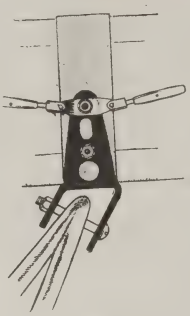


Fig. 7.

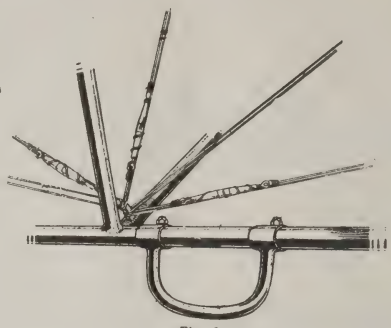


Fig. 8.

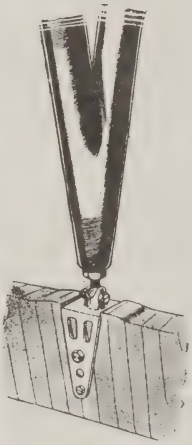


Fig. 6.

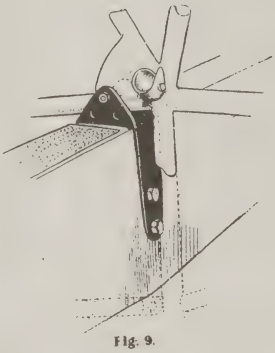


Fig. 9.

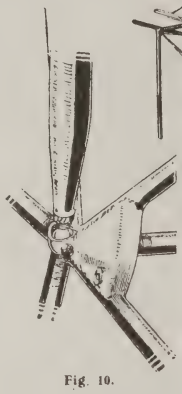


Fig. 10.

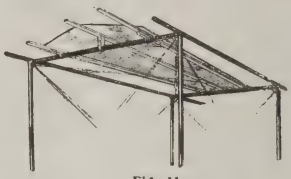


Fig. 11.

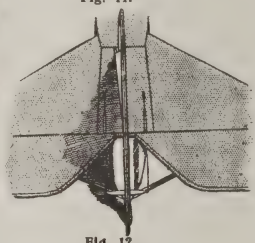


Fig. 12.

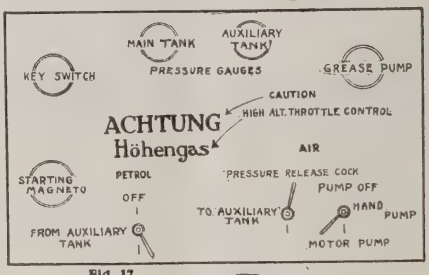


Fig. 17.

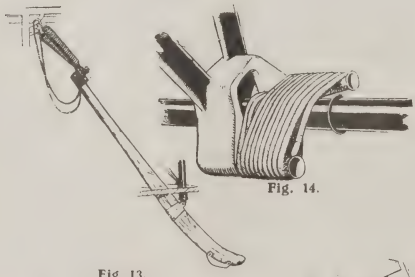


Fig. 14.

Fig. 13.

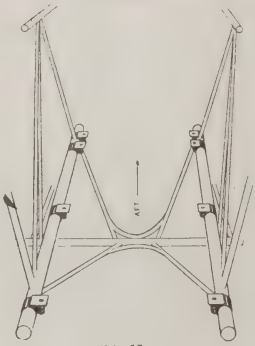


Fig. 15.

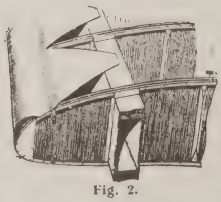


Fig. 2.

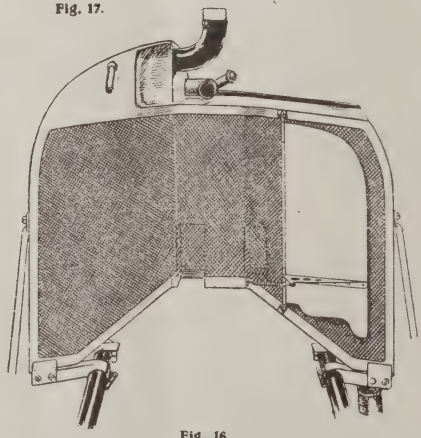


Fig. 16

wing spar is joined to the fuselage and Fig. 10 shows the fuselage joint at this point.

The cowling is of aluminum, and covers the front portion of the fuselage on all four sides. It is extended on the top to the cockpit, and underneath to beyond the rear spar. The cowls are arranged in convenient sheets, and are fastened by means of bolts and nuts of unusual shape. The nuts have small handles about 1 in. long, which enable one to manipulate them without tools. From the rear half of the cockpit to the junction of the tail and body, the top is furnished with a three-ply fairing, which extends over not quite the whole width of the fuselage. This is shown in Fig. 11.

Tail

The fixed tail planes and elevators are almost similar to those of the triplane, i.e., the tail is triangular and the elevators balanced and divided, although they are actually made in one piece. The biplane, however, has a triangular fin whose foremost point is fixed an inch or two to the port side of the centre line of the machine, thus providing a surface which is inclined slightly to the longitudinal axis of the aeroplane. This is illustrated in Fig. 12, and is no doubt arranged to balance the tendency of the machine to turn to the left in flight, due to the slipstream.

The framework of the tail is of circular section steel tubing throughout, including the trailing edges, and this framework is arranged to give the fixed tail a symmetrical camber. The attachment of the tail plane to the fuselage is simple and effective. As is the case in the triplane, the top longerons are dropped at this point sufficiently to allow the tail plane to have its top surface level with the top of the fuselage, and three bolts passing through the main steel tube of the tail and through short pieces of tube welded to the body framework secure it in this position. Of the three bolts, one is placed at either side of the top of the fuselage on the front of the tail, and one at the end of the body framework. The tail plane is set at a slight angle of incidence—about 3½ deegrees—which is not intended to be adjustable, but which could easily be altered by means of a few washers and longer bolts. The tail is stayed by two streamline section steel struts, which connect the rear tube of the tail plane with the bottom of the sternpost, as is shown by the general arrangement drawings. These struts are not barbed.

From the sketch of the tail skid (Fig. 13), it will be seen that this member is balanced at a point about one-third of its length from its lower end, and that the shock-absorbing arrangement consists of two helical steel springs.

Undercarriage

This is a feature of the machine which carries a distinct trace of British influence. The angle between the two limbs of the Vee is usually, in German aeroplanes, very obtuse; i.e., the two top points of attachment are widely separated, while British practice leans towards making this angle fairly acute. In the Fokker the angle between the struts is about 55 degrees. The section of the steel struts is streamlike in form, with major and minor axes of 65 mms. and 34 mms. recpectively. The metal is of 20 gauge.

The upper attachments of the undercarriage struts are of the ball and socket type, with a bolt through, similar to the interplane strut illustrated above. The junction of the lower extremities and the slot which allows for axle travel is clearly explained by Fig. 14. The bracing cables, which connect the upper extremities of the front struts with the opposite lower ends, are attached in the usual manner to lugs welded on to the struts. It is interesting to note that in the crash which wrecked the machine, one of these lugs has torn out a small piece of the sheet steel of which the strut is formed, though there is no sign of fracture at the weld.

The least usual characteristic of the landing carriage, however, is the provision of a small cambered plane surrounding the axle, just as is the case in the Fokker triplane. This auxiliary plane has been badly battered, and few details are available, but the sheet aluminium box which surrounds the axle remains. This box is rectangular in section, and the edges are riveted together on the upper side. It forms the main and only spar of the plane, the construction of which is very similar to that of the main plane. The shock absorbers are of the coil spring type, and are wrapped in the manner illustrated in Fig. 14. The wheels are 760x100.

Engine and Mounting

The engine is a Mercédès of 180 h.p. A full report on this type of engine has already been issued, but the present example possesses one or two minor points of difference from the standard. The chief of these is the fact that this engine has domed pistons, giving higher compression. If found sufficiently interesting, the engine will shortly be reported upon separately.

As has already been mentioned, the engine bearers are steel tubes, supported on a steel tubular structure welded up integrally with the fuselage frame and with the centre section struts. The diameter of these two parallel tubes is 34 mms. and the gauge 14. Each tube carries four "pads" of the type shown in Fig. 15, to which the crankcase is bolted.

Radiator

The radiator, as may be gathered from the scale drawings and sketches, is of the car type (another departure from modern German design), and is supported by steel tubes which are part of a fuselage frame. The radiating surface is surmounted by a curved fairing, of which the port-side half is a brass water tank, into which the filler leads, while the starboard side is merely an aluminum fairing. The radiator is constructed of brass tubes arranged parallel to the engine crankshaft. The tubes are circular in section, but expanded into hexagons at either end and sweated up there. Each hexagon measures 7 mms. across the flats.

The single shutter, as will be seen on reference to Fig. 16, is normally held open by a spring, but can be closed at will by pulling a small cable. This shutter even when completely closed only puts out of action a small portion (roughly about one-third) of the cooling surface.

Petrol and Oil Systems

There is only one fuel and oil tank in the machine. It is of sheet brass and is slung from cross tubes clipped on to the top longerons, just in front of the ammunition magazines, which are placed immediately in front of the pilot.

So far as can be ascertained from such external evidence as is afforded by fillers, piping, the lines of rivets on the tank, and the gauges and petrol cocks, it may be said that this tank is divided into two petrol tanks and one oil tank. The main petrol tank has a capacity for 61 litres (approximately 13½ gallons), and is provided with a baffle plate. The reserve tank holds 33

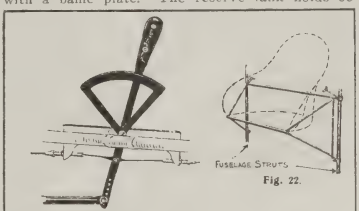
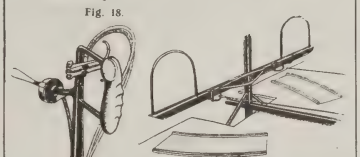
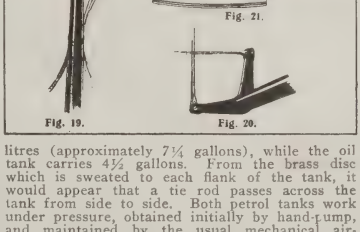


Fig. 18. Fig. 22.


Fig. 21.


Fig. 19. Fig. 20.

litres (approximately 7¼ gallons), while the oil tank carries 4½ gallons. From the brass disc which is sweated to each flank of the tank, it would appear that a tie rod passes across the tank from side to side. Both petrol tanks work under pressure, obtained initially by hand-pump, and maintained by the usual mechanical air-pump. The dashboard carries, besides the main switches and a starting magneto, a two-way cock which allows the pilot to use petrol from the main or auxiliary tank, or to shut it off completely. A separate pressure gauge for each tank and two two-way air pressure cocks are also mounted. Fig. 17 is a diagram of the dashboard with the original German descriptions translated. The "Achtung, Hohengas" appears to be simply a warning to the pilot not to forget the extra air control. It does not seem to bear any relation to any instrument on the dash.

Throttle Control

A sketch of the throttle lever, situated on the pilot's left, is given (Fig. 18). This lever actuates the carburettor throttle by the means shown. The compression tube between the quadrant and the balanced lever is over four feet long and about five-eights inch in diameter. Although heavy-looking, this control is, of course, made of very light gauge material. The adjustment provided at the pilot's end of the control should be noticed. The control works in conjunction with a Bowden type lever on the control lever, as shown by Fig. 19. The twin cables from this auxiliary throttle lever are attached to the main throttle control—Fig. 18 shows the attachments.

Controls

The control lever of the machine works on precisely the same system as that of the triplane, but the grip at the head of the column is quite different. Reference to Fig. 19 will show that the usual two-handed grip is replaced by a single handle for the right hand.

The left hand is free to manipulate the auxiliary throttle control, inter-connected with the main throttle lever. It should also be noticed that the usual pushes for firing guns are absent, and the interrupter gear is actuated by pulling either or both of the levers by the fingers, while the thumb rests on the specially arranged place. There is no separate arrangement for firing both guns together, and it is not possible to lock the elevator controls in any given position.

The longitudinal rocking shaft carries at its front end two arms to which the aileron control cables are fixed (see Fig. 20). These wires cross; and pass upwards and outwards to aluminium pulleys on ball bearings, which are attached in pairs to a hinged sheet steel framework. On the way these cables pass through short tubular guides fixed to the top longerons. The aileron levers follow contemporary British practice, and project vertically above and below the plane.

The elevator control wires are taken direct from the control lever, one pair above and one below the fulcrum.

The rudder bar (see Fig. 21) is of neat and light welded construction. There is no adjustment to allow for variation in leg-length of different pilots, but it should be notices that the pilot's seat is adjustable as regards height. The means by which this movement is obtained is exactly the same as the arrangement in the triplane, i.e., the seat is a sheet aluminium bucket with a three-ply bottom supported by a framework of of steel tubes which grips the fuselage cross struts by four clips, which can be placed at any height. This is made clear by Fig. 22.

Fabric and Dope

The fabric is not attached in any way to the longerons, but is simply carried over the fuselage and laced along the bottom central line. There is a cross-piece of fabric laced to the cross tubes immediately behind the cockpit.

The fabric is coarse flax, coarser and less highly calendered than the type usually met with, and a good deal heavier.

It is colour-printed in the usual irregular polygons. The bright red paint, mentioned below, is removable by alcohol, but not soluble in it, coming off as a skin under the treatment.

Under the paint is a dope layer—an acetyl cellulose. Neither paint nor dope presents unusual features.

Weights—

Paint	92.0 gms. per sq. m.
Dope	68.1 gms. per sq. m.
Fabric	143.6 gms. per sq. m.
	303.7 gms. per sq. m.
Strength .....1772 k/m.	
Extension	7.0 per cent.

Where the wings are not painted, the fabric is covered with a thin layer of dope only.

The coloring of the machine is interesting. The top surface of the wings is painted a brilliant vermilion, while on the underneath surfaces the fabric is untouched, and is revealed as the familiar printed-color fabric. The body is red in the front portion—where are the aluminium cowls—except the radiator, which is painted white. From the cockpit to the rear the color is white.

The vertical surfaces of the tail are also white, and the horizontal surfaces—on both top and bottom—black.

Schedule of Principle Weights

	lbs.	oz.
Upper wing, complete with ailerons, pulleys, bracing wires, facric and strut fittings	156	0
Lower wing (no ailerons fitted), complete with strut fittings and fabric...	97	0
N strut between wings	6	9
Straight strut, between fuselage and trailing spar of upper wing	2	8
Aileron frame, with hinge clips, without fabric	4	8
Rudder frame, with hinge clips, without fabric	4	11
Fin frame, without fabric	1	14
Tail planes (complete in one piece), without fabric	12	6
Elevators (complete in one piece), without fabric	11	2
Radiator, empty	48	0
Undercarriage strut, each	2	10
Undercarriage axle, w ith shock absorber bobbins	18	2
Bobbin, each	0	7
Shock absorber, each	3	9
Undercarriage (complete), without wheels and tires, and without plane, but including struts	29	4
Aluminium tube, forming rear spar of undercarriage plane	1	8
Wheel, without tire and tube	11	8
Tire and tube	9	4
Tail strut	1	15
Fabric, per square foot, with dope....	0	1
Bottom plane compression rib	0	15
Bottom plane ordinary rib	0	11
Top plane ordinary rib, at centre of plane	1	0
Bracket, with bolts, attaching top plane to fuselage struts	1	11
Main spar, top plane, including fillet for ribs, per foot run in centre	1	12

Owing to tapering ends the average weight per foot of the spars will be slightly less than this figure.



The new American-made dirigible airship in flight. It is equipped with two 150 H.P. Hispano-Suiza motors

AERO CLUB AWARDS MEDALS OF MERIT

THE Aero Club of America has awarded a medal of merit to Major B. L. Smith of the Marine Corps and Lt. R. A. D. Preston, U.S.N., to commemorate the first long distance flight made with the first twin-motored dirigible. The D-17, the largest naval dirigible, made a successful trip from Akron, O., to New York, on October 22nd.

The Navy Department's official statement reads as follows:

"Manned by aviation officers of the Marine Corps and the Navy, and with two civilian mechanics aboard, the first of the Navy's twin motor dirigibles, flew over Washington on October 22d at the completion of the first lap of approximately three hundred and fifteen miles, of a flight from Akron, O., to Rockaway, N. Y. The big dirigible landed at the Anacostia aviation

(*Continued on page* 429)



Getting the new dirigible ready for flight

GENERAL KENLY, COLONEL BRANT AND COLONEL DAVIS UP IN A BALLOON

ON October 17th the energetic Chief of the Air Service, Major-General William L. Kenly, Colonel H. B. Hersey, and Colonel A. L. Fuller, went up in a balloon piloted by Major J. C. McCoy. The balloon started from the Polo Grounds, Washington, D. C., and landed in the outskirts of Baltimore, after a trip of about three hours and fifteen minutes under most ideal weather conditions. There being little wind, the officers were able to scatter Liberty Loan posters over Washington. It was General Kenly's first balloon trip and he enjoyed it immensely.

On October 19th another ascension was made with the same balloon, which has a capacity of 35,000 cubic feet, and was filled with hydrogen. Colonel C. G. Brant, Colonel M. F. Davis and Major J. C. McCoy were the passengers and A. Leo Stevens, the veteran balloon expert, was the pilot. The wind was favorable and they landed at Everett, Penna., after having passed through Maryland, Virginia, West Virginia and Pennsylvania, crossing the Alleghany Mountains at 5,000 feet. They were up five hours and Colonel Brant and Colonel Davis, whose first trip it was in a balloon, were delighted with their experience.

Major McCoy has the distinction of holding the first balloon pilot certificate issued in America. Colonel Hersey, A. Leo Stevens and Major B. B. Daggett, who did the work of getting the balloon off, are veterans in the balloon game.



Major-Gen. William L. Kenly, Director of Military Aeronautics, recently made a flight in a free balloon from Washington. Here is shown the balloon just after it left the ground. The dragrope, which can be seen coiled at the left of the basket, has not yet been released. With him were Colonel A. L. Fulton, Colonel H. B. Hersey, and Major J. C. McCoy, who piloted the balloon

(*Continued from page* 428)

field for a fresh supply of fuel, but resumed its flight at 1:17 P. M. The start was made from Akron this morning at 1:10 A. M., Central Time, and the landing was made at 11:10 Eastern Time, a running time of nine hours, approximately 35 miles an hour. The flight over Washington was made at a low elevation, and as the dirigible flew over the new Navy Building, then circled over the White House and Treasury, thousands had a close view of it."

The dirigible, marked D-17, flew low over Washington and caused considerable commotion. Through the mark, D-17, the public learned that it was a naval dirigible. The ship has a hydrogen capacity of about 180,000 cubic feet, and is equipped with two Hispano-Suiza motors of 150 horse power. The following were the crew on board: Major B. L. Smith, Marine Corps; Lieut. R. A. D. Preston, U.S.N.R.F.; Lieut. (j. g.) D. T. Hodd, U.S.N.R.F.; Lieut. (j. g.) W. L. Hamlin, U.S.N.R.F.; Ensign J. Esterley, radio operator; and M. Roulette and James Royal, civilian mechanics.

This was the first trip made by dirigible from Akron to Washington, and from Washington to New York, therefore, it has historic value.

The only recent long distance trip on the part of a dirigible was made by a Goodyear Dirigible, the D-12, when it made a 360 mile flight from Akron, O., to Dayton, O., and return, last summer. The D-12 was equipped with a single motor, whereas the D-17 is equipped with two motors.



Before the flight, tiny rubber balloons were sent up to ascertain the upper air currents. They were inflated with hydrogen from the hydrogen bottle seen in the illustration. The officers in the photo are (left) Captain Smythe and (right) Major J. C. McCoy

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation dutv.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Dayton, Ohio, Chief Technical Section.
Note 3—Report to Dayton, Ohio, Production Engineering Dept.
Note 4—Report to Dayton, Ohio, Dis. Mgr. of Aircraft Finance.
Note 5—Report to Naval Hydroplane Station, Pensacola, Fla.
Note 6—Report to Standard Aircraft Corp., Elizabeth, N. J.
Note 7—Report to Dis. Mgr. Aircraft Finance, Detroit, Mich.
Note 8—Report to Students' Army Training Corps, Lafayette College, Easton, Pa.
Note 9—Report to Commanding General, Boston, Mass.
Note 10—Take station at Cumberland, Md. Wire DMA.
Note 11—Report to Aviation Gen. Supply Depot, Middletown, Pa.
Note 12—Report to Dis. Office of Production, Dayton, O. Wire DAP.
Note 13—Report to Commanding General, Central Dept., Chicago, Ill.
Note 14—Report to Major E. S. Moore, Dis. Mgr. Production, Buffalo, N. Y

Special Orders, Nos. 234-238 Inc.

A

Albery, Freeman.....EOT
Arnold, Ernest C.....FLA; MSC
Austin, Edward C.....LDT
Andrews, Mark.....CPA
Andrews, John P.....CGC
Austin, Carter H.....TFT
Aaroe, George Christian.....CPA
Aisip, Frank W.....CPA
Anderson, Otho B.....CPA
Alexander, Harry S.....CPA
Adams, Jack Richard.....SLA; ELA
Anderson, Leland Stanford.....SLA; CFT
Anderson, Charles Ewing.....SLA; SAG
Axberg, Edward.....SLA; CFT
Albery, Freeman.....SLA; PWM
Aurelius, Paul John.....SLA; CFT
Abernethy, Wilbur Kingsley.....SLA; AAD
Ayers, George R.....AGC
Amis, William N.....AGC
Allen, Albert Delos.....FLA
Anderson, Wallace Alexander.....FLA
Ashwell, George Gouverneur.....FLA
Arnold, Ivan T.....EOT
Anderson, Arnold A.....MIA
Allen, Irving E.....EOT
Acosta, Bertram Blanchard.....CPA
Ashby, William T.....MIA
Abbey, Evers.....DMA; TMA; Note 1
Andrews, Elmer F.....CGC
Aney, Melvin.....CGC
Allison, Roy G.....PWM

B

Benedict, Howard M.....WFO
Brown, William C. F.....SMA
Buckley, William Joseph.....SLA; CWT
Batchelder, Charles Shaw.....SLA; CWT
Benedict, Maurice T.....TFT
Boyd, Linn.....TFT
Bubb, Harry Agnew.....MJA
Blood, Howard Earl.....MJA
Bartelt, Frank Edward.....SLA; CFT
Brandt, Alvin Rudolph.....SLA; CFT
Borre, Peter Celestine.....SLA; SAG
Burdick, Harry Avery.....SLA; ABC
Bridgman, Ethan Allan.....SLA; ABC
Birnn, Roland.....SLA; TMA
Blotter, Richard G.....TFT
Biber, Walter Earl.....SLA; GLC
Bohrer, Charles R.....BST
Baker, Foster Kenneth.....SLA; CWT
Burkhardt, Harry Lee.....SLA; KST
Blevens, Charles Elmo.....SLA; KST
Borden, Cecil Alexander.....FLA
Bruton, David Derden.....FLA
Burge, Edwin.....FLA
Burton, Joseph W.....FLA
Bainey, James Andrew, Jr.....PWM
Blair, Lewis Francis.....SLA; CWT
Berry, Richard B.....RSD
Bostwick, William Harmon.....CPA
Babcock, Raymond A.....KST
Brainard, Spencer.....CPA
Bettis, Cyrus.....SLA; CWT
Boies, Sherhan H.....CPA
Bunting, Walter Mills.....SLA; AAD
Blair, Percy A.....CPA
Benson, Reynolds.....CPA
Blakeman, Frederick T.....CPA
Brockway, Albert L.....CPA
Brown, Paul D.....CPA
Barrett, William.....CPA
Bleecker, William H., Jr.....FLA
Bleistein, George, Jr.....CPA
Bleach, Stephen Stanley.....SLA; ABC
Blanchard, David.....SLA; PMT
Boomer, Floyd Henry.....SLA; ABC
Black, Ernest Bateman.....CPA; DAP
Bailey, Joseph Norbert.....SLA; DAP
Brown, Ronand Whetten.....SLA; CRI
Bijur, Harry.....FLA
Borum, Fred Sidney.....FLA
Barker, Donald Vernon.....SLA; SAG
Beil, Richard M.....CGC

Bellmont, Lee T. ..... KST
Batts, Carl T. ..... DAF
Block, Kenwood Morton ..... SLA; CWT
Baxter, Maxwell ..... FLA
Bell, Cecil Kenneth ..... FLA
Brooks, Martin V. B. ..... KST
Brewer, Scout Ridge ..... CPA
Bumstead, John Henry ..... SLA; PWM
Buckley, Daniel ..... KST
Barb, Martin B. ..... PWM
Bond, George C. ..... CGC
Browning, Irving K. ..... CGC
Bricka, Walter William ..... SLA; SAG
Burgtorf, Edward Allen ..... SLA; SAG
Blandford, James T. ..... MIA
Baldwin, Henry Marvin ..... SLA; ELA
Bagley, Frank Horace ..... SLA; KST
Buckingham, Dwight Monson ..... SLA; ABC
Boxell, Morris Lanpher ..... SLA; ABC
Boyer, George P. ..... BST
Brown, Frank K. ..... BST
Byers, Ralph Rollin ..... PMT
Brown, Lincoln George ..... SLA; ABC
Buckmaster, Samuel A. ..... CGC
Bonn, Wesley C. ..... AGC
Burns, John R. ..... AGC
Bloomer, James Ralph ..... FLA
Baker, Earle F. ..... BST
Berg, George Oscar ..... SLA; RWT
Bach, Hollis Sebastian ..... SLA
Belote, George Harold ..... SLA
Buell, William Charles ..... SLA
Birch, Leland Watts ..... FLA
Bragg, Caleb Smith ..... CPA
Buff, Frederick William ..... SLA
Boomer, Floyd H. ..... CJW
Brandon, Elvis Denby ..... SLA; CWT
Bower, Paul E. ..... CGC
Bonisteel, Roscoe Osmond ..... CPA
Buttler, Bruce B. ..... DMA
Binford, Morton C. ..... CFT
Banholzer, Clarence C. ..... SMM
Benson, John David ..... SLA
Bloom, George Barnett ..... SLA
Blair, Bert R. ..... CGC
Bouvier, John Vernon, 3d ..... MJA
Beraud, Lloyd W. ..... CGC
Bailey, Dan W. ..... MIA
Bohrer, Charles Richard ..... SLA; KST
Brumback, Jefferson U. ..... Note 2
Bailey, Joseph Popenjoy ..... SLA; RWT
Bacon, Asaph P. ..... AGC
Brass, Philip H. ..... Note 15
Bullock, Bryant W. ..... EOT
Baldwin, Charles B. ..... TFT
Byrnes, Ralph J. ..... TFT

C

Cooley, Arthur B. ..... TFT
Copeland, Jay M. ..... TFT
Curtis, Erland L. ..... TFT
Conklin, David Edward ..... SLA; RWT
Cheston, Radcliffe, Jr. ..... CPA
Curtis, Emory Blake ..... SLA; GLC
Copenhaver, Edwin Henry ..... SLA; PWM
Chauchoin, Charles August ..... SLA; CWT
Cochrane, Robert Bryce ..... TFT
Crandall, Winfield Roger ..... CPA
Cobb, Elliot ..... CPA
Curtis, Sidney B. ..... CPA
Colton, Deane W. ..... TFT
Cody, Joseph J. ..... CPA
Cone, J. Carroll ..... CPA
Close, Harry B. ..... CPA
Cumming, Clarence Warder ..... CWT
Chennault, Claire L. ..... LHV
Cunningham, Arthur L. ..... FLA
Colbert, Lewis F. ..... FLA
Campbell, Douglas ..... CPA
Cooper, Marion Caldwell ..... CPA
Carr, John P. ..... SMM
Clarkson, John W. ..... SMM
Campbell, Marston, Jr. ..... MAT
Culbertson, Robert A. ..... SMM
Cady, Harry Charles ..... SLA; ABC
Cameron, Briton M. ..... CGC
Clark, Robert Ernest ..... SLA; CRI
Cundiff, Lawrence B. ..... CGC
Cornog, Isaac C. ..... CGC
Cassidy, John Alexander ..... SLA; CWT
Chandler, Lane T. ..... CGC
Crane, Charles B. ..... MJA
Carberry, James Paschal ..... FLA
Colmery, Harry Walter ..... FLA
Cory, Wayne Meisner ..... FLA
Coney, William D. ..... CGC
Cunningham, Ray Michael ..... SLA; AAD
Churchwell, Daisy Lee ..... SLA; CWT
Crim, William D. ..... KST
Cabot, Thomas D. ..... MIA
Chrystie, Edward P. ..... LHV
Carmody, Arthur R. ..... EOT
Crandall, Winfield R. ..... Note 5
Cook, Robert G. ..... Note 6
Cameron, Mortimer B. ..... BST
Crowl, Leon W. ..... TFT
Cunningham, Parker H. ..... Note 7
Chapman, William B. ..... MIA
Collar, Gilbert T. ..... SMA
Campbell, Eno ..... CGC
Clark, Harold L. ..... CGC
Cronan, Robert T. ..... CGC
Clark, Ben H. ..... CGC
Christiansen, Charles E. ..... CGC
Chambers, Harold C. ..... CGC
Cooper, Russell H. ..... CGC
Crawford, William L. ..... CGC
Culver, Benjamin C. ..... CGC
Church, Rollin S., Jr. ..... BST
Cassidy, Charles Walker ..... SLA
Cragon, Miller Murray ..... SLA
Candlish, Robert Harrison ..... SLA; AAD
Chambers, Howard Elmer ..... SLA
Cooper, Elmer E. ..... AGC
Crawford, Daniel M. ..... AGC
Chandler, William Henry ..... CPA
Croxford, Frank D. ..... AGC
Clinton, Edgar Thompson ..... SLA; SAG
Clough, Charles Edwin ..... SLA; CWT
Chilton, Cyrus H. ..... SMM
Critchley, Horace F. ..... SMM
Cragon, Miller M. ..... PWM
Carson, Louis F. ..... EOT
Carleton, George Morrison ..... SLA; ABC
Chilson, Roy W. ..... KST
Chadwick, Stuart ..... CGC
Church, George Myers ..... CPA
Campbell, Hugh Siler ..... SLA; SAG
Clancy, Edwin M. ..... BST
Colburn, Eldred Brenna ..... SLA; ABC
Cady, Harry C. ..... CJW
Cargill, Charles R. ..... AGC
Circle, Ralph E. ..... CGC

D

Doak, Carroll David ..... SLA; SAG
Doherty, George Joseph ..... SLA; SBI
DeForrest, John ..... AGC
Duggan, James R. ..... TFT
Dunham, Carroll ..... SMA
Duncan, James Cameron ..... SLA; CWT
Davis, Richard Stanley ..... CPA
Downe, George Edward ..... CPA
Dobie, Richard L. ..... FLA
Dwyer, Geoffrey J. ..... CPA
Drake, Alonzo Manning ..... CPA
Dickey, Leslie Joseph ..... SLA; PMT
Drennen, Leonard H. ..... CGC
Davis, Richard Earle ..... FLA
Deeves, Edwin Pratt ..... FLA
Duke, Jack E., Jr. ..... FLA; DMA
Dick, Guy Henry ..... SLA; PWM
Dean, Alexander ..... CGC
Davis, Homer H. ..... SLA; PWM
Davies, Ward J. ..... PWM
Dobbins, Verne Foster ..... SLA; CWT
deSteiguer, Walter George ..... CPA
Danziger, Maurice ..... SLA
Davidson, Rufus Benjamin ..... SLA
Degen, Albert Gustav ..... SLA
De Voe, Elmer Paul ..... SLA
Dally, Joseph W. R. ..... CGC
Danne, Harold A. ..... CGC
Dean, Edward K. ..... CGC
DeWitt, Dalton G. ..... CGC
Donaldson, Howard L. ..... CGC
Doane, Glendon B. ..... EOT
Davidson, James Virgilius, Jr. ..... SLA; Note 14
Duddleston, Charles S. ..... Note 2
DeLorraine, Claude H. ..... Note 10
Davidson, Lawrence E. ..... EOT
Davis, Milton Ernest ..... FLA

E

Emerson, Sigard A. ..... RSD
Edwards, Chester H. ..... SMM
Ehlers, George Washington ..... SLA; PWM
Ervin, Robert G. ..... CGC
Eckert, Samuel B. ..... CPA
Eisenchimel, Milton Charles ..... FLA
Euchner, William H. ..... FLA
Elm, Ionar E. ..... EOT
Ellis, Walker M. ..... CPA
Estabrook, Benjamin W. ..... CPA
Ewell, John E. ..... CPA
Eldredge, James Sharp ..... SLA
Emberton, Robert D. V. ..... TFT
Ebaugh, John W. ..... CGC
Ely, William N., Jr. ..... CGC
Erickson, Arthur X. ..... PWM
Ells, Myron B. ..... BST

F

Fitzpatrick, Francis Edward ..... SLA; PWM
Ford, Charles E. ..... TFT
Foster, Thad V. ..... PWM
Fladeland, John E. ..... PWM
Fleet, Reuben H. ..... MJA
Fleming, Donald Livingston ..... SLA; GLC
Fleming, Carl ..... SLA; SAG
Feild, Rutledge Hughes ..... SLA; ELA
Fee, Ray E. ..... TFT
Ferguson, Harry C. ..... CPA
Flynn, Edward James ..... SLA; CRI
Field, John Bacon ..... SLA; ELA
Friedman, Harry B. ..... KST
Fisher, Robert Lewis ..... PWM
Fox, William A. ..... CPA
Ford, Fred M. ..... FLA
Fisher, George F. ..... CPA
Ferris, Eugene M. J. ..... CPA
Ferry, Jay R. ..... CPA
Fleitman, Henry T. ..... CPA
Fetters, Jay March ..... SLA
Foley, Andrew Edward ..... SLA
Francis, Paul Robertson ..... SLA
Foley, Raymond W. ..... Note 4
Field, Rutledge H. ..... AGC
Ford, Harold R. ..... AGC
Frindel, Samuel, Jr. ..... SLA
Frankley, Lawrence W. ..... AGC
Fyfe, Henry M. ..... SLA; BST
Fischer, Ira W. ..... CGC
Forshey, Fred William ..... FLA
Franclemont, Edward L. ..... CGC
Fahey, Thomas Francis ..... SLA; BFT
Fry, G. Kenneth ..... MIA
Fenno, Jesse K. ..... CGC
Filson, Harry R. ..... EOT
Faris, Nicholas Beatrous ..... SLA; BST
Finney, Olin ..... CPA
Freston, Herbert A. ..... KST
Farr, Marcus Stulls ..... CPA

G

Greene, George Gordon ..... SLA; PMT
Gaylord, Elmer James, Jr. ..... SLA; GLC
Glatts, Bernard Russell ..... CWT
Gregory, William R. ..... DMA
Garrett, Kenneth ..... SLA; CFT
Gale, John M. ..... AGC
Gledhill, Franklin W. ..... FOB
Gorman, Karl H. ..... AGC
Goldsmith, Bertham Joseph ..... SLA; SAG
Granniss, Norman Caleb ..... SLA; DMA
Giesecke, Bertram Ernest ..... FLA
Greene, Arthur D. ..... TFT
Green, Paul E. ..... CPA
Griffin, William ..... LHV
Glover, John LeRoy ..... CPA
Gwynne, Arthur ..... CPA
Gove, Robert Russell ..... SLA; PWM
Greenawait, Henry Samuel ..... SLA; SAG

(*Continued on page 436*)



The A. R. Dorand-Renault Corp d'Armee machine

FOREIGN NEWS

BRITISH

The Independent Air Force bombed the railways at Metz-Sablons on October 18 and at night dropped projectiles on the railways at Saarburg, according to an official announcement.

In withdrawing from Flanders and the Belgian coast the Germans not only gave up their submarine bases, but also left behind immense aerodromes. Before the enemy retirement northern Belgium might have been known as the home of the Gotha. By moving eastward the Germans lose the points nearest to England from which they used to carry out raids upon London and other English towns. Hereafter, it is believed, the Germans will find it increasingly difficult to make air raids upon London.

The evacuation of Ostend and Zeebrugge will make easier the work of the British navy in keeping the British Channel clear of submarines. The Germans also have been forced to remove the torpedo boats from these bases.

Germany has made herculean efforts to solve the problem of Mannheim and has failed. Night bombing continues to make life in that city almost unendurable. Its great chemical and munition works are vital to the Hindenburg armies. It cannot escape. Its huge buildings cannot be moved and the British airmen know their position exactly.

Continual bombing of the fiercest sort causes the workers to threaten to strike and fills the mass of the population with terror. Even if the workers do not strike, they are again and again driven from their post of duty, their rest is disturbed and their working capacity reduced. Peace at any price is becoming in Mannheim a cry that appalls the authorities. Anti-aircraft guns surround the town and their barrage is so thick that on a clear night the sky is overcast with the smoke of bursting shells. Kite balloons ring the place around and the cables holding these are connected with electrified wires.

Machine guns are mounted wherever there is any prospect of their firing effectively. Searchlights sweep the skies nightly. None of these devices nor all of them put together prevent bombers from droning through the darkness, one after another, across the lines along the silver ribbon of the Rhine.

The Britons, threading their way among the searchlights and bursting shrapnel at a great height, rush like shadows over the very rooftops of the town and fling down destruction while the archies and machine guns spread a harmless canopy of missiles over their heads. Perhaps in no other part of the theatre of war has the comparative helplessness of armed land folk against armed air folk been proved so strikingly as at Mannheim. In spite of the thickness of the perils that encompass the bombers, they come off with few casualties and often with none. There is one record of a year's bombing operations by the British against a place on the western front in which no Briton was wounded and no British machine lost.

Sometimes there is a false warning and all night long the populace awaits the thunder of bombs without any bombs falling. These warnings have caused the people to hear enemy machines when no enemy machine is anywhere near. Sometimes no warning is given when the Britons do come and in such cases the inhabitants get their first warning from the red flashes of bombs on the munition plants.

I have just heard of a fight on the Italian front in which one British fighting plane after a long chase, in company with a brilliant Italian airman, overtook nine Albatross scouts, manned by Austrians. Single-handed he fought the squadron, destroying four machines and scattered the others. Three of the Austrian machines fell on their backs and the fourth was telescoped after a nose dive. One Austrian pilot escaped in a parachute after his plane had turned turtle and could not be righted. The Briton rejoined his Italian companion uninjured.

Thirty hostile aeroplanes were destroyed, six driven down out of control, two downed from the ground, and one balloon shot down in flames, Field Marshal Haig reported on October 16 in his communique on aviation activities.

British flyers also bombed the Frescaty aerodrome, damaging a Zeppelin shed and wrecking a hangar. Casualties among the mechanics were noted. The enemy did not fire on the attacking squadrons.

Thirty three tons of bombs were dropped during the day and thirteen in night attacks. Eleven British planes were missing at the end of the day.

The official statement of October 24 dealing with the operations of the independent air forces says: "On Wednesday night we bombed railways at Burbach and Saarbrucken, chemical factories at Mannheim and railways at Coblenz, near Mainz, and at Metz-Sablons."

FRENCH

On October 21, along the west front and in Flanders, our observation squadrons carried out important work of reconnoissance and surveillance behind the enemy front. Two enemy planes were brought down, and a balloon was burned. During the early part of the night our bombing planes dropped 18,800 kilos of projectiles on important railway junctions, and, in particular, on the stations at Longuyon, Stenay, Hirson, Vervins, Marle, Montoornet, Rozoy-sur-Serre, Previsy-sur-Serre, and Liart. They noted a great number of hits on their objectives, following which fires broke out in the stations at Longuyon, Hirson, and Rozoy.

The official French report of October 24 says:

On October 23 observation planes, in the course of numerous reconnoissances, proceeded more than seventy kilometres (about forty-three and a half miles) inside the enemy lines. They brought back several hundred photographs. Two captive balloons were burned and twelve enemy machines were brought down or put out of action. The greater part of these successes were obtained in the region of the Aisne, where the vigilance of our pursuit machines was particularly exercised.

During the night our bombing machines dropped 14,500 kilos of projectiles on the railway station at Montcornet, Marle, Vervins, and Wassigny, with particular attention to Provisy, on which more than seven tons of explosives were dropped, causing several fires.

ITALIAN

On October 8 army and navy dirigibles, even though there was a strong wind, bombarded with great success the enemy's aviation fields and centres of concentration in the Trentino and on the Piave.

Great results were observed and numerous fires started as a consequence of the action. Our airships returned safely, notwithstanding the heavy fire from the enemy's anti-aircraft batteries.

On October 9 there was great aerial activity on all parts of the front. Many recognition flights and aerial combats. Our pursuit machines assaulted a large patrol of enemy machines which attempted to pass the battleline. Three were sent to earth and the remainder were compelled to retreat. Our bombing squadrons efficiently hit enemy trenches, cantonments and railroad stations, while special patrols, at a low altitude, fired by machine guns on columns of the enemy's soldiers marching to and from the front.

On October 10 bad weather, entirely adverse on all parts of the front, greatly reduced the aerial activity. Notwithstanding these conditions, numerous recognition and patrol flights were executed by our squadrons.

Naval machines at the front on the 10th and 11th accomplished with great results the bombardment of the Bay of Durazzo. All returned safely to their base.

On October 14, 15 and 16 bad weather hindered all aerial activity.

The Supreme Italian Command publishes the results of the aerial operations during the last part of September on our front.

Twenty-six enemy machines fell.

Eleven bombardments, during which 18 tons of explosives were dropped. More than 1,320 bombs of different calibre were dropped during the recognition flights.

Thirty-two thousand shots from machine guns were fired on enemy troops from special patrols at a low altitude.

Four thousand five hundred photographs of enemy positions were taken.

One million pamphlets were thrown inside hostile territory.

Long recognition flights were executed to Portogruaro, Cazzo Carnieo, Tolmezzo, the Valley of Drava at Toblack.

Wright Monument in France to Be Near Where He Flew

Paris.—The French Aero Club Committee, which is arranging to erect a monument to Wilbur Wright, inventor of the aeroplane has decided to place it near the small village of Auvours, near Le Mans, where Wilbur Wright made his first flight in France on August 9, 1908. The monument will be erected next spring.

French Plane Builder Dies

Paris.—Leon Morane, the French aviator and aeroplane builder, is dead.

In 1910 Leon Morane earned the reputation of being the leading French aviator. In July of that year he established a new record for speed, and in September ascended 8,471 feet, at that time the greatest height ever attained by an aviator. He was injured in October, 1910, and afterward gave his entire attention to the building of aeroplanes.

Belgian Rulers Visit Bruges by Aeroplane

Dunkirk.—King Albert and Queen Elizabeth of Belgium visited Bruges by aeroplane on October 22.

They left Dunkirk at 8:45 o'clock in the morning and landed at Bruges a half hour later. They visited the chief streets of the city and received a joyful welcome from the populace.

On their return they left Bruges at 11 o'clock.

The Italian Trade

A large K. seaplane brought down at Venice quite recently is said to have two motors, acting on one propeller shaft. The machine is on view in that vity, but illustrations of the craft are not very enlightening.

A new radiator, the Valcerusa, is coming very much to the front, several big engine builders fitting it. Among others the S. P. A. vertical motor on the S. V. A. is colled by a Valcerusa.

A Franco-Russian Alliance

M. Sikorsky, the designer and constructor of the giant biplane bearing his name, is now associated with the French Voisin Co., in the capacity of consulting engineer. It seems likely that he will devote himself to multiple-engined machines, and, considering his early entry into the field of large aeroplanes, the results of his experiments should be of interest.

Massachusetts Flyer with the British Is Reported Dead

Lieutenant John S. Ferguson of the British Royal Flying Corps, reported missing September 21, is now reported dead. Lieutenant Ferguson was twenty-five years old. He left Pittsfield, Mass., last spring and was commissioned in August. A brother, Lieutenant Thomas Ferguson, was killed while fighting with the British in April, and another brother, Andrew Ferguson, is overseas with a Canadian regiment.

In bombing the areas to the rear of the German lines the British aviators sent down one and one-half tons of bombs. The road was jammed with a mass of wreckage.

Germans Dread Winter and Raids By Allied Fliers

London.—A despatch to the Daily Mail from The Hague says: "From all information available here, in Germany there is a widespread dread of winter and of daily and nightly air raids from German aerodromes in Belgium, which are now in the hands of the Allies.

"It is indicated that such raids would produce internal results in Germany quite different from the present symptoms of unrest."



MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

Selecting A Wing Section

ONE of the problems of the Aeronautical Engineer is to pick the proper wing section for the machine he has under consideration. For a fast scout of light weight he must select a wing curve with a high ratio of lift to drift. This ratio is generally represented by the sign L/D.

Three wing sections, the first for a fast scout, the second for a medium fast machine and the third for heavy machines needing a great lift such as flying boats, will be found below. Also tables for each curve showing the coefficients of lift and drift (or resistance) at different angles of incidence of the wing from minus 4 degrees to plus 20 degrees are given, along with the ratio of lift to drift and the distance of the centre of pressure from the front edge of the wing at each angle of the wing.

The location of the centre of pressure in each wing section must be known, as the centre of gravity of the whole machine, and the centre of pressure must be in the same vertical line or as near to each other as possible.

The writer has selected these wing curves as they were designed to allow the use of large wing spars in the construction of the wing, which is desirable for the machine we are to build.

The formulae given herewith are put in for simplicity's sake. Though they look very difficult at first glance, the student will find that by looking closely at what the different symbols mean, the work is much simplified thereby.

Sustaining Power and Resistance of Wings

To figure the lift given by a wing we use the formula,

$$L = Ky\ AV^2$$

where Ky is the coefficient of lift at the angle of incidence, of the wing under consideration. A = the area of the wing in square feet and V^2 = the speed in miles per hour, squared.

For instance, we wish to find the lift of curve No. 1 at an angle of zero degrees having a wing area of 160 square feeet and traveling 120 miles per hour.

Substituting values for the above equation, we find alongside of 0° under Ky .000721, so we have

$$L = Ky \quad A \quad V^2$$

$$\text{Lift} = .000721 \quad 160 \quad 120^2 \text{ or}$$

multiplying, we have $.000721 \times 160 \times 14400 = 1661$ lbs. lift.

As the lift must be equal to the weight, it can be seen that the above would apply to a machine weighing 1661 pounds.

The resistance of this machine would be figured by the formula,

$$KxAV^2$$

where Kx is the coefficient of resistance. Looking under Kx along a line with zero° angle, we find the coefficient at the angle to be .0000653.

Substituting values for the above, we have,

Resistance = $.0000653 \times 160 \times 14400 = 150$ lbs. approx.

Weight = $Ky\ AV^2$, or the same as for lift.

$$Ky = \frac{W}{AV^2} \text{ or}$$

weight of machine, divided by the area, times the velocity squared.

The above equation can be used in determining the angle needed to sustain the machine at the lowest flying speed, or to ascertain the angle to set the wings to give the proper lift at full speed. For instance, we found the speed of 120 M.P.H. necessary to sustain the machine with an angle of zero degrees. Suppose we wanted the machine to have a minimum or slow flying speed of 60 M.P.H.; then, substituting values for the equation, we have

$$Ky = \frac{1661}{160 \times 3600} \text{ or } 1661 \div 2304000 = .002883$$

Looking at the table of Ky, we find this to be near 12 degrees, or roughly, 11 degrees 30 minutes. Then, in order to fly this machine at a speed of only 60 M.P.H. the pilot would have to drop the tail to give the wings an angle of incidence of 11 degrees 30 minutes to maintain horizontal flight.

Another equation for use in determining the speed a machine would have to make in order to fly is

$$V = \sqrt{\frac{W}{Ky\ A}} \text{ substituting values } \sqrt{\frac{1661}{.000721 \times 160}} \text{ or simply}$$

$$\sqrt{1661 \div (.000721 \times 160)} = 120 \text{ M.P.H.}$$

Again to find the area if we know the weight, speed and the

$$A = \frac{W}{Ky\ V^2} \text{ or}$$

Suppose we wanted to find the area needed for an angle of 10 degrees at a speed of 60 M.P.H.

Looking in Ky column we find opposite 10 degrees coefficient .002580, substituting values in the formula, we have

$$\text{Area} = \frac{1661}{.00258 \times 3600} \text{ or } 1661 \div 9.288 = 175.6 \text{ sq. ft.}$$

The student will see that a wing gives more lift as the angle increases until the critical or highest angle of lift, called the (burble) point is reached.

After this angle is reached the lift drops and the resistance increases.

As the lift increases with the angle, so the resistance increases.

(To be continued)

Aerodynamic Laboratory Tests

U. S. A. 1.

L of i	*Ky*	*Kx*	*L/D*	Distance of C. P. from leading edge, in fractional part of chord.
—4°	—.000399	.0001515	2.64	....
—2°	.000156	.0000905	1.72	....
—1°	.000432	.0000700	6.15	.620
0°	.000721	.0000653	11.00	.530
1°	.000936	.0000670	14.00	.463
2°	.001146	.0000688	16.60	.415
4°	.001510	.0000860	17.50	.340
6°	.001878	.0001158	16.20	.316
8°	.002230	.0001558	14.30	.303
10°	.002580	.0002055	12.60	.290
12°	.002910	.0002595	11.20	.283
14°	.003165	.0003040	10.40	.274
16°	.003165	.0003710	8.50	.276
18°	.003080	.0005520	5.60	.310
20°	.002882	.0008500	3.40	.360

U. S. A. 3.

L of i	*Ky*	*Kx*	*L/D*	Distance of C. P. from leading edge, in fractional part of chord.
—4°	—.000506	.0001589	—3.19	....
—2°	.000420	.0001052	3.99	.676
—1°	.000692	.0000845	8.20	.482
0°	.000928	.0000835	11.10	.403
1°	.001123	.0000856	13.10	.353
2°	.001310	.0000889	14.75	.323
3°	.001508	.0000893	16.16	.295
4°	.001704	.0001073	15.88	.280
5°	.001919	.0001180	16.18	.260
8°	.002520	.0001823	13.82	.230
10°	.002905	.0002290	12.70	.220
12°	.003160	.0002830	11.15	.208
13°	.003235	.0003142	10.30	.204
14°	.003240	.0003410	9.50	.197
15°	.003215	.0003780	8.50	.197
16°	.003155	.0004460	7.02	.197
18°	.003125	.0006620	4.73	.236
20°	.002889	.0008570	3.37	.266

U. S. A. 4.

L of i	*Ky*	*Kx*	*L/D*	Distance of C. P. from leading edge, in fractional part of chord.
—4°	—.0001231	.0001640	—0.75	....
—2°	.0005200	.0001150	4.52	.670
—1°	.0007650	.0001078	7.11	.525
0°	.0009750	.0001032	9.44	.461
1°	.0011840	.0001002	11.80	.416
2°	.0013820	.0000995	13.90	.388
4°	.0017700	.0001115	15.88	.347
5°	.0019800	.0001340	14.80	.330
8°	.0025600	.0001900	13.50	.298
10°	.0029900	.0002555	11.70	.273
12°	.0033100	.0003100	10.67	.276
14°	.0036000	.0003545	10.15	.276
16°	.0036150	.0004430	8.15	.276
18°	.0034700	.0005580	6.22	.303
20°	.0031000	.0007640	4.06	.335

L of i = Angle of wing chord to wind.
Ky = Lift coefficient in lbs./sq. ft./MPH.
Kx = Drift coefficient in lbs./sq. ft./MPH.
L/D = Ratio of l'ft to drif .



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

A Tiny Tale Spun by the Housewife

To market to market
We hire a jit,
Wait forty minutes,
Then lickety split.

Over the roadway
Careening we go!
Even the airplanes
Seem placidly slow.

Faster and faster
We skid round the bend—
Yonder's a bridge—Oh,
Can this be the end?

Riggety jiggety,
Pop goes a tire!
List to that chauffeur's
Magnificent ire.

In again, on again,
Feeling quite pale;
Missing a cow
By the hair of her tail!

Racing with trolleys
And trucks—and a cop;
Hitting the high spots
A terrible flop.

To market to market
We hire a jit—
But do we return in it?
"Je vous dis"——NIT!



Courtesy Evening Journal.

The Insignia

The lieutenant was testing the squad in visional power. "Tell me, No. 1," he said, "how many men are in the trench-digging party over there?"

"Thirty men and one officer" was the reply.

"Quite right. But how do you know one is an officer at this distance?"

"Cos he's the only one not working."

—Ex.

Aerodonetics

(With Apologies to the White Knight or Somebody.)

'Twas solo and the ailerons
Did flit and flutter in the wake.
Too flimsy seemed the longerons
And the instructor outspake—

"Beware too level banks, my son,
The side slips and the other sins.
Beware the uppish stalls and shun
The dangerous tail spins."

He took his Curtiss ship in hand
And long the Figure 8 he sought.
Then rested sick on the trembling stick
And glided deep in thought.

And as in pannish thought he slid,
Rip-roarin' Texas, full of sand,
Came huffling on the nervy kid
And blew to beat the band.

One, two, three, four, and more and more
His spinning plane went blither block.
He hit the sward and in the Ford
He beat it for the Doc.

"And hast thou busted up the ship?
Back to the bench, thou monkey cage!
Oh, frowsy dub! Thou—blank—glub—glub—"
He stuttered in his rage."

'Twas solo and the ailerons
Did flit and flutter in the wake.
Too flimsy seemed the longerons.
AND the instructor outspake! ! ! ! !

—Lieut. L. B. C.

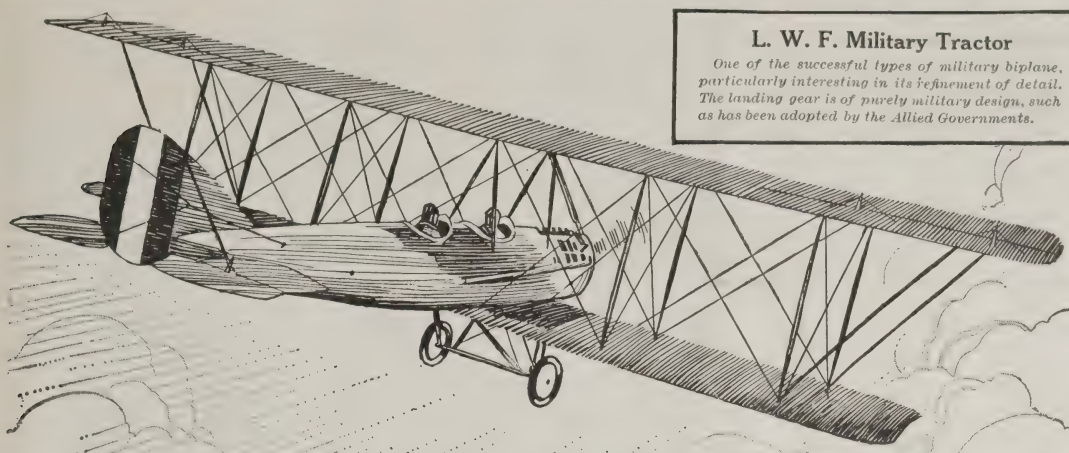
Documents Lost!

LOST—One address. Will the conductor that took up transportation tickets on Sunday night's Cognac Express kindly look through his pockets and see if he was given the address of a Parisien mademoiselle instead of a night pass. Reward: Beau coup gratitude and Y. M. cigars. No questions asked or answered. Pvt. Zig-Zag, care, Plane News. t.f.

Slinging the Old Stuff

"A state of enhanced protection" is the new German name for martial law. "What do you read, my lords?" Words words, words!—*Daily Times.*

And bull, bull, bull!



L. W. F. Military Tractor

One of the successful types of military biplane, particularly interesting in its refinement of detail. The landing gear is of purely military design, such as has been adopted by the Allied Governments.

VALENTINE'S
VALSPAR
The Varnish That Won't Turn White

Valspar aids Airplane Efficiency

Valspar is the ideal varnish for airplanes and seaplanes in active service, because it is proof against water and weather, oil and gasoline, and the extreme vibration of the engine and machine-gun.

Valspar protects wood, metal or fabric with a coating of unsurpassable toughness and elasticity. It will neither blister, check, crack, nor turn white from exposure.

Valspar resists also the destructive effects of high speed and hard usage, and retains its protective qualities long after ordinary varnish requires renewal.

Valspar is in constant use in the air service of the Allies and has satisfied their most exacting requirements.

Our Airplane Department will gladly afford information and assistance in solving your varnish problems. To purchasing agents and superintendents of production we will send our book on airplane finishing free on request.

VALENTINE & COMPANY, 456 Fourth Avenue, N. Y.

ESTABLISHED 1832—Largest Manufacturers of High-grade Varnishes in the World

New York Chicago Boston TRADE VALENTINE'S VARNISHES MARK Toronto London Amsterdam

W. P. FULLER & CO., Agents for the Pacific Coast: San Francisco and Principal Pacific Coast Cities

Valentine Products used by the world's leading airplane-makers include Valspar Varnish, Valspar Bristol Enamel, Valspar Low Visibility Gray Enamel, Valspar Olive-Drab Enamel, Valspar Black Enamel, Valspar Filler (Wood), Valspar Primer (Metal), Valspar Primer (Wood), Valspar Khaki Enamel, Valspar Aluminum Paint. Dipping, Spraying, and Brushing coatings of all kinds, Quick-Drying Insignia Colors.

(Continued from page 431)

Gregory, Ralph Lester.....SLA; SAG
Garrett, Pearson B.....CPA
Gray, Ralph Monzingo.....SLA; PMT
Gahris, Leroy E.....CUI; DMA; LHV; Note 1
Gould, Theodore John.....SLA
Gower, John Maurice.....SLA
Grimes, Plumer William.....SLA
Green, Henry Oliver.....SLA
Glose, Charles William.....SLA
Gemmill, William B.....CJW
Gibbons, John R.....SMM
Giffels, Raymond F.....CGC
Genung, Arthur Lawrence.....SLA; PMT
Goodrich, Augustus.....CFT
Giroux, Louis A.....DMA
Grover, Ralph J.....DMA
Gilbert, Francis M.....AGC
Gibson, Peyton.....CGC
Garrett, Kenneth.....CGC
Gerke, Walter H.....EOT
Gilchrist, Claude F.....CAF

H

Hill, William Burr, Jr.....FLA
Heard, Charles Richard.....SLA; SAG
Hosking, Oakely William.....SLA; SAG
Horton, Clarence Frost.....SLA; KST
Harvey, Harold Williamson.....SLA; GLC
Heisner, Charles Lester.....SLA; CFT
Hart, Charles Whittlesey.....SLA; SAG
Hartsough, Ralph Clayton.....SLA; SBI
Hibner, Harold Wellington.....SLA; PMT
Hoddick, Arthur H.....FLA
Heckert, Sidney F., Jr.....FLA
Heebner, Miller Beekman.....FLA
Hilliard, Walter Bertran.....FLA
Hamor, Bert Lee.....SLA; PWM
Harp, John Holland.....SLA; CWT
Hoare, J. Maurice.....SLA; KST
Hoffman, Henry Allen.....SLA; GLC
Hersey, George F.....CJW
Hamlin, Charles Evelen.....SLA; PWM
Hill, Maurice Benjamin.....SLA; PWM
Haugen, George Arnold.....SLA; PWM
Hill, John Calvin, Jr.....SLA; PWM
Hall, Loring Howes.....SLA; ABC
Harvey, Henry Steven.....SLA; LHV
Hobbs, John Edward.....SLA; ELA
Hoatson, Thomas Lewis.....SLA; ELA
Hill, James Moore.....SLA; ELA
Hart, Haden Bourland.....SLA; SBI
Hajek, William J.....FRF
Hopkins, Hiram Oliver.....SLA; BFT
Hagerty, William Joseph.....SLA; CRI
Hunter, Daniel Franders.....SLA; CWT
Harding, Roland R.....TFT
Hessey, John H.....TFT
Holderman, Lester Dale.....SLA; PMT
Henderson, Finley D.....BST
Hitchcock, Harry Coverly.....SLA; SBI
Halley, Samuel Russell.....CPA
Hammes, John Safford.....SLA; CWT
Hastings, Edgar Roswell.....SLA; CWT
Howard, John Clough.....SLA; PWM
Harold, Eugene Leslie.....SLA; PWM
Hughes, George F.....CPA
Heyniger, C. Lambert.....CPA
Hollander, Cyril M.....LHV
Harmon, Roy William.....SLA; SAG
Hambleton, John A.....CPA
Herlihy, John A.....CPA
Herbert, O. Haswell.....CPA
Hill, George R.....CPA
Halstead, John E.....FLA
Hopkins, Mark.....FLA
Hunter, Thomas Caborne.....SLA; ELA
Henn, John Ervin.....SLA; PWM
Hackett, Chauncey.....CPA
Hagan, Thomas H.....CGC
Hinkle, Stacy C.....CGC
Harrell, Samuel C.....AGC
Hall, Russell F.....MIA
Hurst, Edward.....Note 5
Hall, Frank Loomis.....FLA
Hawks, Harold Phelps.....FLA
Hoffman, Verne W.....CGC
Harrison, Benjamin Demas.....SLA
Horton, Hiram T.....MIA
Hull, Perry Albanis.....SLA
Hadenfelt, Charles O.....SMM
Holmes, Walter E.....SMM
House, Archie F.....SMM
Hartman, Harrison J.....ELA
Herington, George B.....CPA
Hibbitt, George W.....EOT
Hunt, Robert McMurray.....SLA; VBW
Hare, Herbert Roy.....Note 4
Hanna, Charles G.....Note 5
Hooper, Willis B.....CGC
Higgins, Louis S.....Note 2
Hovey, Dana W.....DMA
Hodous, Louis Wenceslaus.....SLA; DMA
Harris, Frank D.....PWM
Hyde, Clarence E.....CGC
Harmon, Roy W.....CGC
Herron, Robert M., Jr.....CGC
Hill, Hartwell C.....CGC
Heppeard, Thomas H.....PWM
Henry, William H.....MIA
Henderson, Randall T.....KST
Hutchinson, William B.....RSD
Heisner, Charles L.....CGC
Hawkinson, John L.....TFT
Hennessey, James Roy.....SLA; CWT

I

Inglis, Henry Baxter.....CPA
Ives, Earl E.....FLA
Isaacs, Charles W., Jr.....TFT

J

Johnson, Edward Lee.....PWM
Johnson, Walter Ellsworth.....SLA; BST
Johnson, Arthur Walfred.....CPA
Johnson, Waldo C.....CPA
Jones, Lloyd T.....CPA
Jones, George Lewis.....MJA
Jones, E. Lester.....CLA
Jones, Earl Chester.....SLA; ABC
Jackson, Samuel Dorsey.....SLA; PMT
Jackson, Ralph Lewis.....SLA; KST
Jorstad, Jonas O.....CPA
Joy, William Patrick.....FLA; HHN
Jenkins, Benjamin F.....CGC
Jones, Harrison Morton.....MJA
Jones, Arch James.....ABC
Jenkins, Nelson D.....AGC
Johnson, Jerome B.....CGC
Jones, William L., Jr.....CGC
Jacobs, George S.....SMA
Jones, Martin Tilford.....SLA; HHN
Johnston, Edward M.....CGC
Joscelyn, Douglass L.....AGC

K

Knoeppel, Charles Justus.....SLA; PMT
King, Edward H.....BST
Kleinknecht, Clifford Carl.....SLA; TFT
Koenig, Augustus George.....SLA; CFT
Klotz, Dominic George.....SLA; KST
Kelting, Aubrey North.....SLA; AAD
Kiernan, James Ives.....SLA; ABC
Knauff, Calvin Nicholas.....SLA; PWM
Kelley, Joseph John.....SLA; SAG
Kiley, Richard James.....SLA; BFT
Kinkade, Kennish C.....TFT
Koontz, Leonidas L.....FLA
Kidd, Clifford Manzer.....SLA; SBI
Kelly, Fred Raymond.....SLA; AAD
Kemper, Ralph Thomas.....SLA; PWM
Kelley, Earl C.....TFT
Kellogg, Stuart W.....CPA
Kenyon, William S.....CPA
Kicklighter, Harman K.....CPA
King, John Andrews.....CPA
Knight, Everett Samuel.....SLA
Kendrick, Frank Elwin.....SLA
Kaufman, Godfrey F.....CGC
King, William G.....CGC
Kaplowitt, Mack B.....MIA
Kuhn, Herbert Roy.....SLA; CWT
Keene, Charles W.....Note 2
Kennedy, James A., Jr.....CGC
Kelly, James N.....CGC
Kilander, Carl Franklin.....PMT
Kunkel, Henry W.....AGC
Kern, Ralph D.....CGC
Kline, Lawrence J.....CGC
Kelly, Fred W.....CGC
Kiely, Michael A.....DMA
Korteling, Ralph G.....SMM
Kendall, John D.....CGC

L

Lankford, Frank E.....SRC
Lake, William F.....FLA
Lewis, Tracy H.....FLA
Lamson, Leon L.....CGC
Langin, James Joseph.....SLA; SBI
Langley, George Julius.....SLA; SAG
Lyster, Arthur Frederick.....SLA; CGC
Leeds, Ralph J.....KST
Labaree, Leonard Woods.....SLA; ABC
Lockhart, William Albert.....SLA; VBW
Lang, Lloyd Talbott.....SLA; SBI
Lynch, John Joseph.....SLA; CWT
Longinotti, James Louis.....SLA; PWM
Lyle, Donald.....CPA
Loeblein, John Merkel.....FLA
Leigh, Kenneth Glenmore.....SLA; PWM
Lucas, Donald Teale.....SLA; ELA
Little, James L.....CPA
Lyon, Charles Sidney.....CPA
Lagen, Marc A.....CPA
Lipscomb, McDonald E.....CGC
Lawson, John Theodore.....SLA; SAG
Lewis, William E.....MIA
Lee, George F.....Note 13
Lantz, Lyman Southard.....SLA
Levy, Charles Henry.....SLA
Lackey, Myron Elmo.....SLA
Lomax, Thornton G., Jr.....AGC
Lorenz, Harold A.....AGC
Lantz, Lyman S.....RSD
Lingle, David Glenn.....SLA; LHV
Lewis, Orman J.....TFT
Lundell, Floyd A.....TFT
Leopold, Joseph.....LHV
Lewis, Raymond C.....BST
Lawhon, Guy B.....TFT
Leeth, Herman B.....MIA

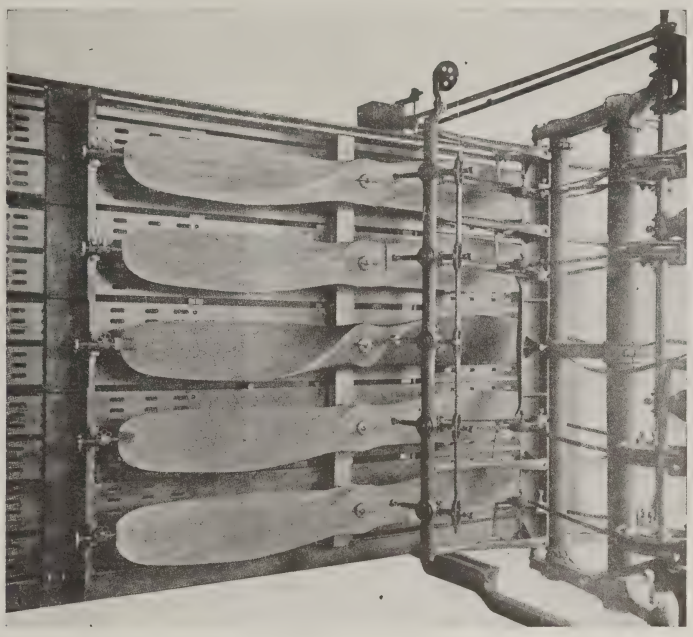
M

Miller, Henry J. F.....AGC
Martin, William, Jr.....SLA; SAG
Millard, Henry Ray.....SLA; ELA
Moffett, George Gilbert.....SLA; GLC
Mueller, Charles Paul.....SLA; KST
Morrow, W. H.....DAP
Miller, Harry A.....CPA
Meredith, James E.....CPA
Merriman, Frederic.....FLA
May, Woodward James.....SLA; PMT
Molleson, Gilbert Cox.....CPA
Marberry, Jason M.....TFT
Moise, Harold.....TFT
Mathews, Leo Ambrose.....SLA; PWM
Mears, Mortimer W.....EOT
Morley, Maynard W.....SLA; AAD
Morlan, Frederick H.....CPA
Morton, Charles I.....FLA
Muse, Donald Patrick.....CPA
Meyer, Henry Fred.....SLA; ELA
Moon, Harold F.....PWM
Murphy, Joseph A.....PWM
Middleton, Ray T.....CPA
Murray, Harry Eugene.....SLA; PWM
Munz, Hugh Earl.....SLA; CWT
Moore, Walter F.....CGC
Morse, Daniel P., Jr.....CPA
Moore, Samuel T.....CPA
Miller, Francis Hukill.....FLA
Matteson, Alfred Simmons.....SLA; PWM
Mitchell, John.....CPA
Marquette, John J.....BST
Marvin, William G.....FLA
Morrow, John, Jr.....SLA; PWM
Moses, Leonard.....SLA; PWM
Mallers, John Bernard.....SLA
Manau, Fred Anthony.....SLA
Marshall, Norman Harold.....SLA
Martin, Pardoe.....SLA
Mell, Robert Emerson.....SLA
Miller, Harold John.....SLA
Moore, Percy Samuel.....FLA
Mills, Charles F.....Note 9
Miller, Edward A.....Note 11
Murray, Albert Francis.....FLA; SMA
Madden, Edward Charles.....SLA
Maddox, Glen J.....SLA
Martin, Ernest D.....SLA
Miller, Tom Barry.....Note 4
Morris, Edward S.....EOT
Martin, Thomas Russell.....SLA; CWT
Morgan, Louie Robert.....SLA; PMT
Morrow, Thornton Court.....SLA; LDT
Metcalf, Frank.....CGC
Marmouget, James A.....CGC
Millard, Henry R.....CGC
Murphy, Maurice H.....CGC
Magruder, Abbey W.....AGC
Moon, Ruthyan K.....AGC
Monger, Walter Victor.....SLA
Miles, Paul K.....Note 15
Mullowney, John Julian.....SLA
Mansfield, Edward G.....CGC
Maas, George J.....CGC
Morrison, Lawrence P.....CGC
Miller, Charles W.....CGC
Miller, James C.....CGC
Marshall, Craig W.....CMV
Marmouget, James Albert.....SLA; ELA
Mucke, Henry C.....EOT
Mayfield, Mercer B.....Note 3
Montgomery, James N.....CAF
Mueller, Charles P.....BST
Mack, Donald L.....AGC
Mathewson, Samuel A.....SMM
Mills, Raymond Tower.....SLA; PWM
Muncie, Floyd Harold.....SLA; PWM
Mohr, James Harvey.....FLA
Martin, Reuel.....SLA; ELA
Mackall, John C.....PWM
Mennies, Michael.....IMA
Meehan, William S.....PWM
Monypeny, William Walter.....SLA; SAG
Mulliken, Harrall.....MJA

Mc

McClelland, Harold M.....AGC
McLaughlin, John Edward.....SLA; SAG
McDaniel, Yancey Clarke.....SLA; FOB
McCormick, Cyrus, Jr.....FLA
McLean, George Wheeler.....FLA
McIver, Stephens.....CPA
McMillin, Byron Dudley.....SLA; CWT
McGill, Robert B.....CPA
McRoberts, Horace Edward.....SLA; CWT
McClymonds, James Douthett.....SLA
McPherson, Andrew Frank.....SLA
MacIlwain, William Henry.....SLA
McKinnon, John Harrison.....SLA
McKay, George Hugh.....SLA; SBI
McLachlen, Lanier P.....CPA
McGill, Raymond Joseph.....SLA; PWM
McEvers, Ernest.....CWT
McCormack, Victor A.....BST
McLeod, Alexander.....CPA
McMcCawley, John H.....CPA
McNees, Joshua McKinley.....SLA; CWT
McCrady, Edward.....SLA; PWM
McFarland, Allan P.....CPA
McKinstry, Augustus Tremaine.....SLA; PWM
McElroy, Paul Elliott.....SLA; FLA
McWilliams, Gerald Shearn.....SLA; PWM
McKean, Henry Pratt.....CPA
McCue, John B.....MIA
McLeoad, Norman Zenos.....SLA; CFT
McKiernan, William.....SLA
McClintock, Ralph Alonzo.....SLA; KST
McCree, Robert Donald.....SLA; CWT
McAndrew, Alexander.....CPA
McCloy, Dixon E.....KST
McCarn, Clarence G.....Note 5
MacCammon, John M.....CMV
McCaughey, Harold Scott.....SLA; CFT
McDarment, Corley P.....CGC
McKee, Stuart.....CGC
McCarron, Henry A.....MIA
McNamara, Laurence J.....CGC
McGurl, Gilbert Vincent.....SLA; ABC
Merrell, George Robert, Jr.....SLA; PWM
McGraw, Leroy E.....ASM
McClure, Samuel M.....CGC

The Curtis Dreadnaught Propeller Cutting Machine, Model 55



THIS machine cuts four blades at a time, and cuts closer and more accurate than any other machine in the market.

It finishes the hub the same as all other parts of the blade.

It cuts with the grain of the wood.

It does not require a metal model; just a regular stock blade is sufficient.

It does not bump over the pattern.

It is manually operated, which gives it the advantage of the human touch required on accurate work.

The hand work required after this machine is from 3½ to 4½ hours on each blade.

It leaves just enough wood for cleaning up.

Curtis Machine Corp.
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McKinnon, Angus G. ..... EOT
McMullen, Clements ..... AGC
McMorrow, William Francis ..... FLA
McGowen, George J. ..... AGC
McCabe, John E. ..... CGC

N

Nunn, James D. ..... DIK
Neville, Ralph Milton ..... SLA; FOB
Nielsen, Andrew J. ..... TFT
Nolte, Julius M. ..... TFT
Norlin, Charles E. ..... FLA; IMA
Newman, Irving Thomas ..... SLA; RWT
Northrop, Marvin Almeric ..... SLA; SBI
Noyes, Stephen Henley ..... CPA
Nelson, Roy A. ..... EOT
Nilson, Harry B. ..... RSD
Nowland, Paul J. ..... FLA
Nutt, Clifford Cameron ..... FLA
Norton, William K. ..... CPA
Neal, Turner B. ..... CPA
Noyes, Daniel Raymond ..... CPA
Neal, Byron Wilkenson ..... SLA
Newbury, Joseph Benjamin ..... SLA
Newhouse, Sewell Omer ..... SLA; PWM
Newland, Philip J. ..... AAD
Netting, Charles Louis ..... SLA; SAG
Newton, Arthur Gove ..... MJA; Note 12
Nabours, James C., Jr. ..... KST
Nordholm, Leon Emery ..... SLA; SBI
Noland, Raymond Richard ..... SLA; PWM
Nelson, Martin A. ..... SLA; PWM
Neff, Harry G. ..... ECT
Nunn, Richard E. ..... PWM
Niblack, Polk H. ..... CGC

O

Orr, Arthur ..... CPA
Overly, Harry R. ..... LDT
Osgood, James Whitman ..... CPA
Olmstead, Rossiter David ..... SLA; PWM
Otto, Thomas Osgood ..... SLA; SAG
O'Connell, Jack Joseph ..... SLA; CFT
O'Connell, Frank L. ..... FLA
O'Melveny, Stuart ..... FLA
O'Brien, Bernard Joseph ..... SLA; PWM
O'Connor, Joseph Paul ..... SLA; ELA
O'Brien, Matthew H. ..... CGC
O'Neil, John Francis ..... ABC
Older, Fred R. ..... AGC
Oliver, Herbert Gladstone ..... SLA; AAD
Olsen, Luther H. ..... PWM
Ober, George B. ..... CGC
Osmund, Robert Hunter ..... SLA; PWM

P

Pearsall, Chester Burdick ..... SLA; SAG
Parmenter, LeClare F. ..... EOT
Pease, Jack J. ..... EOT
Pettis, Edward Valentine .. .. SLA; CWT
Pourron, Joseph F. ..... MJA
Phelps, Edward G. ..... TFT
Pritchett, Frank Edward ..... SLA; PWM
Porter, Joseph Logston ..... SLA; ABC
Potts, Joseph Johnston ..... SLA; CFT
Pillsbury, Edwin S. ..... CGC
Pollock, Robert E. ..... CGC
Parker, Earl Kenneth ..... SLA; ELA
Pell, Clarence C. ..... AGC
Perry, Irving ..... SLA; TMA
Parish, George Edward ..... SLA; ABC
Palmer, Clarence W. ..... CPA
Perry, Donald Irving ..... SLA; ELA
Phillips, Wendell ..... SLA; ELA
Pendleton, James D. ..... FLA
Price, Harlow Russell ..... FLA
Peterson, Elroy Gunnar Emanuel ..... SLA; ABC
Proctor, John Francis ..... FLA; IMA
Porter, Harry Bigelow ..... PWM
Pillsbury, Charles S. ..... CPA
Pogue, Harold Austin ..... SLA; ABC
Pierce, Dele F. ..... LDT
Post, Edwin M. ..... CPA
Prentice, James ..... CLA
Parmenter, Le Clare Fall ..... SLA; PWM
Prince, Earl Powell ..... SLA; PWM
Payson, John Brown ..... SLA; PWM
Phester, Henry J. ..... CPA
Pink, Louis P. ..... FLA
Pierrepont, Rutherford Stuyvesant ..... CPA
Price, Arthur Lowell ..... SLA; FLA

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He can always use a pair of these non-shatterable goggles recommended by U. S. Army and standardized by U. S. Navy. Write for Booklet of aviators' experiences. **Go to the Store where EYETECTS are sold,** or—send $ 2 and his address for the goggle he wants. We guarantee delivery and satisfaction. Money back if you want it. Order now for timely Christmas delivery.

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Pearce, Ronal H. ..... FLA
Paris, Samuel H. ..... FLA
Paine, George Eustis ..... FLA
Perry, William G. ..... CPA
Payne, Byran W. ..... CGC
Peace, Harley M. ..... CFT
Pulver, Seth Q. ..... FLA; IMA
Prentiss, Paul H. ..... MIA
Fitkin, Joseph Lovell ..... FLA; IMA
Patterson, John F. ..... IMA
Parsons, Clyde H. ..... CGC
Pettingell, Raymond R. ..... CGC
Platt, Harold L. ..... CGC
Pollard, Alfred L. ..... CGC
Poore, Owen P. ... . CGC
Pingree, John, Jr. ..... Note 4
Peterson, James Andrew, Jr. ..... SLA; CWT
Pardee, James Lee ..... Note 8
Patterson, James McKnight ..... SLA; ELA
Pfirrman, Ernest James ..... SLA; IMA
Paschall, Winfred Eugene ..... SLA; SRC
Parker, Kenneth H. ..... EOT
Pfau, George Harold ..... FLA
Panton, Howard R. ..... SMM
Pugh, Roy L. ..... SMM
Phelps, Samuel B. ..... CAF

Q

Queal, William Nelson ..... FLA; HHN
Quirt, Harold W. ..... CGC

R

Ryan, James Francis ..... SLA
Ryan, William F. ..... IMA
Robertson, Hugh ..... SLA
Roberts, Arthur M. ..... FLA
Rowley, William Perry ..... SLA
Reeves, Charles H., Jr. ..... CGC
Reagan, Oliver Edward ..... FLA
Ramey, George E. ..... FLA
Rhoads, Robert Blee ..... FLA
Ronan, Arthur Thomas ..... SLA; DAP
Rowell, Fenton Charles ..... SLA; CWT
Rider, William Norris ..... SLA; CFT
Reid, Ted ..... SLA; PWM
Raid, Theodore Shyghighon Knoles ..... SLA; PWM
Ramsey, Joseph Walter ..... CPA
Rozenc, Arthur Emanuel ..... SLA; SBI
Raber, Edward McGrew ..... SLA; CFT
Rodger, Raymond John ..... SLA; CFT
Rider, Nelson Willard ..... SLA; TMA
Ritterbusch, Walter Henry ..... SLA; ELA
Ruh, Donald O. ..... SMM
Russell, Selwyn Emerson ..... SLA; PWM
Rice, Nelson Phelps ..... SLA; PWM
Rickenbacker, Edward V. ..... CPA
Reynolds, Clearton H. ..... CPA

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(*Continued from page 437*)

Rochford, James Lawrence....FLA
Rogers, Emery Herman....FLA
Rollins, Joseph R....CUI; LHV; Note 1
Riley, Joseph Edward....SLA; KST
Roger, Raymond L....CGC
Reece, Henry Emerson....CPA
Rotan, George Vallandigham....CPA
Roberts, Carroll H....CGC
Rank, Levin....IMA
Reierson, Gustav....SRC
Reid, William Herbert Eddy....SLA; TMA
Roddie, James Alexander Bostic....SLA; CFT
Ramey, John Robert....SLA; PWM
Rambo, Ross Curtis....ABC
Roller, Duane E....SMM
Ringer, Albert R....AGC

S

Smith, Maurice R....CPA
Shappell, Maple Delos....CPA
Smith, Arthur H....CGC
Sheldon, Frederick Henry, Jr....SLA
Simons, LeRoy Simeon....MIA
Somers, Paul E....BST
Simons, Henry H....CPA
Stevenson, Joseph H....CPA
Scott, Grant Elbert....FLA
Slattery, Frank Earl....FLA
Seeley, deBenneville Keim....CPA
Sanborne, Paul Fitch....FLA
Sampter, E. Lawrence....FLA
Shaffer, William L....FLA
Simerman, George Andrew....FLA
Simpson, William Dudley....FLA
Slattery, John William....FLA
Scarritt, Daniel de Rocheblave....SLA; PWM
Spencer, Raymond Cleveland....SLA; PWM
South, John Claybourne....SLA; PWM
Stone, Harry Donald....SLA; PWM
Saunders, Walter LeRoy....CPA
Sutton, Harry Allen....CPA
Spain, William W....CPA
Smith, Granville M., Jr....CPA
Soule, Arthur Logan....PWM
Shaffer, William L....CGC
Simpers, Robert Sherman....MJA
Stetson, John B., Jr....CPA
Scouton, Harry Edwin....SLA; PWM
Sweet, Milo Jasper....FLA; VBW
Strum, Elmer Augustine....SLA; KST
Stubblefield, Blaine....SLA; KST
Sanderson, James Windle....SLA; SAG
Stoops, Earle Elmer....SLA; KST
Shepard, Lynn Crawford....SLA; ELA
Shepherd, John E....KST
Sona, Peter....KST
Smith, Charles R....KST
Smith, Lowell H....AGC
Sackett, Charles R....EOT
Stimson, George W....FLA
Seeligson, Lamar G....BST
Sanderson, James W....BST
Shaper, Henry F....BST
Swedberg, Ernest William....PWM
Seaver, James Daniel....PWM
Simpson, William T....LHV
Skinner, Richard D....CPA
Savage, Charles M....CPA
Snyder, John H....FLA
Spencer, Edward James....SLA; SBI
Stephens, Albert Edward....SLA; RWT
Saunders, Edward Roberts....SLA; PWM
Sleeper, Gordon C....FLA
Shimmon, Joseph M....FOB
Studler, Rene R....BST
Spiegel, Edward R....CPA
Schoen, Ernest R....CPA
Shepley, Henry Richardson....CPA
Sutton, Harold P....CGC
Snyder, Gerald S....AGC
Switzer, Byron R....AGC
Stewart, James Leonard....SLA; SAG
Spalding, Charles Thomas....SLA; SAG
Sanders, Ralph Lloyd....SLA; PMT
Sanderford, Horner F....SMM
Sivley, Andrew H....SMM
Simms, John A....PWM
Shephard, Herbert R....AGC
Stoddard, David I....SLA; VBW
Seaman, Lewis F....MIA
Stockard, Lester N....SLA
Stephens, Albert E....AGC
Seward, Leon E....CGC
Shoffstall, Frank S., Jr....CGC
Silver, Bertram E....CGC
Singletary, Harry H....CGC
Smith, Edwin C....CGC
Stuetz, Albert R....CGC
Smith, Robert C....AGC
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Smith, Felix Tesseire....CPA
Soreng, Edgar M....WFO
Strachan, Otto W....GLC
Spencer, Elmer E....KST
Smith, Frank B....EOT
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Shelby, Francis Haywood....SLA; CFT
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Stokes, William Hughes....SLA; PWM

T

Trimble, Perry D....LHV
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Trippe, Graham....SLA
Troy, William Wylie....SLA
Tyrrel, Charles P....CGC
Taylor, Raymond Edward....SLA; CRI
Towner, Archibald R....CGC
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Tindall, Howard Wilson....SLA; ELA
Taylor, Bennett Ross....SLA; ELA
Talbot, Harry Milton....SLA; ELA
Thompson, David E....CGC
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Towner, Walter L....TFT
Trask, Verne Alva....SLA; PWM
Townsend, Frederic W., Jr....CPA
Thach, Robert G....CPA
Thomas, George J....CGC
Talbot, Harry M....CGC
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Taylor, Loren E....AGC
Thomas, Harry Lee....SLA; PWM
Tomkin, Thomas C....CGC
Taney, Theodore....SLA; KST
Towe, William Thompson....SLA; CWT
Taylor, John A....AGC
Thompson, John F....AGC
Thornton, Clarke Wayne....SLA; ABC
Towle, Howard H....MIA
Thursby, Sydney, Jr....SLA; KST
Taylor, Elmer L....TFT
Taylor, George F....CGC

U

Utley, Fred Herbert....SLA; CWT
Umstead, Stanley Nilward....SLA; CWT
Underhill-Thompson, Ernest Alfred....SLA; PWM

V

Van Emden, Harry Benjamin....SLA; SBI
Van Wicklen, John Henry....FLA
Von Sprecken, Theo. Markwaller....SLA; PWM
Van Aelst, Adrian Cornelius....SLA; SBI
Van Eaton, Harry H....FLA
Vogel, Harry James....CPA
Vollmar, Paul J....SLA; FOB
Van Surdam, Henderson E....AMV
Vinson, Clyde....CGC

W

Wentz, Robert Carroll....SLA; PWM
Wuertenbacher, Harry Edward, Jr....SLA; SBI
Wright, Elisha Pierson Swift, Jr....SLA; PWM
Wessel, Harold Louis....SLA; SBI

(*Continued on page 445*)



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Wentz, Robert C. ..... EOT
Warren, Harold Clyde ..... SLA; CRI
Walsh, Charles Vincent ..... SLA; CRI
Wotton, Thomas Andrew ..... CPA
Waddel, Chauncey L. ..... RSD
Wiepert, George Douglas ..... SLA; PMT
Willmering, Joseph F. ..... SLA; TFT
Waldo, Herbert Strong ..... SLA
Welsh, William Joseph ..... SLA
White, Leon Hosea ..... SLA
Work, James Ralph ..... SLA
Wentworth, Ralph Preston ..... SLA
Williams, George Wesley ..... SLA; ELA
Wakefield, Robert Brown ..... SLA; SAG
Wellman, Harrison W., Jr. ..... PWM
Williams, John M. ..... FLA
Wells, George B., Jr. ..... FLA
Winslow, Burr Horton ..... SLA; CWT
Wiggs, George Absalom ..... SLA; CWT
Wheeler, Chilion Farrar ..... CPA
Wright, Wilbur F. ..... CPA
Walters, Harvey Henry ..... FLA
Weatherly, Carroll D. ..... CPA
Woodward, Ernest William ..... SLA; KST
Walker, James Knox ..... SLA; CWT
Walker, James Kenyon ..... SLA; CWT
Watkins, Brackett O. ..... CPA
Wilson, Harold D. ..... LHV
Wehrle, Howard F. ..... CGC
Wakefield, Robert B. ..... BST
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Wellman, Arthur Ogden ..... SLA; PWM
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Welch, Arvin Jesse ..... SLA; ABC
Williams, Warren Lee ..... SLA; ELA
Wright, Ray Elbert ..... SLA; ABC
Wallace, William, Jr. ..... SLA; PWM
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Wood, Harold F. ..... CPA
White, Edward Hurley, Jr. ..... CPA
Williams, Fred F. ..... CGC
Winant, John Gilbert ..... CPA
Witherup, M. Lester ..... CPA
Wallace, William H. ..... CPA
Wilkes, Henry G. ..... FLA
Walker, Theodore P. ..... CPA
Wilkinson, John A. ..... CGC
Woodward, Henry G. ..... CGC
Wriston, Roscoe C. ..... CGC
Wuenker, Ralph F. ..... CGC
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Wilcox, Leon B. ..... Note 5
Walter, Frank Herbert ..... SLA; ABC
White, George R. ..... CGC
Wolongiewicz, Frank Ignatius ..... SLA; PMT
West, Benjamin Franklin ..... Note 4
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Waterman, Sherwood L. ..... CGC
Webster, Robert C. ..... MIA
Weiss, John Joseph Richard ..... SLA; CWT
Work, James R. ..... PWM
Werneth, Louis Sylvester ..... SLA; KST
Weir, Charles Raymond ..... SLA; ELA
Woods, Howard L. ..... CGC
Whitsitt, Vincent Porter ..... CPA
Wieners, Frederic Bernard ..... CPA
Whitney, Reginald W. ..... CGC

Y

York, Elisha Lee ..... SLA
Yapple, Lee Gerald ..... SLA; PWM
Young, Naasson S. ..... KST

Z

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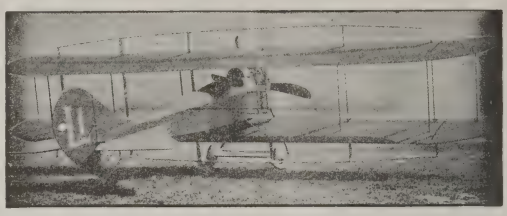
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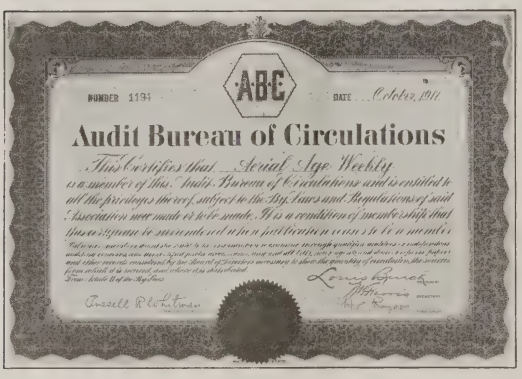
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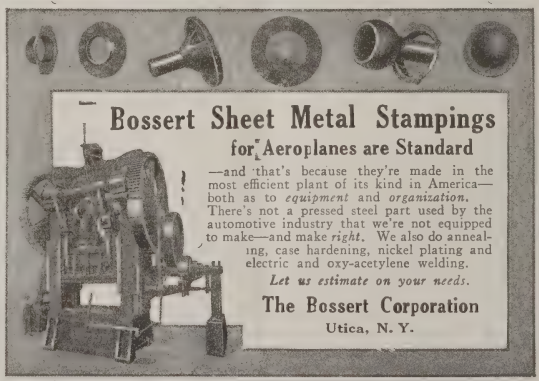
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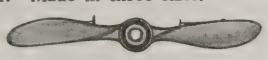
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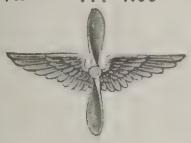
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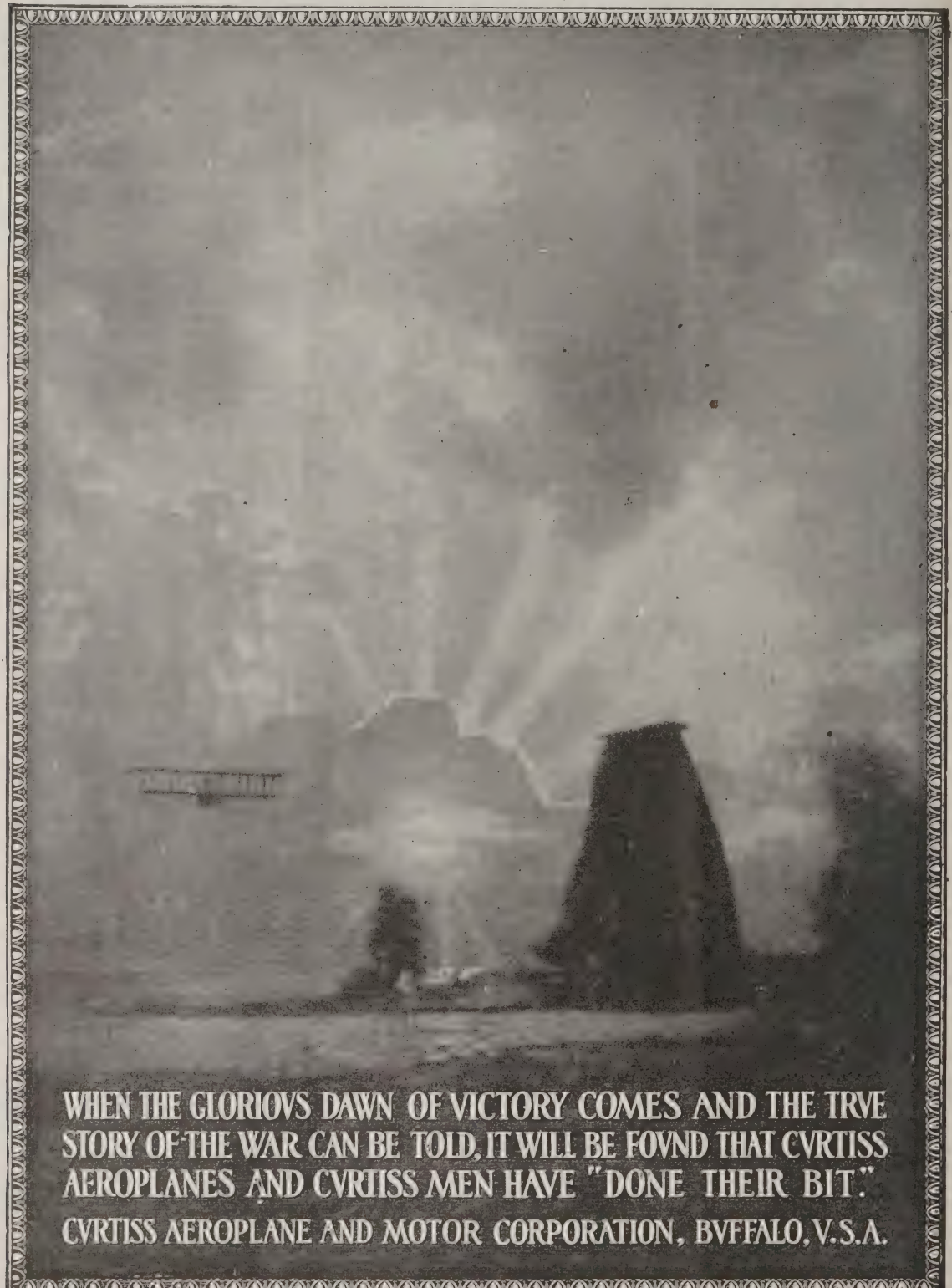
VOL. VIII NOVEMBER 11, 1918 No. 9

TABLE OF CONTENTS

	PAGE
Austria-Hungary and Germany Surrender	461
Hughes and Gregory Reports on Aircraft Investigation	462
News of the Week	472
The Aircraft Trade Review	474
Military Aerostatics	475
U. S. Aerial Mail	478
Naval and Military Aeronautics	479
Foreign News	482
Elementary Aeronautics and Model Notes	483
Aeronitis	484

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC
Foster Bldg., Madison Ave. and Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
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WASHINGTON OFFICE: 619 *Union Trust Bldg.*

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Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

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Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, NOVEMBER 11, 1918 NO. 9

AUSTRIA-HUNGARY AND GERMANY SURRENDER

AS we go to press announcement is made that Germany has accepted terms paralleling those accepted by Austria-Hungary.

The armistice terms as announced by the U. S. State Department on November 4th, with parenthetical explanations of minor errors in cable transmission, are as follows:

MILITARY CLAUSES

One—The immediate cessation of hostilities by land, by sea and air.

Two—Total demobilization of the Austro-Hungarian army and immediate withdrawal of all Austro-Hungarian forces operating on the front from the North Sea to Switzerland.

Within Austro-Hungarian territory, limited as in clause three below, there shall only be maintained as an organized military force a (?) reduced to pre-war effectives. (Effectiveness ?).

Half the divisional, corps and army artillery and equipment shall be collected at points to be indicated by the Allies and the United States of America for delivery to them, beginning with all such material as exists in the territories to be evacuated by the Austro-Hungarian forces.

Three—Evacuation of all territories invaded by Austria-Hungary since the beginning of the war. Withdrawal within such periods as shall be determined by the commander-in-chief of the allied forces on each front of the Austro-Hungarian armies behind a line fixed as follows: From Picumbrail to the north of the Stelvio it will follow the crest of the Rhetian Alps up to the sources of the Adige and the Eisach, passing thence by Mounts Reschen and Brenner and the heights of Oetz and Zoaller. The line thence turns south, crossing Mount Toblach and meeting the present frontier Carnic Alps. It follows this frontier up to, Mount Tarvis, and after Mount Tarvis the watershed of the Julian Alps by the Col of Predil, Mount Mangart, the Tricorno (Terglou), and the watershed of the Cols di Podberdo, Podlaoiscam and Idria.

From this point the line turns southeast toward the Schneeberg and excludes the whole basin of the Save and its tributaries. From Schneeberg it goes down toward the coast in such a way as to include Castua, Mattuglia and Volosca in the evacuated territories.

It will also follow the administrative limits of the present Province of Dalmatia, including the north Lisarica and Trivania, and to the south territory limited by a line from the (semi grand) of Cape Planca to the summits of the Watersheds eastward, so as to include in the evacuated area all the valleys and water course flowing toward Sebenico, such as the Cicola, Kerka, Butisnica and their tributaries. It will also include all the islands in the north and west of Dalmatia from Premuda, Selve, Ulbo, Scherda, Maon, Paga and Puntadura in the north up to Meleda in the south, embracing Santandrea, Busi, Lisa, Lesina, Tercola, Curzola, Cazza and Lagosta, as well as the neighboring rocks and islets and passages, only excepting the islands of Great and Small Zirona, Bua Solta and Brazza. All territory thus evacuated (shall be occupied by the forces ?) of the Allies and the United States of America.

All military and railway equipment of all kinds, including coal belonging to or within those territories (to be ?) left in situ and surrendered to the Allies, according to special orders given by the commander-in-chief of the forces of the associated Powers on the different fronts. No new destruction, pillage or requisition to be done by enemy troops in the territories to be evacuated by them and occupied by the forces of the associated Powers.

Four—The Allies shall have the right of free movement over all road and rail and waterways in Austro-Hungarian territory and of the use of the necessary Austrian and Hungarian means of transportation. The armies of the associated Powers shall occupy such strategic points in Austria-Hungary at times as they may deem necessary to enable them to conduct military operations or to maintain order. They shall have the right of requisition on payment for the troops of the associated Powers (wherever ?) they may be.

Five—Complete evacuation of all German troops within fifteen days, not only from the Italian and Balkan fronts but from all Austro-Hungarian territory.

Internment of all German troops which have not left Austria-Hungary within the date.

Six—The administration of the evacuated territories of Austria-Hungary will be entrusted to the local authorities under the control of the allied and associated armies of occupation.

Seven—The immediate repatriation without reciprocity of all allied prisoners of war and interned subjects of civil populations evacuated from their homes on conditions to be laid down by the commander-in-chief of the forces of the associated Powers on the various fronts. Sick and wounded who cannot be removed from evacuated territory will be cared for by the Austro-Hungarian personnel who will be left on the spot with the medical material required.

NAVAL CONDITIONS

One—Immediate cessation of all hostilities at sea and definite information to be given as to the location and movements of all Austro-Hungarian ships.

Notification to be made to neutrals that freedom of navigation in all territorial waters is given to the naval and mercantile marine of the allied and associated Powers, all questions of neutrality being waived.

Two—Surrender to the Allies and the United States of fifteen Austro-Hungarian submarines completed between the years 1910 and 1918, and of all German submarines which are in or may hereafter enter Austro-Hungarian territorial waters. All other Austro-Hungarian submarines to be paid off and completely disarmed and to remain under the supervision of the Allies and the United States.

Three—Surrender to the Allies and the United States with their complete armament and equipment of three battleships, three light cruisers, nine destroyers, twelve torpedo boats, one mine layer, six Danube monitors, to be designated by the Allies and the United States of America. All other surface war ships, including river craft, are to be concentrated in Austro-Hungarian naval bases to be designated by the Allies and the United States of America and are to be paid off and completely disarmed and placed under the supervision of the Allies and the United States of America.

Four—Freedom of navigation to all war ships and merchant ships of allied and associated Powers to be given in the Adriatic and up the River Danube and its tributaries in the territorial waters and territory of Austria-Hungary.

The Allies and associated Powers shall have the right to sweep up all mine fields and obstructions, and the positions of these are to be indicated.

In order to insure the freedom of navigation on the Danube the Allies and the United States of America shall be empowered to occupy or to dismantle all fortifications or defence works.

Five—The existing blockade conditions, set up by the allied and associated Powers are to remain unchanged, and all Austro-Hungarian merchant ships found at sea are to remain liable to capture, save exceptions which may be made by a commission nominated by the Allies and the United States of America.

Six—All naval aircraft are to be concentrated and impactionized in Austro-Hungarian bases to be designated by the Allies and United States of America.

Seven—Evacuation of all the Italian coasts and of all ports occupied by Austria Hungary outside their national territory and the abandonment of all floating craft, naval materials, equipment and materials for inland navigation of all kinds.

Eight—Occupation by the Allies and the United States of America of the land and sea fortifications and the islands which form the defences and of the dockyards and arsenal at Pola.

Nine—All merchant vessels held by Austria-Hungary belonging to the Allies and associated Powers to be returned.

Ten—No destruction of ships or of materials to be permitted before evacuation, surrender or restoration.

Eleven—All naval and mercantile marine prisoners of the allied and associated Powers in Austro-Hungarian hands to be returned without reciprocity.

Hope is being expressed that similar terms can be forced on Germany in the near future. In the meantime the Allies will continue the war on Germany with renewed vigor and we in the United States must not relax an instant our efforts to prepare for victory.

As Premier Clemenceau points out, *"victory is certain, but peace may not be so near as some think."*

Great credit is due to those pioneer American Army aviators led by Major Fiorella La Guardia and naval aviators led by Commander J. Lansing Callan, who gave such material assistance and moral support to the Italians.

HUGHES AND GREGORY REPORTS ON AIRCRAFT INVESTIGATION

THE Hughes and Gregory reports of the aircraft investigation were made public on November 1st. The first covers 182 pages, the second covers twelve pages. They are the summary of five months of investigation during which nearly 300 witnesses were examined and 17,000 pages of testimony was taken.

Policy and Operations Not Investigated

The scope of the investigation was limited to investigating and pursuing charges of dishonesty and malversion in regard to the production of aircraft essentially to ascertain whether any section of the Criminal Code had been violated.

To better understand just what was investigated it is well to mention that the aeronautic branch of the Army has three main divisions, dealing with:

(a) *Policy:* Deciding on the size of the aircraft program.

(b) *Production:* Producing the aircraft required to carry out the program.

(c) *Operations:* Using the aircraft for training or for action, training of personnel, etc.

The investigation only touched on Productions.

The Hughes Report

Herewith is reproduced one section of the Hughes Report. The other sections will follow in future numbers:

WASHINGTON, D. C., October 25, 1918.

THE ATTORNEY GENERAL:

I have the honor to submit the following report of the Aircraft Inquiry:

The investigation has been concerned with Aircraft Production. Other activities relating to aviation, but not to production, have been touched only incidentally. Thus, upwards of thirty training or flying fields with numerous structures have been provided, and to meet other aviation needs a great variety of construction has been required, here and abroad. These enterprises, being aside from Aircraft Production itself, have not been the subject of this inquiry, save as transactions relating to Wilbur Wright Field and McCook Field have invited scrutiny by reason of the aircraft enterprises centered at Dayton, Ohio, and the activities of Edward A. Deeds and his former business associates.

Another governmental activity which does relate to Aircraft Production, but is conducted separately from the orders for Aeroplanes and Engines, is known as the Sales Department. The Government itself purchases large quantities of lumber, fabric, chemicals, etc., which it resells. When these commodities are supplied by the Government to contractors, the Sales Department is credited and the items are transferred to the other appropriate accounts. The largest item of this sort is for Spruce. The account of the Sales Department for the fiscal year ending June 30, 1918, shows that spruce orders amounted to $76,211,360.35 on which there had been deliveries and payments aggregating $6,357,853.83 leaving unfilled orders of $69,853,506.52; and of the spruce delivered the Government had resold to the extent of $3,679,155.95. It appears that the Government had also (to June 30, 1918) invested in its cut-up plant at Vancouver, Washington, the sum of $1,487,237.81. While to some extent testimony has been taken bearing on the spruce contracts, it became evident as the inquiry proceeded that it would be impossible to reach any satisfactory conclusion with respect to the transactions of the Spruce Production Division without a special inquiry on the Pacific Coast, which in view of the extent and character of the activities involved would probably take several months. It has not been practicable to undertake this as yet, in view of the magnitude of the work involved in other branches of the investigation, and accordingly it has been left to be undertaken hereafter by the Department of Justice as it may be advised. For this reason, a report on the operations of the Spruce Production Division or of the Sales Department will not now be attempted. Also, in view of the importance of the present inquiry in its special relation to aeroplanes and aeroplane engines, transactions of the Balloon Division have not been examined.

Aside from these limitation, the inquiry has taken a wide range. It has been prosecuted without pause since it was begun in the latter part of May last. About 280 witnesses have been examined and over 17,000 pages of testimony have been taken. The more important plants have been visited, and a large part of the testimony has been taken at these plants where books, records, employees and Government representatives have been available. To compass all the activities involved in Aircraft Production, reaching into a great variety of contracts and operations involving numerous plants and the expenditure of many millions of dollars, would require the constant efforts of a force of investigators for a year or more longer and also the services of an army of accountants charged with the responsibility of checking and auditing the work of the hundreds of Government representatives now supervising the contractors' accounts. It is impossible, of course, to say what irregularities or offenses such a protracted inquiry would bring to light, but the investigation has been sufficiently comprehensive to give, it is believed, a survey of the field as a whole and to disclose the facts bearing upon the serious charges which have been made.

In addition, and as a result of information received through this inquiry, there have been special proceedings before Grand Juries. This, on information of violations of the Sabotage Act at the Hammandsport (New York) plant of the Curtiss Aeroplane and Motor Corporation, the matter was examined by the Grand Jury and indictments were returned in the Western District of New York and there have also been indictments in the same District for violations of this Act at the North Elmwood plant, Buffalo, of the same corporation. There also has been a special investigation by the Grand Jury at Sacramento, with respect to conditions at the Liberty Iron Works.

It is manifestly impracticable to state the details of even the more important evidence, but the salient and controlling facts which have been elicited will be set forth, so far as this is deemed to be compatible with military exigency.

FIRST—APPROPRIATIONS AND EXPENDITURES

At the time of the declaration of a state of war with Germany, April 6, 1917, the appropriations available for aircraft production were those applicable to the fiscal year ending June 30, 1917. By the Act of August 29, 1916, the sum of $14,281,766 was appropriated for the expenses of the Signal Service, with the proviso that not more than $13,281,666 should be used for the purchase, manufacture, maintenance and operation of aircraft and of described vehicles necessary for the Aviation Section. It was further provided that not to exceed $50,000 should be used for the payment of all expenses in connection with the development of a suitable type of aviation motor and not more than $500 should be used for the cost of special technical instruction of officers of the Aviation Section. Of the total appropriation above mentioned the sum of $4,500,000 was later (Act of May 12, 1917) made available for the establishment of aviation schools and experimental stations, and it was under this appropriation that Langley Field, Virginia, was acquired and developed.

The Act of February 14, 1917, appropriated $3,600,000 for aircraft, buildings for equipment, and other accessories necessary in the Aviation Section, for use in connection with sea coast defenses.

The Act of May 12, 1917, appropriated for the expenses of the Signal Service, for the fiscal year ending June 30, 1918, the sum of $11,800,000, with the proviso that not more than $10,800,000 should be used for aircraft production, including experimentation, and for the buildings for equipment and personnel, and necessary accessories. The sum of $43,450,000 was appropriated by the deficiency appropriation Act of June 15, 1917, of which $31,846,067.16 became available, under the terms of the Act, for the fiscal year 1917-18.

Provision for an adequate aircraft program for the Army was not made until the passage of the Act of July 24, 1917, appropriating for aeronautical purposes the sum of $640,000,000.

STATEMENT FOR FISCAL YEAR JUNE 30, 1917 TO JUNE 30, 1918

The aggregate of all aeronautical appropriations which were available for the Army for the fiscal year ending June 30, 1918, were as follows:

Act of July 24, 1917	$640,000,000.00
Other aeronautical appropriations	51,851,866.47
Total	$691,851,866.47

The estimated obligations charged against these appropriations during the fiscal year amounted to $933,948,959.03. To the extent of $176,924,903.42, this excess represented obligations of the Sales Department already described, for which it was contemplated there would be reimbursement by resales. (Of this last-mentioned amount there were reported as disbursed in the Sales Department (to June 30, 1918) that is, for deliveries of materials, $25,966,739.95* the resales amounting to

*Corrections on further accounting raised this amount to $26,557,706.87.

$19,008,150.26, and the balance representing assets on hand.) Exclusive of the obligations of the Sales Department, the estimated aeronautical obligations of the Government for the fiscal year 1917-1918 amounted to $757,024,055.61. These obligations were calculated on estimated costs, and the excess over the total aeronautical appropriations (that is, over $691,851,866.47) will largely be offset by savings on the estimated costs and by cancellations of orders.

Obligations Other Than for Aeroplanes and Engines

The estimated obligations for the Aviation Equipment Division covered not only Aeroplanes and Engines, but a variety of equipment and other essentials. Thus, the testimated obligations, charged against the $640,000,000 appropriation, for Transportation including motor trucks, chassis, motor-cycles, bicycles, etc., amounted to $42,938,630.73; for General Equipment including various sorts of apparatus and supplies, $34,979,741.53; for Maintenance, including maintenance of supply depots, planting of castor beans, etc., $17,948,955.60; for Special Clothing for aviators, mechanics, etc., $2,520,512.63; for Machine Guns, Ammunition and Bombs, $29,249,033.29; for Acquisition of Plants, $2,595,599.82; and for Miscellaneous Equipment, including various incidental expenses of officers, stations and schools, $7,748,617.75.

There were also charged against the $640,000,000 appropriation the estimated obligations of the Construction Division, embracing training fields and construction here and abroad, amounting to $62,232,664.55; of the Balloon Division (covering balloons and accessories) $16,910,891.20; of the Schools Division, $1,016,223.48; and of the Finance Division (including the pay of Reserve Corps and of civilian employees, and the reserve for foreign expenditures) $35,963,417.55. The various estimated obligations for similar purposes, other than for Aeroplanes and Engines, which were charged against the other aeronautical appropriations for the fiscal year 1917-1918, aggregated $28,009,060.92.

Thus, out of the total estimated obligations ($757,024,055.61) for all aeronautical purposes (exclusive of the Sales Department) the estimated obligations for purposes other than Aeroplanes and Engines aggregated $282,113,349.06.

Obligations for Aeroplanes and Engines

The amount of the estimated obligations for Aeroplanes and Engines, and spare parts of both, (including experimental and development work) charged, to June 30, 1918, against the aeronautical appropriations for the fiscal year 1917-1918 was as follows:

Charged to the $640,000,000 appropriation.....	$457,379,122.15
Charged to other appropriations.....	17,531,584.40
Total.....	$474,910,706.55

Actual Disbursements for All Aeronautical Purposes

It should be noted that the amounts above stated represent estimated obligations, not actual disbursements. Although obligations were incurred, payments were to be made only as payments were earned by performance of contracts. Payments prior to June 30, 1918, were made on vouchers for amounts represented as earned, but such payments were only a part of the estimated obligations, by reason of delays in production. Further payments should be made only as production goes forward and contracts are duly performed.

Thus, as against the total estimated obligations for aeronautical purposes, aggregating $933,948,959.03 (including the Sales Department) the disbursements reported down to June 30, 1918, amounted to the sum of $430,224,316.99. Out of the $640,000,000 appropriation, the total disbursements for the fiscal year for all aeronautical purposes (that is, embracing those apart from aeroplanes and engines, as well as for the latter) amounted to $363,818,014.87;* and, according to the accounts of the Bureau of Aircraft Production, there remained of this appropriation in the Treasury of the United States on June 30, 1918, the sum of $276,181,985.13. According to the books of the Treasury Department, the unexpended balance of the $640,000,000 appropriation amounted on June 29, 1917, to $304,478,211.70. The difference of $28,296,226.57 is explained by the existence of unwithdrawn balances which had been alloted to the Quartermaster Corps and the Ordnance Department and by various credits pertaining to the month of June which were not received in the Bureau of Aircraft Production until July.

Actual Disbursements for Aeroplanes and Engines

The actual payments for the fiscal year 1917-1918 against the estimated obligations for Aeroplanes and Engines, and spare parts of both (including payments for experimental and development work), are reported by the Finance Division of the Bureau of Aircraft Production as amounting to $155,535,946.41 as follows:

Disbursed from the $640,000,000 appropriation..	$142,908,398.95
Disbursed from other appropriations.....	12,627,547.46
Total	$155,535,946.41

These disbursements included not only payments to contractors for articles delivered or on account of work and materials, but also advances in the nature of loans to contractors, upon security, made by the War Credits Board, and, in addition, the payments which had been made for the manufacture of planes and engines overseas.

The payments for manufacture overseas amounted to $25,605,074.31 as follows:

Cash remittances to overseas disbursing officers for payment on overseas contracts for Aeroplanes and Engines.....	$16,600,000.00
Paid on purchase of materials, supplies, etc., purchased by United States for shipment abroad to be used in overseas manufacture of Aeroplanes and Engines.....	9,005,074.31†
	$25,605,074.31

The unpaid balances of advances to contractors (whose contracts are embraced in the obligations for Aeroplanes and Engines above described), these advances being repayable to the Government, amounted on June 30, 1918 (exclusive of interest) to $21,491,551.14. The principal contractors who have received these advances are specified below:

Contractor	Advances Authorized	Advances Made	Balance Unpaid June 30, 1918 (without interest)
Curtiss Aeroplane and Motor Corporation	$8,000,000	$8,000,000	$5,561,645.94
Dayton Wright Aeroplane Co...	2,500,000	2,000,000	1,405,222.57
Duesenberg Motors Corporation.	1,650,000	1,650,000	1,632,447.97
Fisher Body Corporation.....	2,000,000	2,000,000	1,944,933.33
Lincoln Motor Co.....	6,500,000	6,500,000	6,255,392.00
Nordyke & Marmon Co.....	2,000,000	2,000,000	2,000,000.00
Packard Motor Car Co.....	5,000,000	5,000,000	1,731,232.00
Trego Motors Corporation.....	315,000	285,000	281,695.70
Willys-Overland Co.....	2,500,000	2,500,000	451,861.25
Various other contractors.....			227,120.38
			$21,491,551.14

The amounts paid, to June 30, 1918, on account of experimental and development work on aeroplanes and engines amounted to $1,697,830.19, of which the principal items are these:

Expeditures of Experimetal Station at McCook Field.....	$974,300.20
Director, Bureau of Standards.....	64,077.33
Department of Agriculture.....	34,540.82
Packard Motor Car Co.....	249,159.10
*Dayton Wright Aeroplane Co.....	48,120.39
Dayton Metal Products Co.....	66,097.14
Miscellaneous payments	261,535.21
	$1,697,830.19

Deducting these advances, and the payments of experimental and development work, th edisbursements to the end of the fiscal year, June 30, 1918, for Aeroplanes and Engines, and their parts, manufactured or in process of manufacture in the United States amounted to $106,741,490.77, as follows:

Total disbursed for Aeroplanes and Engines.....		$155,535,946.41
Less—		
For overseas manufacture.....	$25,605,074.31	
For advances to contractors.....	21,491,551.14	
For experimental and development work.	1,697,830.19	48,794,455.64
Disbursed on account of production in United States..		$106,741,490.77

Aeroplanes and Engines Delivered During Fiscal Year Ending June 30, 1918

The reported deliveries of Aeroplanes and Engines made prior to June 30, 1918, are as follows:

Aeroplanes

Elementary Training Planes		
JN4-D	2972	
SJ-1	1600	4572
Advanced Training Planes		
JN-4H		
Training	402	
Gunnery	321	
JN6-HB	100	
S4-B	100	
S4-C	73	
Penguin	50	1046
Combat and Bombing Planes		
DeH-4	529	
Bristol Fighter	24	553
Total planes		6171

Engines

Elementary Training		
OX-5	5474	
A7a	2188	7662
Advanced Training		
Hispano 150 H. P.	2188	
Gnome 100 "	209	
Le Rhone 80 "	68	
Lawrence 28 "	114	2579
Combat and Bombing		
U. S. 12 Cylinder (Army Type).....	1615	
U. S. " " (Navy Type).....	775	
Hispano 300 H. P.....	2	2392
Total engines		12633

For some of the units thus delivered, payments had not yet been made at the close of the fiscal year. The payments to June 30, 1918, covered about 5530 of the Aeroplanes delivered and about 9750 of the Engines delivered. In addition, there had been deliveries of various planes and engine parts, and the greater part of these were also covered by the payments above mentioned. And there were also large payments to contractors under cost-plus contracts for labor, materials and overhead charges in connection with work in process.

Allocation of Payments to June 30, 1918

The payments for the production of Aeroplanes and Engines, and parts, were made under two classes of contracts, (1) fixed-price and (2) cost-plus contracts:

Payments under fixed-price contracts.....	$57,193,621.06
Payments under cost-plus contracts.....	49,547,869.71
	$106,741,490.77

Fixed-price Contracts

In the case of payments under fixed-price contracts, the payments presupposed delivery to and acceptance by the Government of the articles contracted for. Most of the JN training planes, 150 of the Standard J-1 training planes, metal parts for Handley-Page planes, all the engines for the elementary training planes, and 1500 of the Hispano-Suiza 150 H. P. engines are embraced in the orders placed on a fixed-price basis. Large numbers of parts of planes and engines were ordered on the same basis.

The payments under fixed-price contracts are shown to have been distributed as follows:

For engines and their parts.....	$23,216,930.28
For aeroplanes and their parts.....	33,976,690.78
	$57,183,621.06

*Subject to correction by addition of $590,966.62 for Sales Department.

†This includes the compensation of the purchasing agent, The J. G. White Engineering Corporation, amounting to 3 per cent of the purchases, or $262,662.02.

*Other vouchers allowed before June 30, 1918, but not paid until later, $89,620.52.

Cost-plus Contracts

The cost-plus contracts for engines and parts related to the Liberty engines (U. S. 12s), most of the Hispano Suiza, and the Le Rhone, Gnome and Bugatti engines. Among airplanes, 1450 of the Standard J-1 elementary planes, the De Haviland 4 and Bristol service planes, and the Handley-Page wood parts, were under cost-plus contracts. The following is the distribution of payments under cost-plus contracts to June 30, 1918:

For engines and their parts	$28,748,487.44
For aeroplanes and their parts	21,199,382 27
	$49,547,869.71

These payments (being exclusive of advances in the nature of loans) embraced (1) cost of special tools and "increased facilities" owned by the Government, but located in contractors' plants, (2) fixed profits on completed units delivered, (3) royalties on completed units delivered, (4) cost of manufacture of completed units delivered, and (5) payments for work in process, that is, for materials, labor and overhead expense applicable to units in course of production. The distribution of these payments to June 30, 1918, is:

Special tools and increased facilities own by Government	$6,840,971.70
Fixed profits on completed units delivered	3,279,028.18
Royalties on completed units delivered	374,986.40
Payments to June 30, 1918, under cost-plus contracts for labor, materials and overhead charges applicable to delivered units and to work in process	39,052,883.43
	$49,547,869.71

It is impossible at this time, by reason of the state of accounts, to divide the last item covering cost of manufacture so as to give separately the manufacturing cost (exclusive of fixed profits and royalties) of the units which had been delivered and the cost of work in process at the close of the fiscal year.

APPROPRIATIONS AND OBLIGATIONS FOR FISCAL YEAR JUNE 30, 1918 TO JUNE 30, 1919

Continuance of Prior Appropriations

The Act of July 9, 1918, making appropriations for the fiscal year 1918-1919, continued the prior appropriation of $640,000,000, and other aeronautical appropriations, thus making them available for the present fiscal year and for the payment of obligations incurred prior to the passage of the Act. Under this provision the production orders given in the last fiscal year, which remain uncanceled, will be continued and payments will be made in accordance with the terms of the existing contracts as production progresses.

New Appropriations

The Act of July 9, 1918, also made a new appropriation for the Air Service of $884,304,758. This appropriation is available for the purchase, manufacture, maintenance, repair and operation of airships, war balloons and other aerial machines, with equipment, aviation stations, schools and fields; for the expenses of officers, enlisted men and civilian employees; and also for training, experimental work, creation, expansion, acquisition and development of plants, etc. Of this amout, there has been apportioned for Air Service Production the sum of $760,000,000, of which $200,000,000 has been set aside for Aeroplanes, their spare parts, instruments and accessories, $250,000,000 for Engines, their repair parts, instruments and accessories, and $200,000,000 for foreign expenditures. Various items for balloons, oils, gases and chemical, transportation, plants, miscellaneous equipment and supplies, experimentation, and pay of Reserve Corps and civilians make up the remainder.

Against this new appropriation, thus apportioned, the obligations incurred to September 30, 1918 (exclusive of the Sales Department), amounted to $151,580,503.25, of which $21,603,470.90 is for Aeroplanes, their spare parts, etc., and $102,746,372.91 is for Engines, their repair parts, etc. The total payments against the new obligations amounted, to September 30, 1918, to $3,670,707.66 (exclusive of foreign expenditures and transfers to other departments), leaving then unexpended of the new appropriation of $760,000,000, apportioned to Air Service Production, the sum of $756,329,292.34.

Payments Since June 30, 1918, and Total Payments to Date

The last financial reports available are of September 30, 1918. The disbursements to that date which were made after June 30, 1918, for all aeronautical purposes and were chargeable to the appropriations for the prior fiscal year (continued as above stated) are as follows:

Disbursed from the $640,000,000 appropriation (Act of June 24, 1917)	$128,265,028.41
Disbursed from other aeronautical appropriations	7,250,915.36
Total disbursed since June 30, 1918, under prior appropriations for aeronautical purposes	$135,515,953.67

The total disbursements for aeronautical purposes from June 30, 1918, to September 30, 1918, are in the aggregate:

Under appropriations prior to June 30, 1918	$135,515,953.67
Under appropriations after that date, as above	3,670,707.66
Total	$139,186,661.33

These disbursements for all aeronautical purposes cannot at present be apportioned so as to show separately the amounts disbursed since June 30, 1918, for Aeroplane and Engines and parts.

Deliveries to October 11, 1918

The total deliveries of aeroplanes and engines (exclusive of spare parts) to October 11, 1918, appear, by the Government's reports, to be as follows:

Training Planes	Since June 30, 1918	Total to October 11, 1918
JN-4D	615	3587
SJ-1	—	1600
JN-4H and JN-6H	609	1432
S-4B	—	100
S-4C	225	298
Penguin	245	295
E-1	12	12
	1706	7324
Engines for Training Planes		
OX-5	2532	8006
A-7a (Hall-Scott)	62	2250
Gnome 100 H. P.	69	278
Le Rhone 80 H. P.	679	747
Hispano 150 H. P.	824	3012
Lawrence	328	442
Service Planes	4494	14,735
DeHaviland-4s	1821	2350†
Handley-Page (parts 85% complete)	100*	100
Le Pere	5	5
SE-5	2	2
	1928	2457

Engines for Service Planes

Liberty (U S.)-12s	7299	9689†
Hispano 180 H. P.	242	242
Hispano 300 H. P	3	5
Bugatti	1	1
	7545	9937

*25 sets of wooden parts and no metal parts delivered to June 30, 1918.

†Since the above was prepared information has been received that, to October 18, 1918, 2556 DeHaviland-4s and 10,568 Liberty (U.S.)-12s have been delivered.

PAYMENTS FOR AEROPLANES CONDEMNED

Standard J-1 Training Planes

This type of plane was condemned as dangerous, in June, 1918, because of the unsuitability of the motor (Hall-Scott, A7a) used with it. There were 1600 of these SJ-1 planes ordered and delivered, and all deliveries had been made prior to June 30, 1918. The entire amount disbursed for these planes and their spare parts to September 30, 1918, the date of the last financial statement, is $11,027,733.61, of which $8,593,576.11 was under cost-plus contracts.

There were 2250 A7a engines ordered for these planes, all of which, with parts, have been delivered. The amount disbursed for these engines and parts (exclusively under fixed-price contracts) to September 30, 1918, amounted to $6,487,134.75.

The aggregate cost of the SJ-1 planes with the A7a engines, with spare parts, to September 30, 1918, amounted to $17,514,868.36.

There appears to have been no defect in the SJ-1 plane itself, and there is an expectation that it may be utilized by the installation of another engine. The cost of adapting these planes to such an installation may amount to $2000 a plane.

What salvage may ultimately be gained in this way, or on the A7a engines, cannot now be determined.

Bristol Fighters

The Bristol Fighter was condemned as unsafe in July, 1918. A contract for 2000 of these planes and for 1200 sets of spare parts had been placed with the Curtiss Aeroplane and Motor Corporation on a cost-plus basis at an estimated cost of $19,190,100.00. Orders were also given to the Hayes-Ionia Company and to the Lewis Spring and Axle Company, each for 400 sets of spare parts, at the estimated cost of $1,890,000, or $3,780,000 in all. The estimated cost of the British planes and spares was thus $22,970,100.00.

Only 27 had been delivered prior to cancellation, but there was a large amount of work in process. The amount shown by the accounts of the Bureau of Aircraft Production to have been paid on these contracts to September 30, 1918 (exclusive of "increased facilities" owned by the Government), is about $2,350,00. Taking the materials purchased for the Bristols, the labor and estimated overhead charges, it would appear that the total amount expended by the Curtiss Company in the course of the production of the Bristols was about $3,000,000. This does not include any claim for damages for the cancellation of the contract. The Finance Division of the Bureau of Aircraft Production makes a general estimate (which includes unpaid vouchers and possible claims for damages growing out of the cancellation of contracts) that the aggregate cost of the Bristol will amount to about $6,500,000. What salvage there may be on the materials cannot now be determined.

The Liberty engines intended to be used in the Bristols can be utilized in other planes.

On this estimate, the cost to the Government of the SJ-1 planes (with engines), and on the Bristol planes, subject to reduction by whatever salvage there may be, amounts to $24,000,000.*

SECOND—RESPONSIBLE OFFICERS AND ADVISORY BOARDS

By the Act of July 24, 1917, full authority was given to the President to provide, through the War Department, for the purchase, manufacture, maintenance and operation of all types of aircraft, with all necessary equipment.

Signal Corps

Under the Secretary of War, the authority to establish the aircraft program and the control and administration of matters relating to aircraft production for the Army were vested in the Chief Signal Officer, Brigadier-General George O. Squier. It was under his direction that the organization of the Aviation Section of the Signal Corps, with its various departments of production, supply, inspection and accounting, was effected. The matter of aircraft production was entrusted to the Equipment Division, which was organized on August 2, 1917. Edward A. Deeds was made Chief of this Division, with Sydney D. Waldon as his assistant. At the same time Robert L. Montgomery was made Chief of the Finance and Supply Division. There was a reorganization on August 29, 1917, by which these two divisions were abolished and the functions of both were transferred to a new Equipment Division with Edward A. Deeds in charge. Robert L. Montgomery was made the head of the Finance Department of the Equipment Division. Deeds, Montgomery and Waldon had been members of the Aircraft Production Board and in or about August. 1917, they were commissioned with the rank of Colonel. Thus, Colonel Deeds as head of the Equipment Division had direct charge, under the Chief Signal Officer, of all matters relating to aircraft production. On January 14, 1918, Colonel Deeds became Industrial Executive in the Executive Division of the Signal Corps and was succeeded by Colonel Montgomery as head of the Equipment Division, but despite the change in technical relation, it is apparent that Colonel Deeds remained in practical charge, under the Chief Signal Officer, of production. In February, 1918, William C. Potter became the head of the Equipment Division and remained in this position until the passage of the Act of May 20, 1918.

Bureau of Aircraft Production

By order of the President, dated May 20, 1918 (promulgated May 24, 1918), the Chief Signal Officer was put in charge of military signal duties, not connected with the Aviation Section; General W. L. Kenly was appointed Director of Military Aeronautics and charged with the duties which had formerly pertained to the Aviation Section, except so far as they related to aircraft production, and for the latter purpose the executive agency known as the Bureau of Aircraft Production was established. Mr. John D. Ryan was appointed head of this Bureau and thus became Director of Aircraft Production, Mr. Potter taking the post of Assistant Director.

ADVISORY BODIES

National Advisory Committee for Aeronautics

By the Act of March 3, 1915, an Advisory Committee for Aeronautics was established to consist of two members from the War Department, two from the Navy Department, a representative each of the Smithsonian Institution, of the United States Weather Bureau, and of the United States Bureau of Standards, together with not more than five additional persons qualified as experts. The prescribed duty of the

*Further information has been received that a contract is contemplated under which about $3,500,000 of Bristol parts may be used in a new type of plane, which, if successful, would reduce the estimated loss on the Bristols to $3,000,000 and the total loss on SJ-1s and Bristols, subject to salvage on the SJ-1s, to $20,500,000.

Committee was to supervise and direct the scientific study of the problems of flying with a view to their practical solution. This body has been continuously maintained; it has examined numerous inventions and has been engaged in scientific study. But it has had nothing to do with the formulation of the aircraft program or with decisions as to the types of planes or engines selected for production.

The Committee was also active in securing the adjustment reflected in what is known as the cross-license agreement for the payment of royalties for the use of patented inventions pertaining to aircraft.

Joint Army and Navy Technical Aircraft Board

This Board was constituted in the early part of May, 1917. It was composed of officers of special qualifications by reason of scientific study and experience, who were designated by the Secretary of War and the Secretary of the Navy, respectively. The declared purpose was to "standardize, so far as possible, the designs and general specifications of aircraft except Zeppelins." The Board has been in continuous existence and has made various recommendations. These, however, have not been controlling and the Board has had no authority to enforce its views.

Aircraft Production Board

The Aircraft Production Board was created in May, 1917, pursuant to a resolution of the Council of National Defense. Its function was solely advisory. The initial steps in organization were taken under the authority of the Council of National Defense by Howard E. Coffin, who became Chairman of the Board and selected the civilian personnel consisting of Edward A. Deeds, Sidney D. Waldon and Robert L. Montgomery. Mr. Coffin—Vice-President of the Hudson Motor Car Company—was a member of the Advisory Commission of the Council of National Defense. Mr. Deeds had been engaged in manufacturing enterprises at Dayton; in April, 1917, he had been appointed a member of the Munitions Standards Board and placed on the Sub-Committee on Fuses and Detonators. Mr. Waldon had formerly been a Vice-President of the Packard Motor Car Company. Mr. Montgomery was a member of the firm of Montgomery, Clothier & Tyler, bankers and brokers, of Philadelphia. In addition to the four civilian members, the Chief Signal Officer and Rear Admiral D. W. Taylor, Chief of the Bureau of Construction, were appointed members of the Board, representing the Army and Navy respectively.

While the Aircraft Production Board had no authority to commit the Government, the Board was continuously active in the formulation of programs and the adpotion of resolutions of advice. Numerous contracts for aeroplanes and engines were placed upon its recommendation. When the Equipment Division of the Aviation Section of the Signal Corps was organized in August, 1917, the work of the Board became of less actual importance, though it was still conspicuous in routine. Colonel Deeds, Colonel Waldon and Colonel Montgomery now had executive duties in the Equipment Division under the Chief Signal Officer, and for the most part the recommendations relating to the Army aircraft program naturally followed the views of the Army officers who were in actual control. Similarly, the recommendations relating to the Navy reflected Navy proposals. The Board, however, afforded a valuable opportunity for the interchange of opinion and the unification of effort.

Aircraft Board

The Aircraft Board, superseding the former organization, was established by the Act of October 1, 1917. This was composed of nine members, including the Chief Signal Officer (Major-General Squier) and two other representatives of the Army, and the Chief Constructor of the Navy (Rear Admiral Irwin) and two other naval officers. For the Army, the Secretary of War designated Colonel Deeds and Colonel Montgomery; and for the Navy, the Secretary of the Navy designated Captain N. E. Irwin and Lt.-Com. A. K. Atkins. The civilian members, appointed by the President, with the advice and consent of the Senate, were Mr. Coffin (Chairman), Richard F. Howe (who had been connected with the International Harvester Company) and Harry B. Thayer (President of the Western Electric Company)—the last-named being appointed in February, 1918.

The Act creating the Aircraft Board empowered it under the direction and control of the Secretary of War and the Secretary of the Navy, "to supervise and direct, in accordance with the requirements prescribed or approved by the respective departments, the purchase, production, and manufacture of aircraft, engines, and all ordnance and instruments used in connection therewith, and accessories and materials therefor, including the purchase, lease, acquisition, or construction of plants for the manufacture of aircraft, engines and accessories; Provided, that the Board may make recommendations as to contracts and their distribution in connection with the foregoing, but every contract shall be made by the already constituted authorities of the respective departments."

It was also provided that

"except upon the joint and concurrent approval of the Secretary of War and the Secretary of the Navy there shall not be established or maintained under the Board any office or organization duplicating or replacing, in whole or in part, any office or organization now existing that can be properly established or maintained by appropriations made for or available for the military or naval service."

In February, 1918, Acting Judge Advocate General S. T. Ansell gave an opinion to the effect that the provisions of the Act should be construed to contemplate "only advisory or recommendatory functions." Thereupon, the Chief Signal Officer, in an order approved by the Secretary of War and the Secretary of the Navy, defined the duties of the Aircraft Board as follows:

"a. To act as a clearing house between the General Staff and the Signal Corps for all matters pertaining to raw materials for foreign governments for the production of aircraft, the Equipment Division of the Signal Corps to act as purchasing agency.

"b. To act as a clearing house between the General Staff and the Signal Corps for all information in relation to requirements of foreign governments for aircraft to be manufactured in the United States.

"c. To act as a clearing huose for all information as to requirements as between the Army and Navy for aircraft and raw materials.

"d. To study the requirements of the Army and Navy as regards combat and training planes. To study types with the Technical Divisions of the Army and Navy to the end that recommendations be made that given types be placed with industrial plants best fitted to undertake their manufacture. The Aircraft Board shall have no direct communication with manufacturing plants, except through the medium of the procurement divisions.

"e. As a result of above studies the Aircraft Board may recommend that preparations be made for production before actual contracts are made.

"f. To recommend the placing of experimental contract.

"g. All programs should be made up by the Board from information which shall be furnished by the proper Army and Navy Military and Naval Branches on the one hand and the Equipment and Production Divisions of the Army and Navy on the other. All foreign cables respecting aircraft production should be cleared through the Board.

"h. The Aircraft Board should be the instrumentality through which contact is made on matters of large policy with other bodies such as Shipping Board, Allied representatives, etc."

Despite the broad language of the Act of Congress as to the power which might be committed to the Board under the direction of the Secretary of War and the Secretary of the Navy, it will be observed that this executive order had the effect of greatly limiting the authority of the Board and that it was denied even the right to hold "direct communication with manufacturing plants." It was further provided that all programs should be made up by the Board "from information which shall be furnished by the proper Army and Navy Military and Naval branches on the one hand and the Equipment and Production Divisions of the Army and Navy on the other." The manifest purpose was to leave no question that the actual control of aircraft production rested with the Military and Naval officers.

The Aircraft Board held frequent sessions, and continuously made recommendations upon which action was taken and contracts placed. the service of the Board being virtually that of a clearing house for proposals which generally emanated from the responsible authorities and in all cases were dependent upon the action of these authorities for their final approval and execution.

THIRD—PERSONAL INTERESTS

There are no common law offenses against the United States, and a charge of crime under Federal law must rest exclusively upon the violation of a Federal criminal statute (*United States* v. *Eaton,* 144 U. S. 677, 687; *United States* v. *George,* 228 U. S. 422).

The applicable statutes of the United States, dealing with the question of personal interest of officers and agents of the Government in Government contracts are the following:

(1) Section 41 of the Criminal Code of the United States, formerly Section 1783 of the Revised Statutes, provides:

"Sec. 41. No officer or agent of any corporation, joint stock company, or association, and no member or agent of any firm, or person directly or indirectly interested in the pecuniary profits or contracts of such corporation, joint stock company, association, or firm, shall be employed or shall act as an officer of agent of the United States for the transaction of business with such corporation, joint stock company, association, or firm. Whoever shall violate the provision of this section shall be fined not more than two thousand dollars and imprisoned not more than two years."

Under the statute, it is not enough that an interested person merely recommends or advises transactions with the Government. To constitute a violation of the statute, the interested person must *"be employed"* or *"act as an officer or agent of the United States for the transaction of business with such corporation,"* etc.

(2) Section 3 of the Act of August 10, 1917 (Food and Fuel Control Act), provides:

"Sec. 3. That no person acting either as a voluntary or paid agent or employee of the United States in any capacity, including an advisory capacity, shall solicit, induce, or attempt to induce any person or officer authorized to execute or to direct the execution of contracts on behalf of the United States to make any contract or give any order for the furnishing to the United States of work, labor or services, or of materials, supplies, or other property of any kind or character, if such agent or employee has any pecuniary interest in such contract or order, or if he or any firm of which he is a member, or corporation, joint stock company, or association of which he is an officer or stockholder, or in the pecuniary profits of which he is directly or indirectly interested, shall be a party thereto. Nor shall any agent or employee make, or permit any committee or other body of which he is a member to make, or participate in making, any recommendation concerning such contract or order to any council, board, or commission of the United States, or ay member or subordiate thereof, without making, to the best of his knowledge and belief, a full and complete disclosure in writing to such council, board, commission or subordinate of any and every pecuniary interest which he may have in such contract or order and of his interest in any firm, corporation, company, or association being a party thereto. Nor shall he participate in the awarding of such contract or giving such order. Any willful violation of any of the provisions of this section shall be punishable by a fine of not more than $10,000, or by imprisonment of not more than five years, or both; *Provided,* That the provisions of this section shall not change, alter or repeal section forty-one of chapter three hundred and twenty-one, Thirty-fifth Statutes at Large."

This section covers those who act in any advisory capacity. It has no application to transactions occurring before its passage.

It is apparent that the section was guardedly drawn and its limitations should be noted. The first sentence of the section applies to interested persons only where they *"solicit, induce,* or *attempt to induce"* any person or officer, who is "authorized to execute, or to direct the execution of contracts," to make any contract or give any order for labor, services, materials, etc. The use of different expressions in the different clauses of the section suggests possible shades of meaning. The act of *recommending* does not come within the first sentence unless it is found to amount to *"soliciting," "inducing"* or *"attempting to induce,"* nor does the first sentence cover solicitations addressed to others than the persons or officers duly authorized to make the contracts or give the orders.

The second sentence relates to "recommendations by interested persons, but it is limited to recommendations made "to any *council, board,* or *commission* of the United States, or any member or subordinate thereof" in the absence of the disclosure described. Apparently this sentence does not cover recommendations made to individual officers acting under the authority conferred upon them by law, who are not members or subordinates of a "council, board, or commission."

The third sentence provides that the interested person shall not "participate in the awarding of such contract or giving such order." This would seem to relate to those who take part in the actual awarding of the contract or giving of the order and not to those who act in an advisory capacity only.

The section concludes with the proviso that its provisions shall not alter or repeal Section 41 of the Criminal Code above quoted.

To come within these statutes an interested person must either (1) act as an officer or agent of the Government for the transaction of business with the concern in which he is interested, or (2) solicit, induce or attempt to induce the person or officer, who is authorized to execute or direct the execution of contracts, to make a contract with, or give an order to, the concern to which the interest relates, or (3) take part in a recommendation to a "council, board, or commission" or subordinate or members thereof, without the disclosure stated, or (4) participate in the award of the contract or giving of the order.

In connection with these statutes attention may be called to the following provision, which appears as a rider in the Appropriation Act of March 3, 1917, immediately following an appropriation for the distribution of documents (39 Stat. p. 1106):

"*Provided,* That on and after July first, nineteen hundred and nineteen, no government official or employee shall receive any salary in connection with his services as such official or employee from any source other than the Government of the United States, except as may be contributed out of the Treasury of any State, county or municipality, and no person, association or corporation shall make any contribution to, or in any way supplement the salary of, any government official or em-

ployee for the services performed by him for the Government of the United States. Any preson violating any of the terms of this proviso shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than $1000 or imprisonment for not less than six months, or by both such fine and imprisonment as the court may determie."

It will be noted that this provision, enacted in March, 1917, is not to be operative until July 1, 1919. It may be contended with force, that this constitutes a legislative declaration, by implication, that the action described by the provision, that is, the mere supplementing of the pay of Government officials by private contributions, should not be deemed contrary to law prior to the date fixed.

INDIVIDUAL RELATIONS OF OFFICIALS

Present Bureau of Aircraft Production
John D. Ryan—William C. Potter

There is no suggestion, and no evidence, that either Mr. Ryan or Mr. Potter has taken any part in Government transactions with any concern in which he had a personal interest.

Members of the Aircraft Board

The relations of the members of this Board who received commissions in the Army are stated hereafter. As to Mr. Coffin, and as to the Naval officers who were members of this Board, it should be said that there is no evidence that any one of them has taken any part in transactions or recommendations relating to any corporation, firm or association, in which he has an interest. Disclosures of interest in particular corporations have been made from time to time by Mr. Howe and Mr. Thayer and with respect to such corporations it appears that they have abstained from participating in the recommendations made by the Board; except that Mr. Howe in his disclosure of interest to the Board on February 12, 1918, stated that he was interested in a corporation holding preferred stock of the Willys-Overland Company and that he was present at the meetings of the Board on December 7th and December 18th when resolutions involving a contract with that Company were passed, but that he was not aware of such financial interest at those times. As the Board acts in an advisory capacity simply, Section 41 of the Criminal Code can not be regarded as applicable, and the limitations of Section 3 of the Act of August 10, with respect to mere recommendations, have already been pointed out.

Officers of the Signal Corps Formerly in Control of Aircraft Production

(1) The Chief Signal Officer

It does not appear that General Squier had any interest in any corporations or concerns transacting business with the Signal Corps. The defects in the organization, which was created under his direction for the purpose of aircraft production, are matters distinct from any question of personal interest and will be considered in another division of this report.

(2) Colonel Edward A. Deeds

The charges pertaining to personal interest in Government contracts relate particularly to Colonel Edward A. Deeds and grow out of the highly suggestive transactions with his former business associates at Dayton. These transactions have been subjected to careful scrutiny.

Colonel Deeds was born near Granville, Ohio, on March 12, 1874. There is testimony that he once said that his name originally was "Dietz". No public record has been found to this effect. Colonel Deeds denies making the remark attributed to him and states that his family has borne the name of Deeds for at least four generations—his great-grandfather of that name coming from Pennsylvania. For many years Colonel Deeds was an officer of the National Cash Register Company and was one of several connected with that organization who were indicted in the Federal District Court for the Southern District of Ohio, in 1912, for violation of the Sherman Anti-Trust Act. Upon the trial Deeds, with other defendants, was convicted, but this conviction was seat aside by the Circuit Court of Appeals (*Patterson* v. *United States,* 222 Fed. 599) and the prosecution went no further.

At the time of our entry into the War, Mr. Deeds had large business interests at Dayton. His intimate business associates were Charles F. Kettering and H. E. Talbott. Mr. Deeds and Mr. Kettering (an inventor and engineer of ability) have been jointly associated in many enterprises with equal shares, it being their policy to organize corporations and to take their respective interests in stocks. Mr. Deeds has supplied the financial talent and Mr. Kettering, who is without any aptitude for business details, the engineering skill. They have had, and still have, a common agent of a highly confidential sort, George B. Smith, of Dayton, who holds the power of attorney of each, keeps their respective books, has charge of their bank accounts, signs their checks and generally looks after their financial affairs. They are still associated in various undertakings and their relations are of the most intimate character.

In 1904 Kettering was employed in National Cash Register Company as a designer in the engineering department, and later he became associated with Deeds in the development of what is known as the Delco ignition system for automobiles. In the course of this development Deeds and Kettering organized the Dayton Engineering Laboratories Company, known as the Delco Company. The enterprise was successful and the common stock was sold by Deeds and Kettering in 1916 to the United Motors Corporation for several million dollars in cash and certain shares of stock. Deeds and Kettering each retained a few shares of preferred stock; Deeds continued as President of the corporation, with a salary of $60,000 a year, and Kettering as Vice-President, with a salary of $50,000.

In April, 1915, Deeds, Kettering, H. E. Talbott, Sr., and his son, H. E. Talbott, Jr., organized the Dayton Metal Products Company with a capital stock of $200,000. The stock was held as follows: Talbott, Sr., 900 shares, Deeds 500 shares, Kettering 499 shares, Talbott, Jr., 99 shares, Charles H. Mead, 1 share, and George B. McCann, 1 share. Prior to our entry into the war, this Company had profitable fuse contracts with the British Government and had accumulated a considerable surplus. It appears that in the Spring of 1917 both Deeds and Talbott were appointed on the Sub-Committee on Fuses and Detonators of the Munitions Standards Board. In 1916, the Company had a contract with the Navy Department for fuses and it received other fuse contracts from the Navy and the Ordnance Department of the Army in 1917. As Vice-President of this Company, Deeds had a salary of $25,000 a year. The relation of the Dayton Metal Products Company to aircraft production is that this Company, in the latter part of the year 1917, acquired all the stock (save four qualifying shares) of the Dayton Wright Aeroplane Company and also has sub-contracts for metal parts with contractors making aeroplanes and engines. The Dayton Metal Products Company also subscribed and paid for 1,000 shares (par value $100,000) of the stock of the Lincoln Motor Company which was organized to build Liberty engines and has a paid up capital stock of $850,000.

In September, 1916, Deeds and Kettering organized the Domestic Building Company of Dayton, for the purpose of erecting and financing plants for the use of various companies. The capital stock is now $1,000,000, of which all but four qualifying shares are held by Deeds and Kettering in equal parts. This Company owned the land and erected the building acquired by the Dayton Wright Aeroplane Company for its principal aeroplane plant.

On April 9, 1917, the Dayton Wright Aeroplane Company was incorporated with a capital stock of $500,000 by Deeds, Kettering, H. E. Talbott and H. E. Talbott, Jr., in conjunction with Orville Wright. They had taken over the former Wright organization and thus had started an aeroplane enterprise at Dayton in a small way in the Summer of 1916. The larger enterprise of the Dayton Wright Aeroplane Company was launched about the time of our entry into the war, manifestly with the expectation of obtaining Government contracts. While Deeds was one of the incorporators, he did not become a stockholder, the subscriptions for the first 5,000 shares being as follows: H. E. Talbott 1,990 shares, C. F. Kettering 2,000 shares, H. E. Talbott, Jr., 990 shares, George H. Mead 10 shares, and C. A. Craighead 10 shares. In August, 1917, the capital stock was increased to $1,000,000 ($600,000 common and $400,000 preferred). The new common stock was taken by Messrs. Talbott and Kettering in the proportion of two-fifths, two-fifths and one-fifth. There were early negotiations for a Government contract and as early as June 12, 1917, a contract with the Company was recommended by the Aircraft Production Board. The contract was executed on August 17, 1917 (under date of August 1, 1917) and was for 400 Standard J-1 training planes at the fixed price of $6,500 each. For this there was substituted the contract dated September 7, 1917, which was also recommended by the Aircraft Production Board and was approved by General Squier. This contract was for 400 Standard-J aeroplanes, 2,000 DeHaviland-9s and 1,500 Martinsydes with spare parts. By later modifications the Martinsydes and DeHaviland-9s were omitted and provision was made for 4,000 DeHaviland-4s. These contracts were on a cost-plus basis, the estimated amount involved being upwards of $30,000,000. There was to be a fixed profit of $620 on each Standard-J plane and $875 on each DeHaviland, making a total fixed profit of about $3,750,000, exclusive of fixed profit on spare parts covered by the contract, thus expected to be earned, according to the contemplated deliveries, before the end of 1918. The contract also provided for additional profits to the extent of 25% of the saving under the bogey or estimated cost of the planes ($7,000 on the DeHavilands) and it is estimated that the additional profit on this basis would have amounted to over $2,600,000. When the bogey cost of $7,000 was fixed, letters were obtained from the Dayton Wright Aeroplane Company, and from the Fisher Body Corporation (which also had a contract for DeHavilands), that after 250 machines had been produced there would be an equitable adjustment if the bogey cost was found to be 'materially wrong'. Accordingly, a contract is now about to be signed reducing the bogey cost to $5,000 and the fixed profit to $625 per plane. Even at this rate, the fixed profit on the 4,000 DeHavilands will be $2,500,000, and it is believed that there will be an additional profit through saving under the bogey cost, and on spare parts, of not less than $1,000,000. In August and September, 1917, when the first Government contracts were awarded, the capital stock of the Company ($1,000,000) had not been paid in. It was not paid in until December 1, 1917, when, in one transaction, the stock was paid for and all the shares, preferred and common, save five qualifying shares were transferred to the Dayton Metal Products Company, which thus became and still remains the owner of the Dayton Wright Aeroplane Company. As the latter company practically received nothing on the issue of its capital stock save the fixed property represented by its plants, it was lacking in working capital and this at the outset was supplied by various loans and advances of the interested parties. In December the Government agreed to advance the Company $2,500,000, of which $1,500,000 was advanced at once.

The name of Orville Wright was used in this enterprise, but his chief activity has been as a consulting engineer in connection with experimental work. He has not been responsible for production. Mr. Kettering is an engineer of ability, but his work also has been that of experimental engineering; he is not a manufacturing or production expert. Much emphasis is placed by the parties concerned upon the fact that they were able to avail themselves of the old Wright organization which had been continued as already stated. But this was a very slender basis for the prompt selection of this newly-organized company, which had not even completed its financial arrangements as one of the few companies immediately admitted to the advantages of large and highly profitable Government contracts. The promoters of this enterprise, not content with these profits which were to accrue to them either directly or through their ownership of the Dayton Metal Products Company at once took advantage of the opportunity to increase their gains by salaries as executive officers of the Dayton Wright Aeroplane Company. Dating from August 1, 1917, the salaries thus allowed were as follows: H. E. Talbott, Sr., $35,000; C. F. Kettering, $35,000, and H. E. Talbott, Jr. (thirty years old, who was made president of the Company), $30,000. Talbott, Sr., was at the time receiving, and continued to receive, $60,000 a year as president of the Dayton Metal Products Company; Kettering received a salary of $25,000 from the Dayton Metal Products Company and $50,000 from the Delco Company; and Talbott, Jr., was also receiving a salary of $18,000 from the Dayton Metal Products Company.

There would seem to be no question but that the members of the Aircraft Production Board in recommending contracts had confidence in the capacity of those undertaking the venture, and the previous success of this group; while Mr. Deeds had been associated with them, was well known. But the fact remains that practically at the inception of the Government's aviation activity in connection with the War, and within the sphere of Colonel Deeds' important if not commanding influence, his former business associates were placed at once through Government contracts in a position where they had the assurance of very large profits upon a relatively small investment of their own money and in addition were able to secure generous salaries which they charged against the Government as part of the cost of manufacture.

That Deeds, Kettering and Talbott continued to be on the most intimate and confidential footing in connection with the prosecution of the Government work by the Dayton Wright Aeroplane Company is apparent from their correspondence, of which the following are excerpts:

Letter Deeds to Kettering, June 13, 1917:

"WASHINGTON, June 13, 1917.

"MR. C. F. KETTERING,
City National Bank Building,
Dayton, Ohio.

"MY DEAR C. F.:

"You will be interested to know that the standard training machine is going to be called the U. S. primary training and will not be called the Curtiss J.N. This was decided last week and I forgot to tell you when in Dayton.

"Provision will be made for either Mr. Coffin or myself to appear before the S.A.E.*, and as I am one of the Committee on Arrangements will see that the plans of the Aircraft Production Board get properly before the Association.

"Relative to the design of planes, I do not care to write what is being done but will discuss it with you when I get home and you will

*Society of Automotive Engineers.

see that we have already gone away down the pike in this matter. Everything is lining up now in pretty good shape.

Yours very truly,

E. A."

Telegram Deeds to Talbott, July 3, 1917:

"July 3, 1917.

"Mr. H. E. Talbott,
Dayton, Ohio.

"General Squier went direct to Detroit. Will probably spend fourth at his old home in Michigan. May be in Dayton Thursday or Friday, arriving there from Detroit or from Champagne, Illinois. Harold, Kettering and Wright can take care of him. He will be interested in the Dayton Wright factory and laboratory, Orville Wright laboratory and especially Mr. Kettering's views on scientific subjects. In general he is highly technical.

E. A. Deeds."

Telegram Kettering to Deeds, August 4, 1917:

"Dayton, Ohio, August 4, 1917.

"E. A. Deeds,
Room 527 Munsey Building,
Washington, D. C.

"We believe all confidential telegrams should be sent to Mr. H. E. Talbott, Sr., City National Bank Building, or George B. Smith, instead of the Dayton Wright Aeroplane Company.

C. F. Kettering."

Telegram Deeds to Kettering, August 4, 1917:

"August 4, 1917.

"Mr. C. F. Kettering,
City National Bank Building,
Dayton, Ohio.

"Hereafter all confidential telegrams will be sent to H. E. Talbott, Sr., instead of to the Dayton Wright Aeroplane Company.

E. A. Deeds."

Telegram Deeds to Talbott, September 16, 1917:

"Old Point, Virginia, September 16, 1917.

"H. E. Talbott,
Dayton, Ohio.

"For your personal information as coming from your local attorney. Judge Advocate General has ruled it legal for Government to select one, contractor one and the two a third, as appraisers of market value of plant at expiration of contract. If you care to raise the question the above will be found to be the final ruling.

"E. A. Deeds."

When this last telegram, which puts in a strong light the relations of the parties, was sent, Deeds was an officer in the Army. This highly improper conduct, in holding communication in this manner with his former business associate in a transaction pending between the Dayton Wright Company and the Government Department in Colonel Deeds' charge, demands the attention of the military authorities.

But evidence of favoritism, influence, or confidential communications of this sort, however otherwise reprehensible, do not make out criminal liability under the statutes above quoted, unless it appears that the representative of the Government has a pecuniary interest in the Government contract or order, or is an officer or stockholder of, or has a pecuniary interest in, a corporation, firm or association which is a party to the Government contract or order. And the question is whether Colonel Deeds had such an interest. His statement is that he had no such interest but on the contrary had given up large salaries to devote himself to the Government service.

About the time he received his commission as Colonel in the Army, Mr. Deeds addressed the following communications to the Secretary of War and to the Aircraft Production Board, under date of August 28, 1917:

"Washington, D. C., August 28, 1917.

"Hon. Newton D. Baker,
Secretary of War,
Washington, D. C.

"Dear Sir:

"You have honored me by appointment temporarily as an officer in the Regular Army of the United States, and as a member of the Aircraft Production Board connected with your Department. It is possible that this Board in the development of the aeroplane work may wish to recommend a contract with some of the corporations in which I have had an interest. Following the advice of counsel, I have resigned my official relations with these corporations, and made bona fide transfers of my stock therein to other parties.

"For your protection as well as my own, I desire to file with your Department a copy of a written disclosure of my relations, both past and present, to these corporations which I have this day filed with the Aircraft Production Board, and I enclose same herewith.

"In serving in the positions to which you have appointed me, I desire to comply with both the spirit and letter of the law, and to do no act which might invite criticism upon myself or your Department.

"I count it an honor and privilege to be thus called into the service of our country and am pleased to make whatever sacrifice of time and money that service may demand.

"I enclose a second copy of my statement to be filed with you as Chairman of the Council of National Defense.

Yours very respectfully,

(Signed) E. A. Deeds."

"Washington, D. C., August 28, 1917.

"The Aircraft Production Board,
Washington, D. C.

"Gentlemen:

"As a member of your Board and interested in the letting of contracts on the recommendation of that Board on behalf of the Government, I desire at this time to make a full and complete disclosure of the interest I may have in any corporation which might be a party to any such contract, or which might furnish supplies to the Government through the instrumentalities of your Board.

"I was a stockholder and officer in the following, to wit:

"(1) The United Motors Company of New York, being a union of several companies manufacturing automobile parts.

"(2) The Dayton Engineering Laboratories Company, of Dayton, Ohio, manufacturers of ignition and starting devices for automobiles.

"(3) The Dayton Metal Products Company, of Dayton, Ohio, engaged among other things in the manufacture of munitions.

"(4) The Domestic Building Company, of Dayton, Ohio, a corporation formed for the development of real estate and which now owns the land and buildings leased to The Dayton Wright Aeroplane Company.

"In all of the foregoing corporations I have severed my official connection therewith by resignation and have made a bona fide transfer to other parties of all my stock therein.

"In addition to the above corporations, I was an incorporator of The Dayton Wright Aeroplane Company, but never owned any stock therein., I am also the president of and a large stockholder in The Domestic Engineering Company, of Dayton, Ohio, makers of Delco Light Plants, and expect to retain my official connection therewith and my financial interest therein.

"I also own the ground embraced in The Moraine Experimental Flying Field near Dayton, Ohio, used for aviation purposes but out of which I receive no compensation.

"I make this disclosure now so that your Board, as the representative of the Government, may be fully informed as to my relations, past and present, with these corporations, and be thus enabled to act wisely on any order or contract involving any of these corporations either directly or indirectly. I desire that this written disclosure be recorded in the minutes of your Board for the mutual protection of all of us.

Yours very respectfully,

(Signed) E. A. Deeds."

The facts with respect to the disposition of Colonel Deeds' interests (so far as pertinent to this inquiry), and the method of disposition, are as follows:

United Motors Corporation
Dayton Engineering Laboratories Company

The significance of Colonel Deeds' statement with respect to the disposition of his interests in these corporations is that the Delco ignition system is used in the aeroplane engine known as the Liberty motor. In the planes manufactured abroad, the magneto ignition system had been used and, prior to its use on the Liberty motor, it appears that the Delco system had not been employed on an aeroplane engine. In the specifications for the Liberty motor, the Delco system was required to be installed with the first 20,000 engines. As already stated, the Delco system is controlled by the Dayton Engineering Laboratories Company (Delco Company) and this company is owned by the United Motors Corporation.

On the sale of his Delco stock to the United Motors Corporation, Deeds had received, in addition to cash, 30,000 shares (no par value) of its stock. [The total issued stock amounted to 1,200,000 shares.] After certain distributions, he still held at the time in question 17,500 of these shares. He also had an interest in a pool of certain shares, on which 3,880 additional shares were received in November, 1917. In his letter (above quoted) to the Aircraft Production Board, Deeds stated that he had severed his official connection with the United Motors Corporation and had made a *bona fide* transfer of his shares. He had resigned as Vice-President and director on August 16, 1917. The only transfer made by him of any of his shares in that company was by gift to his wife. He endorsed, for transfer, the certificates for 17,500 shares on October 13, 1917, and they were transferred to Mrs. Deeds' name on October 17, 1917. Thereafter, it is testified, they were held by the confidential agent, George B. Smith, for her account. Entries of the transfer were made in Colonel Deeds' books by Smith not earlier than October, 1917, and were dated back to August 28, 1917. In the statement of his assets on August 31, 1917, submitted to him by Smith, the shares appear as part of his property. Mrs. Deeds' name first appears in the statement of assets of October 31, 1917. The remaining shares (3,880) received on the dissolution of the pool about November 22, 1917, were transferred from the pool manager directly to Mrs. Deeds, as Mr. Deeds' letter and the certificates were received by Smith on her behalf. Prior to the transfer of the stock in October and at the time of Colonel Deeds' letter to the Aircraft Production Board, he had simply told his wife that it was to be her stock, and it does not appear that there had been an effective gift of the shares. The actual value of the 21,380 shares was approximately $500,000.

In addition to these shares in the United Motors Corporation, Deeds also held 38 shares of Delco preferred stock, which he had retained at the time of the sale of his common stock. These preferred shares he transferred to Kettering. It appears that the transfer was first entered by Smith in Colonel Deeds' private journal in December, 1917. The date of the entry was afterwards changed to August 28, 1917, to correspond to the date when Smith was notified that Colonel Deeds had received his commission in the Army. The stock was transferred to Kettering on the books of the company on October 13, 1917. The payment was made by debits in Deeds' open account with Kettering.

If there were evidence that Colonel Deeds had acted as officer or agent of the Government in the transactions with the Delco Company, or with the United Motors Corporation, prior to October 13, 1917, there would be ground by reason of his interest for charging a violation of the statute, and it may be doubted whether there was then or thereafter such a transfer as would avail to take the case out of the statutory prohibition. But there is no evidence that Deeds acted for the Government in any transaction with either of these corporations. So far as appears, the Government made no contracts for Delco ignition either with the Delco Company or with the United Motors Corporation. The contracts for the Delco system were made by the contractors who were manufacturing the engines under contracts with the Government, and the dealings with the Delco Company or with the United Motors Corporation in relation to the Delco system were had by these contractors. It must also be said that, despite the natural inference from former business association and interests, the proof is lacking that the selection of the Delco system was due to the solicitation of Deeds. It can hardly be questioned that the design of the Liberty motor contemplated the use of the Delco system, and that the magneto system could be used only by a special adaptation. The Delco system, however, had been extensively used for automobiles, notably by the Cadillac and Packard companies, and was in high favor with those who were developing the Liberty motor. While there has been a question as to which system was preferable, and it has been understood that foreign representatives at first did not approve the departure from foreign practice, and many may still be found to disapprove it, there is considerable evidence that the use of Delco ignition has been growing in favor, and there has been testimony in this investigation from impartial and competent sources commending its adoption.

Special attention has been given to the memorandum directing the use of the Delco system in the first 20,000 Liberty motors. In the first memorandum by Major Gray, Chief of the Specification Section, under date of October 6, 1916, the accessories recommended were so placed that the Delco ignition came last on the list. This was then rearranged, apparently to attract less attention to Delco, in alphabetical order. The recommendation, Major Gray testifies, for the use of the Delco system and the other accessories specified came from Major Vincent, one of the designers of the Liberty motor and then executive officer of the Aeroplane Experimental Department of the Equipment Division, who stated that he did not believe they would be justified "in specifying for quantity production any other accessories than those which had thus far been tested out satisfactorily." The situation was a delicate one, says Major Gray, as Major Gray himself had been president of the Hess Bright Company (he had resigned his office and disposed of his holdings in June, 1917), whose ball-bearings were required as one of the accessories, and Colonel Deeds had developed the Delco system. Major Gray testifies that he brought the question to Colonel Deeds' attention, who said, "I do not like really to have anything to say about it, because in that list is the Delco ignition and

if I authorize it it will look as though I have an axe to grind." The sum of the matter is that there is no satisfactory evidence that Colonel Deeds signed, prepared or directed the order for the use of the Delco ignition, although it cannot be doubted that he desired the system to be used. Nor is there evidence that any recommendation was made by Colonel Deeds to the Aircraft Board or to any other council, board or commission regarding the matter.

His statement to the Aircraft Production Board on August 28, 1917, that he had made a *bona fide* transfer of all his stock in the United Motors Corporation, when the stock had not in fact been transferred and at most he contemplated a gift of the stock to his wife, was neither candid nor truthful, and is certainly not to be regarded as a "full and complete disclosure." But in the absence of proof of solicitation, inducement or recommendation by him, or action on his part as an officer or agent of the Government in transactions with the United Motors Corporation or the Delco Company, there are no facts bringing the case within the statutory prohibition.

Domestic Building Company

In his letter of August 28, 1917, to the Aircraft Production Board, Colonel Deeds stated that he had made a *bona fide* transfer of his stock in this company. This was not true. It appears that on that date he resigned the office of President of the company, but he did not dispose of his stock. The stock of that company is still held in equal portions by Deeds and Kettering.

Colonel Deeds was plainly led to make the statement in his letter by the fact that the Domestic Building Company had acquired the land and had erected the building which was in course of completion, and was then occupied and intended to be used as the principal plant of the Dayton Wright Aeroplane Company for the manufacture of aeroplanes. It is said that in anticipation of a lease of the property to the Dayton Wright Aeroplane Company, it had been agreed prior to August 28, 1917, that Deeds' stock in the Domestic Building Company should be sold to Kettering. But there is not sufficient evidence of a definite and binding agreement to that effect, or of anything more than a loose understanding between intimates, whose arrangements could at any time be adjusted to suit their mutual convenience. Certainly, there had been no transfer of the stock. It was not until November that there was an adjustment of accounts with this company, and then, instead of a sale of his stock by Deeds, he retained his stock in the Domestic Building Company and the plant erected by that company was purchased by Talbott, Sr., Kettering and Talbott, Jr., who at once transferred it to the Dayton Wright Aeroplane Company.

On February 4, 1918, the Domestic Building Company made a direct conveyance to the Dayton Wright Aeroplane Company of an additional tract of 8.34 acres, adjoining the first tract, at the price of $13,344, or $1,600 per acre.

However, there is no ground, so far as the retention of Deeds' stock interest in the Domestic Building Company is concerned, for charging a violation of statute. It is not enough that the Dayton Wright Aeroplane Company purchased these properties, or that certain advances by Deeds were taken into account in fixing the purchase price of the main plant, or that both parcels of land were sold at more than the amount they had cost the Domestic Building Company. The Government has never had any contracts with the Domestic Building Company and it does not appear that Colonel Deeds has acted as an officer or agent of the Government in any transactions between the Government and that company. The gratuitous statement contained in his letter to the Aircraft Production Board that he had made a transfer of all his stock in this company may be said to indicate a willingness to state, as an accomplished fact, a transaction which never took place but was merely in contemplation as a step to be taken if deemed to be necessary.

Dayton Wright Airplane Company

Colonel Deeds' statement in his letter of August 28, 1917, that he had never been a stockholder in this company was true. The stock is owned by the Dayton Metal Products Company, and if Colonel Deeds had or has any interest through stock ownership in the profits on its contracts with the Government, this interest must be derived from an interest in the stock of the Dayton Metal Products Company.

His relation to the organization of the Dayton Wright Aeroplane Company is this: It was an incorporator and while he did not subscribe for stock, and none was issued in his name, the payment of the stock of the company to the extent of upwards of four-fifths of its par value was made, in substance, by the transfer to the company of the plant built by the Domestic Building Company owned by Deeds and Kettering, and this company received therefor unsecured notes of Talbott, Sr., Kettering and Talbott, Jr., only a small part of which has been paid. Thus, Deeds and Kettering through the Domestic Building Company virtually furnished the main plant of the Dayton Wright Aeroplane Company on a credit to the Talbotts and Kettering. The transaction was as follows:

The aeroplane factory was erected on a tract which the Domestic Building Company had acquired from the Moraine Development Company (a corporation in which Deeds and Kettering were largely interested) at a price a little over $753 an acre. The building was intended for the use of the Domestic Engineering Company, another concern owned by Deeds and Kettering, which was engaged in the business of supplying Delco lights for general illuminating purposes. It was later decided that it should be used by the Dayton Wright Aeroplane Company, which entered into possession. Still later, it was arranged that the syndicate composed of Talbott, Sr., Kettering and Talbott, Jr., should purchase the plant from the Domestic Building Company and convey it to the Dayton Wright Aeroplane Company. In November, 1917 (while the building was still incomplete), Mr. Allan R. Smart, a public accountant (of Barrow, Wade, Guthrie & Company) made an adjustment of the accounts of Deeds, Kettering, Talbott, Sr., and Talbott, Jr., for various advances, and a balance was struck of $683,732.16 as owing to the Domestic Building Company. In this adjustment, the land (25.55 acres) was taken at $1,200 an acre and the building at the amount of the expenditures upon it, making the price of the plant (called the Moraine plant) $836,401.08. The balance of $683,732.16 was covered by three individual notes of Talbott, Sr., Kettering and Talbott, Jr., in the proportion of two-fifths, two-fifths and one-fifth, as follows: H. E. Talbott, $273,492.87, C. F. Kettering, $273,492.87, and H. E. Talbott, Jr., $136,746.43. All of the notes were dated November 4, 1917, and were payable to the Domestic Building Company one year after date with 6 per cent. interest. The notes are unsecured. the makers of the notes have paid interest quarterly; and, in addition, Talbott, Sr., has paid $3,492.87 on the principal of his note, reducing it to $270,000, and Talbott, Jr., has paid $26,746.43 on the principal of his note, reducing it to $110,000. It appears that Mr. Kettering has made payments of $6,000. This transaction left the Talbotts and Kettering as the owners of the Moraine plant, which the Dayton Wright Aeroplane Company was operating, and the stock of the Dayton Wright Aeroplane Company for which they had subscribed had not been paid in.

The payment of the subscriptions for the stock of the Dayton Wright Aeroplane Company, the concurrent payment by that company for two plants (the Moraine plant, already mentioned, and another at Miamisburg), and the transfer of its stock, thus paid for, to the Dayton Metal Products Company were effected by an exchange of checks on December 1, 1917. Shortly before, the Miamisburg plant had been acquired by Talbott, Sr. (for the syndicate) for the sum of $60,000 and was turned over to the Dayton Wright Aeroplane Company at $127,202, the profit being divided between himself, Kettering and Talbott, Jr., according to their respective interests in the syndicate. To accomplish the desired result, the following procedure was adopted:

The Dayton Wright Aeroplane Company gave to the syndicate its check for the sum of $955,071.25, made up of the purchase price of the Moraine and Miamisburg plants ($836,401.08 less an item of interest ($8,531.83) for the Moraine or main plant and $127,202 for the Miamisburg plant). The Dayton Metal Products Company gave its checks to the syndicate for $173,459.55, for various balances of accounts, and for $999,500, the purchase price at par of the stock of the Dayton Wright Aeroplane Company (less five shares retained). The syndicate thus received checks to the aggregate amount of $2,138,030.80. The syndicate gave their check to the Dayton Wright Aeroplane Company in payment of the capital stock of $1,000,000 and another check to the Dayton Metal Products Company for $1,136,537.20 as the purchase price of certain securities which the Dayton Metal Products Company sold to the syndicate, making the total of the syndicate's checks $2,136,-537.20. The Dayton Wright Aeroplane Company gave its check to the Dayton Metal Products Company in repayment of advances for $44,-928.75, the difference between the sum of $955,071.25 paid by the company for the plants and the sum of $1,000,000 received for its stock. The transaction was accomplished with a minimum use of cash (less than $1,500), and as a result the Dayton Metal Products Company had all the stock (save five shares) of the Dayton Wright Aeroplane Company; the Dayton Wright Aeroplane Company had the Moraine and the Miamisburg plants; Messrs. Talbotts and Kettering had the securities which they had purchased from the Dayton Metal Products Company; and the Domestic Building Company (owned by Deeds and Kettering) continued to hold the notes which the Talbotts and Kettering had given to that company on the settlement in November.

On the transfer by the syndicate of the shares of the Dayton Wright Aeroplane Company to the Dayton Metal Products Company it was agreed that all dividends in excess of 7 per cent. per annum on the transferred stock, and in excess of 8 per cent. per annum on the common stock, should be paid to Talbott, Sr., Kettering and Talbott, Jr., in the proportion of two-fifths, two-fifths and one-fifth. Why they should have desired these profits to be divided in the syndicate proportions instead of taking the profits through their dividends, in the proportions in which they held the stock of the Dayton Metal Products Company, the purchaser of the shares, has not been made clear. The Talbotts and Kettering also took an option from the Dayton Metal Products Company to repurchase all the shares at any time within five years for the sum of $999,500.

Dayton Metal Products Company

Colonel Deeds originally held one-fourth of the stock of this company, or 500 shares. It appears from the minutes of the Board of Directors that at a meeting of the Board in Dayton, on May 21, 1917, President Talbott stated that the company had been advised by the Ordnance Department of the Army "that, in all probability, the entire facilities of the company would be utilized for munition work, and, in all probability, contracts would be given to the company as soon as appropriations were made by the Government." It is further set forth "that Mr. E. A. Deeds explained that he had been called to Washington and requested to take place on some of the committees of the Council of national Defense; that he had been to Washington and that he had accepted the call, and he therefore desired it that he might act as uninterested, directly or indirectly, in any manufacturing plant which was contemplating business with the Government, and that he desired to offer his resignation as Vice-President and as director of the company." The minutes show the acceptance of this resignation and that Mr. Kettering was elected Vice-President. The minutes of the meeting of May 21, 1917, conclude with the following statement:

"At this meeting Mr. Deeds offered for sale and discussed probable purchasers for his stock in the Dayton Metal Products Company, and Mr. Deeds offered to the directors his entire holdings of stock at its book value less 15% to cover costs and probable losses in view of the possibility of no future Government contracts being secured and the business of the company would have to be readjusted into lines being developed by the Experimental Department."

Some time subsequently—in the early part of the year 1918—the accountant drew a line across the last-mentioned statement in the minutes. He explains that he did not consider it "a corporate record," but a matter between the stockholders.

The testimony of the parties concerned is that Talbott, Sr., Kettering and Talbott, Jr., purchased all Deeds' shares in the Dayton Metal Products Company at their book value as of May 1, 1917, less 15 per cent. and gave in settlement of the purchase price their notes as follows:

H. E. Talbott	200 shares	$207,706
C. F. Kettering	200 shares	$207,706
H. E. Talbott, Jr.	100 shares	$103,853

The notes were dated May 22, 1917, were payable to Deeds' order one year after date, with interest at 4½%, and were placed in the hands of George B. Smith, the confidential agent of Deeds and Kettering. The notes were wholly unsecured. According to the stock certificate book the old certificates were cancelled and new certificates issued to the Talbotts and Kettering under date of May 22, 1917.

It is not only open to doubt whether the transaction described in the minute book took place on May 21, 1917, but on all the evidence it is reasonably clear that it did not take place on that date. The minutes are typewritten and pasted in the minute book. No one of the parties is willing to testify positively that the proceedings described in the minutes took place on that day. Mr. S. S. King, of the Dayton Lumber & Manufacturing Company, has testified that he and Deeds went to Washington on the same train on May 18, 1917, and that they were in communication every day in Washington, from May 19th to 23d. Furthermore, it appears that on May 21, 1917, when Mr. Deeds is represented as making his statement at the meeting of directors in Dayton, he was making his first appearance, according to the minutes of the Aircraft Production Board, at a meeting held by that Board on that day in Washington. He himself testifies that he was in Washington on that day. While Mr. Deeds is represented as resigning his office as Vice-President of the Dayton Metal Products Company in May, 1917, he continued to draw his salary until the end of June, 1917. The notes were placed in the custody of the confidential agent Smith, but he made no entry in Deeds' bills receivable book of these notes until

September. It does not satisfactorily appear, in view of the nature of some of the items, that the adjustment of accounts in fixing the book value and the determination of the amounts of the notes could have been made before June 30, 1917. There are stock certificates bearing the date of May 22, 1917, and purporting to have been issued after the issue of the new certificates to the Talbotts and Kettering for the Deeds' shares, but these certificates were issued to members of the Talbott family dividing the shares he had formerly held.

Upon all the evidence, it is not established that the stock was purchased as early as May 22, 1917, and there are many indications that the transaction was dated back to that date.

However, Colonel Deeds' stock was actually transferred on the books of the company, and the notes dated May 22, 1917, were given, apparently not later than September, 1917.

On December 31, 1917, interest was paid by the makers on their respective notes to that date; and interest was paid quarterly thereafter. On January 18, 1918, Talbott, Sr., paid $7,706 on account of the principal, reducing his note to $200,000; in February, 1918, Talbott, Jr., paid $3,853 on account of the principal, reducing his note to $100,000, and on September 11, 1918, Kettering paid, on account of his note, the sum of $10,000.

If the transaction was a *bona fide* sale of the stock Colonel Deeds thereby parted with all his stock interest in the Dayton Metal Products Company and thus did not have, by virtue of an interest in that stock, an interest in the profits of the Dayton Wright Aeroplane Company. The parties all deny that there is any secret agreement or option or understanding of any sort for a retransfer of the shares to Colonel Deeds, or for a sharing of profits with him.

To conclude: The fact is that the transfer of the shares in the Dayton Metal Products Company, which owns the stock of the Dayton Wright Aeroplane Company, was made to Colonel Deeds' intimate business associates on their unsecured notes, which are overdue and unpaid save to a small extent. But there is no proof upon which it can be charged that Colonel Deeds retained an interest in the Dayton Metal Products Company and thereby in the Dayton Wright Aeroplane Company.

Other Aviation Activities Centered at Dayton

The Wilbur Wright Field

This is a tract of about 2,245 acres leased to the Government by the Miami Consservancy District, of which Mr. Deeds was the head. It was a portion of the area selected by the Miami Conservancy District for the impounding of waters in the event of a serious flood. The property was acquired by the Government for a flying field and was developed by the erection of hangars, barracks, a store-house and other structures. Upwards of $3,000,000 has been expended by the Government in this development.

On April 30, 1917, Major (now General) Foulois was directed to inspect land sites for aviation purposes at various places, including Dayton, and several tracts at Dayton were examined by him and by Captain (now Colonel) Edgar on May 8. These officers were met at Dayton by Mr. Deeds and both Deeds and Orville Wright accompanied them on their inspection of the tracts in the vicinity. As to these, on May 11, 1917, Major Foulois reported as follows:

"The largest tract of land inspected is about ten miles from Dayton and contains about 4,000 acres. This tract of land is admirably suited for aviation purposes, is under the control of the Conservancy directors and any portion of it can be acquired by the Government at a very low cost. The purpose for which this land has been set aside by the State of Ohio makes it extremely desirable for aviation purposes, in that it will be always used for agricultural purposes only and no buildings or other obstacles will ever be erected within the area set aside. Options on this tract of land or any portion thereof will be mailed to this office within the next few days."

On May 15, 1917, General Squier recommended that the approval of the Secretary of War be obtained for the rental of several aviation training sites, including the one at Dayton which was thus described:

"Approximately 2,500 acres in the vicinity of Dayton, Ohio, at the rate of $17,500 per year with the privilege of renewal for three years and the option of purchase at $350,000, the cost of crop destruction being $75,000. This will provide a four-squadron training field."

Mr. Coffin, as Chairman, endorsed the proposal, stating that it was "in the judgment of the Committee a wise and necessary action," and the project was approved on behalf of the Secretary of War by the Acting Chief of Staff. On May 19, 1917, General Squier authorized Captain Edgar to lease this site and others, and to proceed with the contracting for the necessary buildings. The first lease was signed on May 22, 1917, (by Captain Edgar for the Government and Mr. Deeds for the Conservancy District) for 2,075 acres for the period ending June 30, 1917, at the rental of $2,000, the Government also agreeing to pay $73,000 to cover damages to crops. There was an option for renewal for the year beginning July 1, 1917, at the rental of $17,600, and for a further renewal for the year beginning July 1, 1918, for a tract containing 2,500 acres (including the 2,075 acres first mentioned) at a rental of $20,000, and for further annual periods ending July 1, 1922; and there was also an option to purchase the 2,500 acres for $350,000. Of the proposed tract of 2,500 acres, 505.27 acres were found to be marshy and were withdrawn and 250.47 acres, said to be of equal value, were added. This left a tract of 2,245.20 acres, for which a new lease was executed on July 1, 1917, for the period ending June 30, 1918, at the rental of $18,404.59, with annual options of renewal at a rental of $20,000 until June 30, 1922, with the option to purchase at the same price. The rental for the first year is explained by the fact that there were 210.47 acres of which possession could not be taken until March 1, 1918. Soon after that date the Commanding Officer at the field stated that 34.94 acres were in the possession of the Government, but that the remaining acres were available for occupancy but "were very low and swampy and in the present condition of no value to the Government." For the Miami Conservancy District it was stated that it had settled with the tenants at considerable expense in order to get possession and it was unwilling to take back the land from the Government.

There is an adjoining tract of 32 acres (part of the original 2,500 acres) which with 8 acres additional were sold to the Government as a site for a warehouse.

It appears from the testimony of Ezra M. Kuhns, the Secretary of the Miami Conservancy District, that at the time of our entry into the War the District had been able to secure options on only about 300 acres of the tract in question, but when negotiations with the Government began there was swift action. Mr. Deeds had brought the matter to the attention of Mr. Waldron as early as April 24, 1917, and had sent to him one of the District's engineers with maps. The following telegrams show the activity of Deeds and Talbott:

Telegram Deeds to Kuhns, April 30, 1917:

"Washington. D. C., April 30, 1917.

"Ezra M. Kuhns,
Miami Conservancy District,
Dayton, Ohio.

"Subject of our trip yesterday moving very rapidly and very satisfactorily. There is no doubt in my mind but what we will be successful. Avoidance of publicity very essential. Inspection will be made end of this week or first of next. You and Morgan* must plan now as though it was decided. E. A. Deeds."

Telegram Deeds to Kuhns, April 30, 1917:

"Washington, D. C., April 30, 1917.

"Ezra M. Kuhns,
Miami Conservancy District,
Dayton, Ohio.

"Options should be rushed in the vicinity of Fairfield raising the price if necessary. E. A. Deeds."

Telegram Deeds to Kuhns, April 30, 1917:

"Washington, D. C., April 30, 1917.

"Ezra M. Kuhns,
Miami Conservancy District,
Dayton, Ohio.

"Ohio State University is ordered to-day to cooperate with the Dayton School and Magruder Lord and Knight instructed to report at Camp Gorden, Canada, Monday to learn course of instruction. Publicity will follow these instructions, and no one outside of Signal Corps officers know of our plan for the larger school, and so far as everyone is concerned Dayton School is the Wright field civilian school. Think you should advise Wright Morgan Harold Talbott and Kettering, so that they will not disclose anything inadvertently. The civilian school will continue, regardless of what is done with the other plan, and Ohio state will give the preliminary instruction in military tactics and all class room work, while the Wright Field Company will give the instruction in aviation. Harold Talbott should be the channel through which publicity is given out, and there is no objection using the last statement if called upon. E. A. D."

Telegram Deeds to Talbott, May 11, 1917:

"Washington, D. C., May 11, 1917.

"H. E. Talbott,
Dayton, Ohio.

"Think your whole plan ideal.

E. A. Deeds."

Telegram Talbott to Deeds, May 11, 1917:

"May 11, 1917.

"E. A. Deeds,
Care New Willard,
Washington, D. C.

"Contracts remaining secured to cover twenty-five hundred acres will be closed by tomorrow evening. Will start Monday on immediate possession of land so the fields will be ready when buildings are finished. This applies to central one thousand acres in front of buildings. Builders may retain use of buildings and barns for a few months and in some cases until winter, but main fields must be prepared without delay if they are to be used this fall. Think best to give no reason for immediate possession and feel sure we can arrange it. We can arrange financial matters as suggested. Wire if you approve.

H. E. Talbott."

Telegram Deeds to Talbott, May 11, 1917:

"Washington, D. C., May 11, 1917.

"H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

"With few exceptions owners can, if necessary, continue to live in their houses for a year thus avoiding necessity of moving this summer. Their teams will be employed, giving revenue to them. District wants to try out flying on large scale and wants to try experiment at once. This is only a suggestion. You doubtless may have a better one. May be necessary to exercise option at once, and if so I will gladly go on District's note for full amount.

E. A. Deeds."

Telegram Deeds to Talbott, May 12, 1917:

"Washington, D. C., May 12, 1917.

"H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

"Suggest Kuhns Emmett Grant and Brown be here Monday morning for conference on conservancy bringing description of entire twenty-five hundred. Tax value and tax rate of property under discussion. Will be helpful. Publicity can be delayed at this end without difficulty. Everything moving nicely.

E. A. Deeds."

The partiality for this site does not appear to have been warranted by any advantages it can be said to possess. Indeed, no satisfactory reason appears for the securing of so large a tract, as apparently 1,400 or 1,500 acres would have answered the purpose.

Fields of about 650 acres were selected at Rantoul and Detroit for two-squadron fields, and the field at Dayton was for four squadrons. Both the leasehold interest and the option to purchase are subject to a flood easement. The evidence is that in case of a flood such as that of the year 1913, the impounded water (that is, after the completion of the dam which it is understood will be completed in two or three years) would cover the lowland to a depth of about forty feet; the lowest hangar would have twenty-four feet of water, that is, over the eaves, and the highest hangar would have thirteen feet of water. The barracks and various buildings which stand on higher ground would not be seriously affected. The warehouse itself (a large structure) is in a dry place, and the suggestion that some of the property stored there during the past year has suffered from moisture is not supported. Aside from the consequences of flood in the Miami Valley and the use of the area as a detention basin, it should be added that a considerable part of the tract consists of swamp land which is unsuitable for the use for which it was leased.

There is no evidence that Deeds himself had any interest in the land acquired. He was head of the Miami Conservancy District, but this was a public enterprise not organized for profit. Apparently, at an earlier period, advances had been made by the Dayton Metal Products Company (a portion of which had originally been charged to Deeds personally and later credited back to him and charged to the maintenance account of the company) which had been used for the purchase of options for the District. The result of this transaction was to leave the Dayton Metal Products Company a creditor of the enterprise but without interest in the land. Mr. Deeds had been appointed on the Munitions Standards Board in March, 1917, and he accepted appointment on the Aircraft Production Board on May 11, 1917. At this time, however, he was acting only in an advisory capacity and it was before the passage of the Act of August 10, 1917. He testifies that his only interest in this project was as a citizen of Dayton.

*Morgan was the engineer of the Miami Conservancy District.

The Contract for the Development of the Wilbur Wright Field

The next step was the placing of the contract for development. The contract was signed by Captain Edgar under the direction of the Chief Signal Officer, and its terms were not unreasonable. It was on a cost-plus basis with a sliding scale, which as applied to the amount actually expended gives the contractor a commission of seven per cent. with a maximum limit of $140,000. The contractor, the Dayton Lumber and Manufacturing Company, was recommended by Deeds. This Company has done nothing in an extensive way for several years, having been engaged since the year 1908 in selling material and in operating a planing-mill and a lumber-yard. Its capital stock was $75,000. Prior to April, 1917, one S. S. King had owned 117 of the 750 shares. King's holdings were then increased to 417 shares, and in acquiring these 300 shares King was backed by H. E. Talbott, who as President of the City National Bank of Dayton arranged for a loan of $60,000 for the purpose. King wrote Talbott on April 25, 1917: "As to the ownership of the stock, if you see fit to back me in it this can be determined in any manner that you see fit." It was not long after the control of the Dayton Lumber and Manufacturing Company was thus acquired that the arrangement was made for giving to this Company the contract to develop Wilbur Wright Field. King's narrative of the circumstances in which this contract was obtained is very illuminating and affords a notable contrast to the difficulties of many who unavailingly sought contracts with the Government.

King was sent for by Talbott and informed that he (King) had been "recommended down at Washington to assume the responsibility of putting up some buildings for Wilbur Wright Field," and suggested that he immediately set about effecting an organization for the purpose. This was on Saturday, May 17, 1917, and on Sunday Talbott telephoned to King, asking him to leave immediately for Washington. Accordingly King went to Washington on Sunday afternoon, taking the same train with Deeds. It was arranged that King should call the next day at Deeds' office, which, he was informed, was on the same floor with that of the contracting officer, Captain Edgar. Accordingly on the following day, May 19th, Deeds introduced King to Captain Edgar and in two or three days, on May 23rd, the contract was signed. As Colonel Edgar testifies: "King was brought down here by Colonel Deeds and recommended to us as a proper contractor, the most available in Dayton for the work."

The following is a portion of the correspondence between Deeds and Talbott relating to this contract:

Telegram Deeds to Talbott, May 23, 1917:

"Washing on, D..C., May 23, 1917.

"H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

"King probably returns to Dayton this evening. He is undertaking something which he alone is unable to get through with. It will be important that you give him a vision of this job and some very definite suggestions how to hit it in a big way. This is the biggest undertaking that has ever been put across in Dayton.

E. A. Deeds."

Telegram Deeds to Talbott, May 23, 1917:

"Washington, D. C., May 23, 1917.

"H. E. Talbott,
Dayton, Ohio.

"Suggest you personally direct publicity regarding contract to be given soon, so that it will avoid criticism and at the same time tell the story. This is particulary vital because of Captain Waring to start work Friday and the visitors whom I am bringing, who may read the papers. Your good judgment is needed on this.

E. A. Deeds."

Telegram Deeds to Talbott, May 24, 1917:

"Washington, D. C., May 24, 1917.

"H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

"In arranging for contract do not overlook a local contractor and lumber man in Osborne. Ezra Kuhns knows his name. He has been friendly to us and I promised him something to do on this job.

E. A. Deeds."

Telegram Talbott to Deeds, May 28, 1917:

"May 28, 1917.

"E. A. Deeds.
Care New Willard,
Washington, D. C.

"Just to remind you chartered accountants of Government selection, expense to be paid by contractor and charged to cost of work. Piece work for labor only on various unit sections in various classifications of work, will do much towards speed and economy. Each individual transaction to have the approval of officer in charge before it is effected.

H. E. Talbott."

Telegram Deeds to Talbott, May 31, 1917:

"May 31, 1917.

"H. E. Talbott, Sr.,
Dayton, Ohio.

"Wire what progress has been made on Dayton field. This is for our report to the council. If foundations have been started for instance and how many men on the job. This only needs to be a rough estimate.

Deeds, Aircraft Production Board."

Telegram Talbott to Deeds, June 1, 1917:

"June 1st, 1917.

"Deeds,
Aircraft Production Board,
United States War Department,
Washington, D. C.

"Steam shovel and large trench digging machine now in place. Three cutting gangs at work. Teams and tractors on ground. Carpenters finishing sheds and office for construction purposes. Foundation excavations in progress. Have plant and equipment for six concrete gangs which will at work early in the week. Sidewalks progressing. Repairing highways to facilitate trucking operations from Dayton. Purchased five new Packard trucks to augment transportation over the existing available trucks. Next week will see everything booming along. All material lumber cement planks board roofing located and on the way. Wish you would think over method of authority which can be given me to rush transportation of railway cars. This looks like the main point of congestion. All departments of construction now organized with experienced and competent supervisors and foremen. All this in spite of the fact that it has rained every day since Waring has been here.

H. E. Talbott."

Despite the indications of these messages and of his transactions with King, Mr. Talbott testifies positively that he had no interest in the enterprise, except as a citizen of Dayton and got nothing out of it beyond 6 per cent, interest received by the Dayton Metal Products Company on money loaned.

King had no capital available for the enterprise, nor had the Dayton Lumber and Manufacturing Company. King's testimony is:

"Q. Did you have the capital to swing that? A. Not without assistance.

"Q. Where did you expect to get the assistance? A. When I talked to Mr. Talbott he told me on the Saturday afternoon, I said, 'Well, this will take a good deal of money.' He said, 'Yes, but', he said, 'you need not worry about that. We will work out some way for that.' He said, 'I do not know how we will work it out, but we will work out some way for that'."

The financial assistance that King needed was obtained upon the credit of the Dayton Metal Products Company, supported by the personal guaranties of H. E. Talbott and C. F. Kettering. Notes of the Dayton Lumber and Manufacturing Company to the extent of $400,000 were discounted by the Dayton Metal Products Company with the American Exchange National Bank of New York. It was originally contemplated that these notes should be endorsed by Deeds and Talbott, as is shown by the following extract of a letter to Mr. Talbott from W. H. Bennett, Vice-President of the American Exchange National Bank, under date of June 25, 1917:

"Referring to the conversation which the writer had with you on Thursday, I have conferred with Mr. Kenzel, Assistant Cashier of the Federal Reserve Bank, and upon your statement that the Dayton Lumber and Manufacturing Company is under contract with the United States Government for the preparation of the aviation field at Dayton, and that said company is to receive payments on the tenth of each month on the presentation of receipted vouchers for work completed in the previous month; and that it is the intention of the Dayton Metal Products Company to make advances to said Dayton Lumber and Manufacturing Company of amounts necessary to carry on the work, he ruled that the paper executed by the Dayton Lumber and Manufacturing Company and endorsed by the Dayton Metal Products Company to cover said funds so advanced will be eligible for rediscount with the Federal reserve bank.

"Therefore, we feel that it will probably be of mutual advantage to provide for the advance of $400,000 requested from us by a three months' note executed by the Dayton Lumber and Manufacturing Company, to the order of the Dayton Metal Products Company and endorsed by Mr. H. E. Talbott and Mr. E. A. Deeds. If you so desire, the endorsement of the individual can be secured by an assignment from the Dayton Metal Products Company of certain securities now in safe keeping with us to the individuals referred to."

It was subsequently arranged that the endorsements should be those of Talbott and Kettering, who also gave their separate agreement of guaranty. The avails of discounted paper were passed by the American Exchange Bank to the credit of the Dayton Metal Products Company. It appears from the accounts between the Dayton Lumber and Manufacturing Company and the Dayton Metal Products Company that, while the latter company ultimately paid the notes, their proceeds were used in large part from time to time for the benefit of the Dayton Metal Products Company.

The credit to the Dayton Lumber and Manufacturing Company, thus extended to it upon its notes, was furnished without security, or, as Mr. Talbott put it, with "no further security except in the man (King). I trusted the man; I knew his contract." After the contract had been obtained, King increased his stockholdings in the Dayton Lumber and Manufacturing Company by the purchase of 104 additional shares, borrowing for the purpose $20,000 from the Dayton National Bank.

It appears that the total amount paid by the Government under the contract with the Dayton Lumber and Manufacturing Company, to August 14, 1918, amounted to $3,115,161.94. This represents the amount paid for the cost of the work, that is, for lumber, materials, etc. The commission or profits of the contractor, which had been paid to that date, amounted to $102,436.04. There has been considerable trouble in connection with the contract, and the accounts are far from being in satisfactory shape. An audit of the books of the company was made by Barrow, Wade, Guthrie & Co., to November 30, 1917. They reported that they found "the payrolls very incomplete, full of errors, corrections and erasures" and that there was "abundant evidence that great laxity and carelessness has been exhibited by the employes of the company, especially those in the paymaster's department." These statements are amply confirmed by the evidence in this investigation, and the accounts are in course of being reaudited by Government accountants. The consideration of the various irregularities in the accounts and of the questions to which they give rise must await the result of this examination. It will be observed that the Government has withheld a large part of the compensation of the contractor until a satisfactory adjustment has been made. Of the profits received from the Government, it would appear that the moneys have been retained in the business of the Company, except to the extent of a dividend of $37,500, that is, 50% on the capital stock. Of this dividend, King was entitled, on the 521 shares acquired in his name, to $26,050 and of this amount it appears that he had received 70%, or $18,235, to July 1, 1918. He had paid $11,000 on account of his loan ($21,000) to the Dayton National Bank. He had paid nothing on the $60,000 loan from the City National Bank. No agreement has been proved for a division of profits on this contract, and there is no proof that Colonel Deeds has had an interest in the contract or in the Dayton Lumber and Manufacturing Company. Even if it appeared that the Dayton Metal Products Company was interested in the contract (which would explain transactions otherwise difficult to understand), this fact would not affect Colonel Deeds unless he were found to be interested in that Company. The question would thus come back to the transfer of his stock in the Dayton Metal Products Company, which has already been considered.

McCook Field (formerly known as North Field)

This is a field of approximately 200 acres in and adjacent to Dayton, which was leased by the Government from the Dayton Metal Products Company, and has been used for the purpose of making various tests. Lt.-Col. Vincent first suggested another field (South Field or Moraine Field) and brought the matter to the attention of Colonel Deeds by whom that field was principally owned. On September 27, 1917, Colonel Deeds sent the following telegram to Mr. Talbott:

"Washington, D. C., September 27, 1917.

"Mr. H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

"Colonel Clark takes letter regarding Moraine flying field with him to Dayton to-night. George McCann has another letter, for Mr. Kettering. Government will lease land, put up buildings and operate experimental field. Lease will be for three years without privilege of purchase, as that is not necessary. Have complete description of property prepared, also statement of cost of buildings already erected and suggested monthly rent arrangement and have George McCann bring them to Washington to complete lease. Have him prepare deed for this property to Mr. Kettering, who in turn, will lease it to the Government.

Deeds, Equipment Division."

Talbott and Kettering refused to consent to this use of South or Moraine Field, as it was said to be needed for experimentation in con-

nection with the Dayton Wright Airplane Company, and they suggested North Field, or what afterwards became known as McCook Field. The latter tract had originally been purchased by Deeds and Kettering, each of them bearing one-half of the cost, and they had made some improvements such as levelling, removing trees, etc., and had erected one or two small buildings. The object of their purchase had been to develop a training field for aeroplanes, to be used by civilians, but this project could not be carried out. The suggestion was that this parcel, with approximately 82 acres of land adjoining which was owned by the Dayton Metal Products Company, would be suitable for the Government's use as an experimental station. Deeds did not wish to be a party to the lease, and conveyed to Kettering his undivided one-half interest in the parcel owned by them in common, and Kettering then conveyed that parcel to the Dayton Metal Products Company which thereupon leased the entire tract to the Government.

The lease was dated October 4, 1917. Colonel Deeds was present at the conference at which the terms were settled and sent the following telegram to Talbott on October 3rd:

"Washington, D. C., October 3, 1917.

"Mr. H. E. Talbott,
City National Bank Building,
Dayton, Ohio.

"Have worked out a lease for the North Dayton field twelve thousand eight hundred dollars a year without cash payment. It is the best thing that can be done under the circumstances and suggest its acceptance. Craighead will discuss it with you in detail when you see him.

Deeds, Equipment Division."

Lt.-Col. Edgar, under the authority of the Chief Signal Officer and the approval of the Chief of Staff and of the Assistant Secretary of War, signed the lease on behalf of the Government. The rental is at the rate of $12,800 a year with an option of renewal from year to year, until June 30, 1921. There is no option to purchase; the lessor agrees that at the expiration of the lease the lessee may remove the structures and improvements erected by it upon the premises.

The contract for the development of the field was made with the Dayton Lumber and Manufacturing Company, notwithstanding the fact that the contractor had failed to give satisfaction in connection with the Wilbur Wright Field. This is explained by Colonel Edgar as follows:

"We had an organization at the Wilbur Wright Field. We had practically reorganized King's force, and it was determined to take them over to McCook Field, which was brought to us by Colonel Deeds as a rush job which must be done immediately. . . . He personally brought the proposition to me as a proposition that had to be put through immediately. They had no place to test the planes that were coming out. We did not pick out McCook Field; we had nothing to do with its location. A contract was made for the rental of the ground of the McCook Field, and we were importuned to take our organization over there with this contractor and finish this job up and it was done.

"Q. Importuned by whom? A. By Colonel Deeds."

The total amount expended by the Government upon McCook Field, to August 14, 1918, amounts to $949,085.35, and the contractor's compensation is seven per cent. of the cost with a maximum limit of $46,200. The amount paid, to that date, as contractor's profit was $26,667.65. The remaining portion of the total compensation has been withheld awaiting the audit of the contractor's accounts.

There is no proof that Colonel Deeds has had an interest in the contract for the development of this field. Nor does it appear that he had an interest in the lease executed by the Dayton Metal Products Company to the Government, or in the rent reserved. While Colonel Deeds originally owned a part of the tract leased to the Government, he conveyed—by what purported to be an absolute sale—his interest to Kettering, and was not interested in the lease by Kettering's grantee, the Dayton Metal Products Company, unless he was interested in the stock of that company, a question already considered. It is understood that the amounts advanced by Deeds, in connection with the development of that portion of the tract in which he had an undivided one-half interest, were taken into account in the settlement that was made in November, 1917, when the amount to be paid (by notes) to the Domestic Building Company for the plant acquired by the Dayton Wright Airplane Company was determined; but this fact is not sufficient to establish an interest in the lease so as to bring the matter within the range of the Federal penal statute.

South Field or Moraine Field

This is a tract of about 110 acres lying south of the City of Dayton and a short distance from the plant of the Dayton Wright Airplane Company. The greater portion of the land belongs to Colonel Deeds. It has been improved by the erection of a number of hangers and other buildings. This land was leased about November 30, 1917, to the Dayton Wright Airplane Company for a period of three years, at a rental of $1 per year. It is used by that company as a place of experimentation. The expenditures for hangers and improvements upon South Field which had been made by Colonel Deeds had been taken into account in the settlement made with the Domestic Building Company.

Acceptance Field

This is a field lying close to the plant of the Dayton Wright Airplane Company, upon which the aeroplanes it manufactures for the Government are taken out for trial. The greater part of this field belongs to the Moraine Development Company and it appears that Deeds is interested in this field as a stockholder in that company. Deeds and Kettering each hold 2055 shares, out of a total of 10,003 shares, the majority of the stock being held by Adam Schantz. This field is leased to the Dayton Wright Airplane Company. The transactions relating to South Field and Acceptance Field were with the Dayton Wright Airplane Company and not with the Government.

(3) Colonel Sidney D. Waldon

During the period in question Colonel Waldon was a stockholder in the Packard Motor Car Company. This interest he retained, but he disclosed it to the Aircraft Production Board at its meeting of August 27, 1917, and to the Secretary of War, and it does not appear that he took part at any time in any proceedings of the Board, or in any other transactions, in relation to the Packard Company. No interest on his part in any other concern having dealings with the Government is shown.

(4) Colonel Robert L. Montgomery

At the time Colonel Montgomery entered the service of the Government he was one of the directors of the J. G. Brill Company, of Philadelphia, holding one share of common stock. Colonel Montgomery states that he resigned from the Board of Directors and sold his share of stock on September 22, 1917, before any contract was made by that company with the Government and that he did not negotiate the contracts in which that company is interested. Colonel Montgomery further states that at the time he entered the Government's service it was agreed with his partners that no member of the firm should have any interest in any concern connected with aircraft work. It appears that the wife of one of his partners held for some time 200 shares of the stock of the Curtiss Aeroplane and Motor Corporation, which she had purchased in her own right, and then sold it, and that subsequently she bought some 500 shares of the stock of the Wright-Martin Aircraft Corporation. With these transactions Colonel Montgomery had no connection.

Colonel Montgomery's firm (Montgomery, Clothier & Tyler), in August, 1917, took an interest of $250,000 in an underwriting syndicate through the National City Company for the flotation of $5,000,000 six per cent. notes of the Electric Auto-Lite Corporation. Later, Montgomery, Clothier & Tyler issued a circular offering the notes for sale to the public. These notes of the Electric Auto-Lite Corporation were secured, in part, as the circular states, by a specific pledge of collateral among which were shares, amounting to $12,500,000 in par value, of the common stock of the Willys-Overland Company. The Farmers' Loan and Trust Company of New York was made trustee to receive the pledge. The sale of all the notes was completed by September 12, 1917, $116,000 being sold through Montgomery, Clothier & Tyler, who received $8,500 in settlement of their interest in the underwriting. Colonel Montgomery states that this transaction, with others, was undoubtedly mentioned to him by his partners at or about that time, but that he never saw the circular or had the transaction fully explained to him until May of this year. In August and September, 1917, at the time of this transaction, Colonel Montgomery on behalf of the Government was negotiating contracts with the Willys-Overland Company for the manufacture of engines for training planes. The Willys-Overland Company not only made these contracts, but also had a substantial interest in the Curtiss Aeroplane and Motor Corporation, which at the time had contracts with the Government for aeroplane engines. While the Electric Auto-Lite Corporation was affiliated with the Willys-Overland and Curtiss Companies, the transaction in question concerned the flotation merely of notes of the Electric Auto-Lite Corporation, and the interest of purchascrs of these notes in the stock of companies having dealings with the Government was only through the pledge of the Willys-Overland stock as collateral security. It appears that while Colonel Montgomery's firm took part in the sale of the notes as members of the underwriting syndicate, none of the notes were actually purchased by his firm, either for firm account or for any individual partner, and in these circumstances it is believed that there would be no sufficient ground for holding the above-quoted statutes to be applicable.

Apart from the above matter there is no evidence that Colonel Montgomery has had an interest in, any corporation, association or firm with which he has dealt as an officer or agent of the Government.

OTHER OFFICIALS

Lt.-Col. Jesse G. Vincent

In April, 1917, Mr. Vincent was vice-president of the Packard Motor Car Company in charge of engineering, with a salary of $25,000 a year. Under his contract with that company, made in 1912, he was entitled to subscribe for certain shares of its stock. On August 15, 1917, having resigned his office, he made a settlement with the company, receiving his salary to that date and a bonus of $5,000 for the preceding year's work, and at the same time, through the exercise of his option, he acquired $15,000 of common stock at par which with the stock dividends previously declared thereon gave him approximately 347 shares. He had purchased outside about 82 shares, so that he became a stockholder in the Packard Motor Car Company to the extent of 429 shares of the common stock of the par value of $42,900. This stock he has continued to hold since August, 1917; he has received dividends of 1¾ per cent. quarterly with the exception of one quarter for which a dividend was passed.

From about May 27, 1917, until August 15, 1917, Mr. Vincent, while paid by the Packard Company, was actually at work for the Government in the development of the Liberty Motor. It is said that for this period he was "loaned" by his company to the Government. On September 3, 1917, he received a commission in the Army with the rank of Major and later he was raised to the rank of Lieutenant-Colonel. About July 1, 1917, he was put in charge, as a civilian, of the Engine Design Section of the Signal Corps and he remained in this service after he was commissioned and until October 1, 1917. On the latter date, the Airplane Experimental Department of the Signal Corps was established in charge of Lt.-Col. Clark, with headquarters at McCook Field, Dayton, and Major Vincent was associated with this department as its executive officer with his office at the Lindsey Building, Dayton. On February 6, 1918, he was put in charge of the Airplane Engineering Department at Dayton and in command of McCook Field. He is now in charge of the Airplane Engineering Division of the Bureau of Aircraft Production.

Both before and after Major Vincent received his commission in the Army, he had transactions with the Packard Motor Car Company in which he acted on behalf of the Government. On June 6, 1917, the Aircraft Production Board adopted a resolution which provides, after recitals, as follows:

"Therefore be it resolved, that the Board proceed immediately to secure space wherein to bring together sufficient draftsmen under a competent engineering organization to produce complete designs of 8 and 12 cylinder motors, to be known as the US-8A and US-12A respectively; that the design for the 4 and 6 cylinder motors follow as soon as practicable, these motors to be known as the US-4A and US-6A respectively. These designs and drawings to be made to include the designs and drawings for the special tools necessary to produce the parts of these motors. The Board should undertake to have the parts made wherever in its judgment they can be most quickly and advantageously done and have them sent to Washington and assembled here in space to be secured, parts to be made for Five (5) US-12A and five (5) US-8A.

"And Be It Further Resolved that the Board recommend to the Office of the Chief Signal Officer that the sum of $250,000 be immediately set aside to carry on this work and that a disbursing officer be assigned to handle this fund."

This allotment, or $249,159.10, was paid to the Packard Motor Car Company for drawings, models, tests, etc., and for six US-8A's and five US-12A's which were to serve as standardized engines. No written contract for this work or written order for this work setting forth unit prices or specifying the terms on which the work was to be performed is found in the files of the Signal Corps, and in this respect the proceeding was very irregular. Instead of there being an appropriate agreement or written order, it appears that verbal orders were given from time to time by Mr. Vincent, which, it is testified, were confirmed in conversations with Mr. Deeds.

(*Continued on page* 485)



THE NEWS OF THE WEEK



Pershing Honors Gallant Aviators

Washington.—The Commander-in-Chief of the American Expeditionary Forces, in the name of the President, has awarded the distinguished service cross to the following officers and soldiers for acts of extraordinary heroism: First Lieutenant Joseph C. Raible, 147th Aero Squadron; First Lieutenant Arthur H. Alexander, 6th Aero Squadron; First Lieutenant Donald B. Warner, 96th Aero Squadron; First Lieutenant Alfred A. Grant, 27th Aero Squadron; First Lieutenant Charles W. Drew, 13th Aero Squadron; Second Lieutenant Arthur H. Jones, 147th Aero Squadron; First Lieutenant Walter L. Avery, 95th Aero Squadron; First Lieutenant Fred W. Norton, 27th Aero Squadron; First Lieutenant Robert Fulton Raymond, 27th Aero Squadron; First Lieutenant Louis G. Bernheimer, pilot; Second Lieutenant John W. Jordan, F.A. observer; Second Lieutenant Roger W. Hitchcock, pilot (since reported killed in action); Second Lieutenant James S. D. Burns, 165th Infantry, observer, deceased; First Lieutenant Joel H. McClendon, pilot, deceased; Second Lieutenant Charles W. Plummer, 101st F. A. observer, deceased; First Lieutenant Philip R. Babcock, pilot; Second Lieutenant Joseph A. Palmer, 15th F. A. observer; First Lieutenant Richard C. M. Page, pilot; First Lieutenant John I. Rancourt, 103rd F. A. observer; Lieutenant G. A. Vaughn, Lieutenant T. J. Herbert, Lieutenant M. L. Campbell, Lieutenant L. A. Hamilton, Lieutenant J. A. Keating, Lieutenant H. C. Knotts, Lieutenant H. L. Blair, Lieutenant W. W. Lauer, Lieutenant F. E. Luff, Lieutenant T. L. Moore, Lieutenant J. O. Creech, Lieutenant W. Clements, Lieutenant E. E. McKindley, Second Lieutenant H. Burdick, Second Lieutenant A. F. Diamond, Lieutenant E. W. Springs, Lieutenant G. D. Wicke, Lieutenant Theodore E. Boyd, 88th Aero Squadron; First Lieutenant Charles Raymond Black, pilot; Second Lieutenant Earle W. Porter, observer; Second Lieutenant Dogan H. Arthur, pilot, 12th Aero Squadron; Second Lieutenant Phil A. Henderson, observer, 12th Aero Squadron; Lieutenant Edward Orr, pilot 12th Aero Squadron; Second Lieutenant Byrne E. Raucom, observer, 1st Aero Squadron; First Lieutenant William P. Erwin, pilot, 1st Aero Squadron; Major William Thaw, 103rd Aero Squadron; First Lieutenant Edward V. Rickenbacker, 94th Aero Squadron; First Lieutenant Douglas Campbell, 94th Aero Squadron; Second Lieutenant Ralph A. O'Neill, 147th Aero Squadron; First Lieutenant James A. Meissner, 94th Aero Squadron; Captain David McK Peterson, 94th Aero Squadron; First Lieutenant Frank A. Llewellyn, pilot, 99th Aero Squadron; Second Lieutenant, Roland H. Neel, observer, 99th Aero Squadron; Lieutenant Thomas J. Abernathy, 147th Aero Squadron; Second Lieutenant Alan F. Winslow, 94th Aero Squadron.

Armored Plane Captured

With the American Army Northwest of Verdun.—Americans captured an immense German armored battleplane on Oct. 23 north of Brieulles. The machine was virtually intact, but the pilot and gunner made their escape.

It is supposed that the battleplane was downed a day or two ago by American aviators. Just when the machine landed is unknown. Infantry forces found the monster.

A number of valuable instruments and two machine guns were captured. The battleplane was equipped with a bomb-dropping device, and had a gun and sighting arrangement so fixed that the gunner could see to shoot directly beneath him. This gun was for firing on roads. So far as known this is the first plane of this type captured by Americans. Half the fuselage was covered with quarter-inch armor.

Interned in Holland

The Navy Department is informed that Second Lieutenant Frank Nelms, Jr., U. S. Marine Corps, pilot, and Second Lieutenant John Frederick Gibbs, observer, while flying a navy bombing plane were compelled, because of engine trouble, to land in Holland, where they were interned.

Exploits of Famous Airmen Not Published

London.—British air force authorities do not allow publication of stories of exploits of the most successful British aviators using the names, as in France and Germany, because it is considered unfair to men who are doing fine work, but who have not had opportunities for winning many air victories. Also they say the loss of a famous aviator creates a bad impression if the people at home have been led to believe that he is almost a superman.

This view is also taken by many British flying officers. One of them, recently wrote: "I go into the air perfectly equipped to bring down 'Hun' machines. A pilot on artillery observation or photography work goes up to do a highly necessary job, and perhaps has to spend several hours over it, and in any case has other work to do and cannot go straffing, however much he might like it. Why should I be advertised and glorified any more than he is? We both are trying to do our job, and nobody can do more."



Lieut. Jacques M. Swaab, American Air Service, the newest American "Ace", who downed his fifth German plane on October 31, according to press reports

Doug. Fairbanks Will Help War Fund Drive

Washington.—Douglas Fairbanks, motion picture star, enlisted for the united war work drive. Douglas said he had so much fun raising money for the liberty loan that he is going to jump in and help raise the $170,500,000 for the Y. M. C. A. and the six organizations associated with it.

Fairbanks made his announcement in a characteristic way.

"Hey, fellows," he said as a bunch of khaki-clad "Y" men on their way overseas filed through the Willard Hotel. "You are regular guys and I'm going to help raise that hundred million or two to give you a better chance to help our boys over there."

The athletic movie man will be in California during the drive, November 11 to 19. He says he is thinking about "touching" a few western millionaires and flying from California to Washington with the money.

"Aren't you afraid of a hold-up?" he was asked.

"Aeroplane hold-up!" he exclaimed. "Great stuff! That would beat the old stage coach hold-up all to pieces, wouldn't it?"

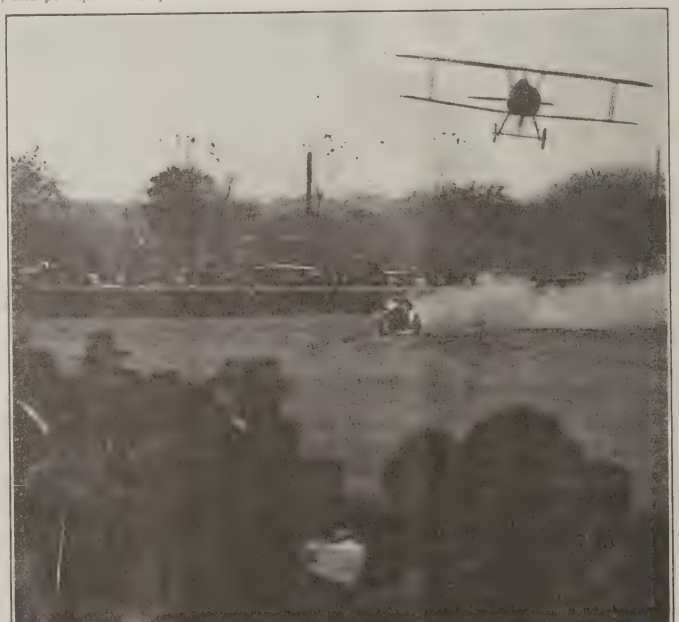
Anyhow, Douglas says he is going to get the money.

Aeroplane Extras Give Soldiers News

With the American Army Northwest of Verdun. —The men in the most advanced positions on both sides of the lines are reading the newest developments regarding an armistice almost as early as those to whom the daily papers are available. Propaganda officers, both American and German, are using aviators to distribute the notes which have passed between Berlin, Vienna and Washington, and preparations were made to disseminate the news of Turkey's downfall.

Arthur Page and Walter Lippmann are conducting the propaganda from the headquarters in Paris and the details are being carried out by a big force, with which are co-operating the Personnel Staff and Flying Corps.

President Wilson's note to Austria was circulated by the Americans among the Austrian troops within a few hours after it was delivered.



Aeroplane vs. Automobile. Near the end of the race between Louis Chevrolet on his Frontenac racer and Lieutenant E. C. Meaney in a Thomas-Morse scout plane, which was one of the events at the Aero Carnival at Belmont Park on October 26th

Allied Instructors Finish Their Work

During the past fifteen months the American Balloon Corps in France has developed a large number of skilled balloonists, and from now on will be able to furnish experienced men from the front to serve as instructors; for this reason the British Government believes the time has come for this government to relinquish its claims on these men, whom they need in their own service.

Major J. Rutherford Hannay, Captain R. M. A. Edlundh, Captain Robert Wann, and Flight Sergeant H. C. Hill of the Royal Flying Corps, who have been in the United States several months initiating a system of instruction for the Balloon Corps and in procuring and standardizing material, have reported to the Division of Military Aeronautics from balloon fields in various parts of the country prior to returning to their stations overseas.

Lufberry's Sister In War

Lawrence, Mass.—Miss Mary Lufberry, sister of the late Major Lufberry, New England's "Ace of Aces," is going to France. She seeks, in her own words, in some way and to some extent to avenge the death of her brother at the hands of the Hun.

With that object in view Miss Lufberry has been training at the Lawrence telephone exchange preparatory to going to France as an operator. She is confident once she gets there she will find a way to square accounts with the enemy. She feels that even in the humble position of a telephone operator she will be doing something to help cripple her brother's slayers.

24 Psychologists Needed

An unusual opportunity is offered to twenty-four men of limited service classification who have had psychological, physiological and physical training, to enter the air service, according to announcements made by Major Willard Wadsworth, Department Air Service office in Greater New York.

These men are needed for personnel units now being organized, to give tests of aptitude for flying to applicants for training as pilots, observers, bombers and balloonists. They will be sent to the School of Military Aeronautics at Princeton, N. J., for a short course of training before assignment to duty. Candidates should have at least two years of education beyond high school and some laboratory experience to their credit.

Six of the men will be assigned for duty at Princeton. The other eighteen will be sent to San Antonio, Chicago and San Francisco. Application should be made to the Air Service Trade Test Board, 104 Broad street, New York City, room 902.

Roland Garros Killed

Geneva, Switzerland.—The American Red Cross announces that Roland Garros, the famous French aviator, and one of the pioneers in flying in a heavier-than-air machine, was killed Oct. 5, and buried at Vouziers.

Previously it had been reported that Garros was wounded.

Oneonta Field Changed to Ream

As a tribute to the late Major William R. Ream, Oneonta Gunnery School has been changed to Ream Field by order of the Director of Military Aeronautics.

According to unofficial reports great improvements are to be made at Ream Field and it plans are carried out this field will be a close rival of Rockwell Field, although it will still be under the direction of our Commanding Officer, Lieutenant-Colonel H. B. S. Burwell—Rockwell Field Flight.

In 64 Hours in Air Goes 4,000 Miles

Washington.—Lieutenant John E. Davis, United States Air Service, recently travelled 4,000 miles in the air in a zigzag course from the Gulf of Mexico to the Great Lakes, at Mount Clemens, Mich., and return. He was in actual flight sixty-four hours and had many thrills and numerous narrow escapes.

Nine days elapsed from the time Lieut. Davis left Ellington Field, Houston, Texas, until his return. He travelled without a mechanic, did not change either plane or motor, and carried an extra gasoline tank, giving him a capacity of fifty gallons.

He started from Ellington Field Friday afternoon at 1 o'clock, spent the night in Dallas and from there he flew to Memphis. Sunday night at 8 o'clock he made Indianapolis by following the Mississippi north to St. Louis and swinging east by way of Springfield and Rantoul, Ill. There he was forced to take the ground in the dark without landing lights. On Monday he flew to Cincinnati and the following day to Mount Clemens.

On the return trip Lieut. Davis encountered a heavy storm over the Mississippi Valley and fell through it from an altitude of more than 4,000 feet to 300 feet.

Flies 228 Miles in One Hour 45 Minutes

Pittsburgh.—A new record time for an aeroplane flight between Dayton, Ohio, and Pittsburgh was claimed on October 29 by James M. Schoonmaker, Jr., son of the vice-president of the Pittsburgh and Lake Erie Railroad, who covered the distance of 228 miles in a De Haviland battleplane in 1 hour and 45 minutes. An average speed of more than two miles a minute was maintained.

Young Schoonmaker, who is chief engineer of the Dayton-Wright Aeroplane Company, received a long distance telephone message that his father, who just had undergone an operation, was seriously ill. He immediately decided to make a flying visit to his bedside, and obtained permission to use a De Haviland Four battleplane. With Howard Rinehart as pilot he left Wright Field, Dayton, at 11:15 a. m. and landed here at 1 p. m. on Brunots Island.

Schoonmaker said the fastest previous record aeroplane time between Dayton and Pittsburgh was 2 hours and 5 minutes.

American Official

Washington.—Gen. Pershing has cabled the following:

> In spite of poor weather conditions on Oct. 29, our aviators were again active on the front of the 1st Army and shot down three enemy aeroplanes and one observation balloon. All our machines returned.

Washington.—Bombing units attached to the American First and Second armies dropped six tons of explosives on Oct. 30 on Barricourt, Bayoneville and Longuyon, Gen. Pershing reports in his communique.

The evening communique for Oct. 30 reports officially the downing of twenty-one enemy aeroplanes by pursuit squadrons of the First American Army and states that two of the American machines are missing.

Washington.—The War Department received the following from Gen. Pershing on Oct. 31:

> Our pursuit squadrons operating on the front of the 1st Army shot down twenty-one enemy aeroplanes and two observation balloons. Two of our machines are missing.
>
> Yesterday our bombing units attached to the 1st and 2d Armies carried out a number of successful raids, dropping six tons of explosives on Barricourt, Bayoneville and Longuyon.

"With more favorable weather conditions on Oct. 30 there has been increased aerial activity on the front of the First Army throughout the day. Our pursuit squadrons engaged the enemy in numerous combats, in the course of which eighteen enemy aeroplanes were shot down. Five of our machines did not return. Our aviators also carried out important reconnaissance and photographic missions."

Leaps Mile Safely from an Aeroplane

Washington.—It was announced on October 27 by the War Department that Chauffeur R. W. Bottriell of the 145th Air Squadron had performed the feat of jumping successfully with a parachute from an aeroplane at Kelly Field, San Antonio, Tex. The aeroplane was at an altitude of 4,800 feet, almost a mile high, when the jump was made. There was a strong wind blowing, but Bottriell judged his distances nicely and landed safely.

The pilot of the aeroplane stalled the motor slightly just before the jump was made, banking to the right so as to get the tail out of the way of the parachute when Bottriell jumped over the side. A large American flag attached to the parachute during the drop was flying during the descent.

As a result of this test American aeroplanes possibly will be equipped with parachutes as a possible means of saving the aviator in case of an accident.



WATCHING THE AVIATORS AT BELMONT PARK

Left to Right: Alan R. Hawley, President of the Aero Club of America; Colonel F. M. Davis, U. S. A., Mrs. Charles A. Van Rensseleer, Captain Jacques Boyriven of the French Army, and Henry Woodhouse, a Governor of the Aero Club of America, in the official stand at the U. S. Army Aviation Meet at Belmont Park, L. I., Saturday, October 26th

The AIRCRAFT TRADE REVIEW

1,000 Plane Motors Now Made Weekly

Washington.—Production of American aircraft has now reached a state where it is being limited practically only by facilities for transporting the aeroplanes to France. The production of Liberty motors during October reached a stage of 1,000 a week, a goal which had not been hoped for at soonest until December.

The latest official compilations show that since June 1 approximately 2,500 fighting aeroplanes of all descriptions have been shipped to the American forces in France. These 2,500 planes included nearly 150 heavy bombers. The remainder were planes of all classes, including observation machines and day bombers.

Reports from all the production centers show the output is growing rapidly. The American forces have been moving so fast in the last few weeks that it has been found necessary to give up some of the transportation space which was intended for aeroplanes to other material, but within the next few weeks the full movement of aircraft is expected to bein swing again.

Flax Needed in Britain; Linen Used in Aeroplanes

London.—The great development of the aeroplane in war has made linen, and therefore flax, a military material. Before the war Russia supplied three-fourths of the 100,000 tons of flax that British linen manufacturers used every year. Some flax was grown in Ireland, and when the Russian imports ceased Irish flax cultivation was at once taken in hand.

A flax extension committee, which has now developed into the Irish Flax Society, Ltd., took the matter in hand. First a guarantee fund of $2,500,000 to support the campaign was subscribed. More acreage was at once put into flax; the seed was secured from Canada and elsewhere. The result has been that the Irish flax acreage has increased from something over 50,000 acres, two years ago to nearly 150,000 acres, which should bring an increase of 30,000 tons in flax production. This still leaves a shortage of 40,000 tons, which is being made up by importations from British East Africa and from Canada. If the British empire can become self-supporting in the matter of linen materials during the war it will be a lasting trade advantage.

New Aerial Range Finder

By a little instrument attached to aeroplane moving picture cameras, Dr. S. N. Baruch, of San Francisco, says the efficiency of allied artillery will be increased 10,000 per cent. His aerial range-finder has the endorsement of Capt Alter, range expert at Fort Scott, Cal., and former profcssor of astronomy at the State university.

"Existing finders of the latest type establish a range in five seconds," says Dr. Baruch, "but mine is eighty times faster, and therefore adaptable to aeroplanes. This permits allied fliers not only to map enemy country photographically as heretofore, but to establish exact distances between given points, and therefore remove all the guesswork from artillery shooting. The attachment is simple and inexpensive. Though not absolutely perfect as yet, the principle is thoroughly established and the rest is merely a finishing touch."

Dr. Baruch is the inventor of an aerial torpedo which finds its target—the hostile aeroplane—accurately by vibratory attraction, and which is now in the hands of the French army. He has also perfected a depth shell for the destruction of submarines. It is like the depth bomb, but may be fired from a cannon like an ordinary shell.—Washington *Herald*.

Discovers Radium Substitute

Dr. Richard B. Moore, of the United States Bureau of Mines, Golden, Colo., is reported to have announced the discovery of a substitute for radium. Dr. Moore has named the new product mesothorium. Among its uses is in the manufacture and illumination of aeroplane dials and compasses.

Price of $4.50 Per Bushel Set for Castor Oil Beans

The War Department authorizes the following:

In order to procure an adequate supply of castor oil for use in connection with the War Department aviation program, numerous contracts were let last spring for the raising of castor beans in the Southern States, at a price of $3.50 per bushel. With the harvesting of the crop it has been found that this price does not provide sufficient remuneration to the grower.

After careful consideration of the matter by a board of the Bureau of Aircraft Production, Mr. W. C. Potter, the acting director of aircraft production, has established a price of $4.50 per bushel of 46 pounds. As specified in the original contracts, beans are to be delivered hulled and sacked, in carload lots, f. o. b. the nearest railroad station to the land on which they are grown.

Most of the planting of castor beans was done under subcontracts with the general contractors. The price of $4.50 now established is to be paid to the actual growers of the beans. The remuneration of the general contractors for their services in connection with the crop is in addition to this sum.

Dinner to Thomas Morgan

Thomas A. Morgan, contracts manager of the Sperry Gyroscope Company, was the guest of honor at a dinner tendered to him in the state apartment at the Waldorf-Astoria, Manhattan. The dinner was in the nature of a "Good Luck" party, in view of his coming marriage to Miss Diana Yorke of 325 West 83rd St., Manhattan. Mr. Morgan has been associated with the Sperry Gyroscope Company practically since its organization in 1910.

Among those present at the dinner were: J. B. Allen, E. R. Barany, W. E. Brewster, H. Cenarro, P. Colvin, I. Conover, G. P. Casper, C. S. Doran, R. Eberhardt, R. E. Gilmer, J. G. Gates, W. R. Goodman, H. Goodman, F. J. Fannon, B. H. Goldsborough, D. O. Kay, F. T. Kirby, R. E. Kortepeter, M. R. Lott, R. B. Lea, Walter Lunn, J. N. Mahoney, I. H. Mills, F. Colburn Pinkham, M. L. Patterson, E. A. Sperry Sr., E. G. Sperry, E. A. Sperry Jr., Lawrence Sperry, C. E. Scattergood, L. W. Stetson, W. H. Thompson, M. Titterington, F. W. Von Ness, O. B. Whitaker and Paul Willis.

Prices Fixed for Spruce

The Price Fixing Committee authorizes the following:

In agreement with the industry the Price Fixing Committee has extended the present maximum prices on New England spruce until December 1, 1918.

The present prices of New England spruce are: Rough lumber, specified length 20 feet and under, 3,000 pounds weight to 1,000 feet of lumber, $48 to $60; random lengths, $36.50 to $59.

Will Enlarge Plant

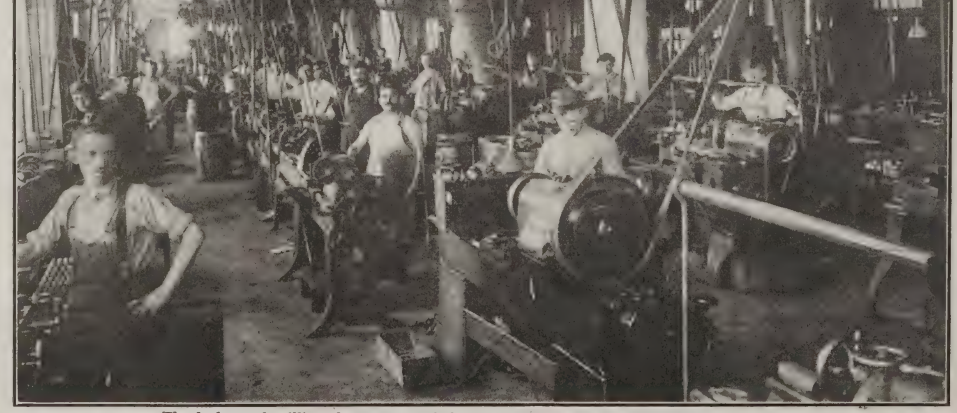
For the purpose of keeping apace with the Government demand for aeroplane motor parts, The Steel Products Company, 2196 Clarkwood Road S. E., will erect a new plant which, fully equipped, will cost about $155,000. The building will be 90 by 123 feet, of concrete and brick construction, with steel spans.

Recently, contracts were let for the adding of a fourth story to the main building, which is 60 by 125 feet, and the building of a power plant 70 by 100 feet.

This work, with the new building, brings up the total cost of improvements to about $200,000.

Standard News Notes

Mr. George D. Kershaw, formerly Works Manager of the Standard Aircraft Corporation of Elizabeth, New Jersey, has resigned in order to take up important duties in a large munitions plant in the middle west.



The lathe and milling department of the Excelsior Manufacturing & Supply Company



MILITARY AEROSTATICS



By LIEUT. H. K. BLACK, R. F. C., C. F. A.

Technical Equipment

APART from the optical instruments in the basket there are the several technical instruments which also are a very necessary part of the basket equipment. Chief among these is the aneroid barometer. This, it need hardly be said, is the instrument which records the height of the balloon at all times. Though it is a barometer, it is arranged to read in thousands of feet instead of in inches of mercury. It is adjustable and can be set to zero before the balloon leaves the ground each day, thus making itself independent of the daily variation. It is generally hung in the rigging of the basket just about the height of the pilot's head for easy reading. Aneroids are rather sluggish in their action, though for that matter it makes very little difference in an observation balloon. However, on occasions when for some reason the balloon was pulled down in a hurry, I have noticed the aneroid reading one hundred feet while I was climbing out of the basket onto terra firma. This sluggishness is of greater moment in aeroplanes, I would imagine.

Of wind measuring instruments there are two which are in more or less common use. Perhaps the more common is the Pitot tube, which is an arrangement of rubber tubes, copper piping and a dial, the whole thing being fastened to a wooden handle. That is not a very lucid description but any balloon pilot who has ever sat up in his balloon in the high winds of France will tell you that the Pitot tube is not a very lucid instrument. Personally, I have felt very much inclined to doubt the word of the Pitot tube when the wind was more than twenty-five miles per hour. The infernal contraption would blithely indicate twenty-six or seven miles per hour when I was morally certain that it was nearer forty-five. However, the menu at breakfast maybe had something to do with that.

The other wind instrument we had beside the bugle, was an Anamometer, which was nothing else than a swanky windmill. It had a propeller which when the instrument was connected with the telephone, produced a click every so many revolutions. The introduction of the Anamometer was a sore blow to some of the "Heroes" of the early days of ballooning in France. With the Pitot tube the people on the ground simply *had* to take your word for what you said the wind was at any given height, and in the early part of the war, a wind of about thirty m.p.h. used to cause a dangerous strain on the cable and when that arrived the balloon hauled down till milder conditions held sway. So it was that a young spark of an observer who was enjoying himself not at all in the basket on account of the wind, or the cold, or the Boche planes, or the rain, or the any one of the thousand things which take away from the joy of ballooning; so it was that when the wind reading was asked for from the ground, this young chap might be prone to make a mistake of ten or fifteen miles per hour, reporting it as forty-five when it might have been only thirty-five, —quite accidentally, of course, oh, Heavens yes—gaining the ground and comfort thereby. He might have done that, knowing the circumstances as I do, I think it might be said to be possible. However, that was in the good old days of ballooning, the Heath Robinson days, when one had only a hazy idea of whether the balloon would go up or down, when ballooning was really dangerous egad,—not from Hun planes, thank Heaven, at that time neither the Huns nor ourselves had dropped the utility of tracer bullets as parachute producers,—but from the weather and the balloon itself.

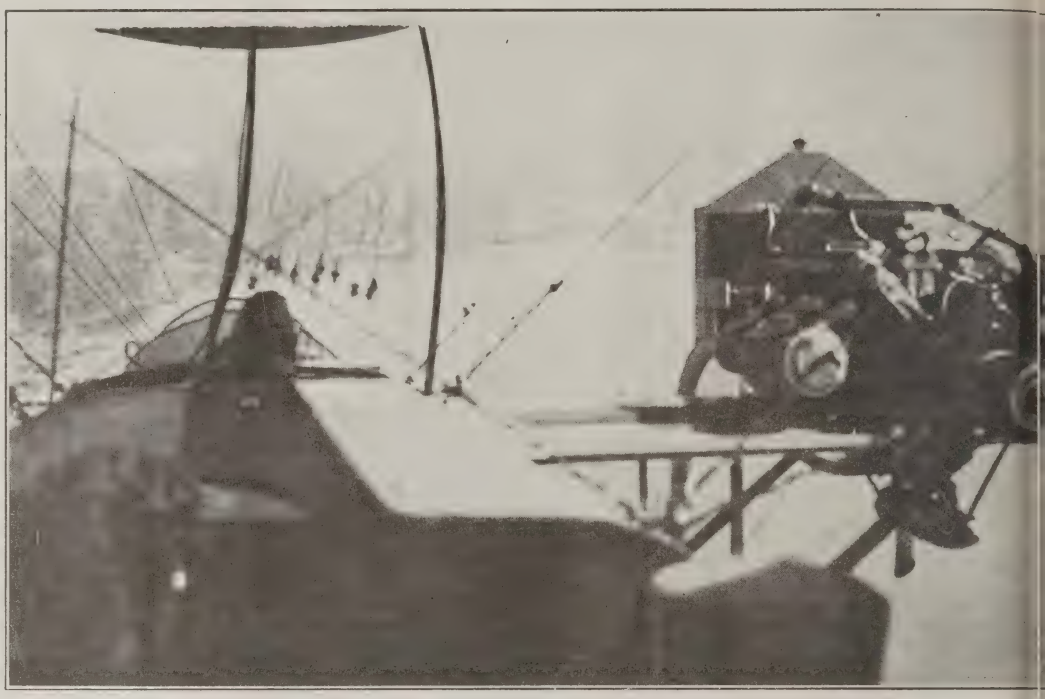
Nowadays it is different. The young buck observer finds it impossible to swing the lead about the wind, or anything else for that matter. Anamometers have come into use. Now when you read the wind the chart room clerk does it. "Would you mind putting in the wind plug, Sir," says he, and you comply. There ensues a series of "clicks" and then the chart room announces "Thank you, Sir, wind eighteen and seven-eighths m.p.h." Of course, everybody in the basket is quite sure that the wind is thirty miles, if an inch, and the beautifully bright Anamometer whirls merrily on. It is not clicking now and you get on with some shooting. Just as you are comfortably engaged, you hear a Wh-e-e-e-e-e-, behind you, a shell headed for the back of your neck. You turn round suddenly, wondering why a shell is coming at you from behind—and there is the shining Anamometer which has speeded up a bit to a puff of wind, giving an altogether too accurate imitation of a high velocity shell. Oh. damn the Kaiser.

(*To be continued*)



At a British Royal Naval Air Service training camp. The upper picture shows the flying field from where the kite balloons ascend. Two balloon hangars and two balloon beds may be seen in the background. The lower picture shows an old type basket. As it is a naval basket it is made to float in water. Details of the rigging may be seen. The parachute cases are the kind in use at the present time. The small picture at the left shows some cadets acting as part of the balloon crew manning a handling guy

TWIN-MOTORED DIRIGIBLE AND AERO



This photograph was taken from the new American made dirigible. It shows one of the twin Hispano-Suiza motors. The of one hundred and fifty H.P. It is the D. 17, the first of its type to be flown. On October 22nd this dirigible, mann aviation officers of the Marine Corps and the Navy, flew over Washington, D. C., at the completement of the first lap o proximately three hundred and fifteen miles of a flight from Akron, Ohio, to Rockaway, New York



A group of American aviators at an aviation camp on Salisbury Plain (England). Salisbury Plain has become very famou overseas and there they got their first taste of European weather. Accustomed to the clear cold of the New World, they and it constituted a fine training for their trench work in France. Salisbury Plain has always been an aviation center, also. Note the camouflaged hangars in the background. The American boys will find Salisbury a very interesting spot is an old Druids Temple. Big pieces of rock weighing tons are to be seen built up into a rude temple. These rocks

NE AND THE BOYS WHO FLY THEM



At a French Aviation Camp. A Voisin bombing plane. The photograph shows a good deal of the equipment. The machine is twin-motored, of course, and carries a crew of several men. Note the streamlining of everything. The unique type of radiator may be seen above and behind the propeller. The mounting of the forward machine gun indicates the position of the machine gunner with the pilot behind him



oldiers from the New World, for it was on Salisbury Plain that the famous First Canadian Division spent their first winter erely from the rain and the mud. Salisbury Plain, however, was only a foretaste of what they were to get in France arly days the Royal Flying Corps trained at Netheravon and Upavon. Now the American aviators are training there in historical lore. There are mounds or "Tumuli" there which date back to the early Britons and at Stonehenge there been transported for many miles for there is no rock of this particular nature in that section of the country at all

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Frank Bowie, College Park, Md., Representative
Harry L. Hartung, Belmont Park, L. I., N. Y., Representative
H. Thomas, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Danville

THREE HOURS GAINED ON TRIP WEST BY EARTH'S TURNING—PAST SPEED MARKS SHOW ALL DAYLIGHT FLIGHT IS POSSIBLE

By FREDERICK M. KERBY, N. E. A., Staff Correspondent, New York

Trans-continental aero mail will go from the Atlantic coast to the Pacific within one day's daylight.

This is the assertion of Alan R. Hawley of the Aero Club of America:

"The trans-continental mail lines will soon be established," said Hawley today. "When they are, we may expect to send mail from New York to San Francisco, from Boston to Seattle, from Philadelphia to Santa Barbara, from Washington or Charleston to Los Angeles or San Diego within one day's daylight. This will be done by relays of aeroplanes. The fact that the earth revolves from west to east makes this possible. Pacific coast time is three hours slower than Eastern time. At 3 o'clock in the morning in New York it is only 12 o'clock midnight in San Francisco.

"The direct line from New York to San Francisco, as the aeroplane flies, is exactly 2,500 miles. Figuring daylight from 3 o'clock in the morning until 9 at night gives 18 hours. But the time differential of three additional hours makes the available daylight flying time 21 hours. This would require a speed of only 120 miles per hour to make a non-stop flight across the continent.

"One hundred and twenty miles per hour is not a high speed as aeroplane performance goes now. On October 2 a De Haviland 9 aeroplane, equipped with a Liberty motor and piloted by Caleb Bragg, a civilian pilot of the bureau of aircraft production, flew from Dayton, Ohio, to Washington, D. C., a distance of 430 miles, in two hours and fifty minutes, or at a rate of NEARLY 143 MILES PER HOUR. The Liberty motor produces, on the average, more than 400 horsepower.

"Our Government has already successfully tested out the first of the American-built Caproni aeroplanes, equipped with four Liberty motors, which develop 1,750 horsepower. Aeronautical engineers familiar with the progress that has been made in the last two years in aeronautics, and familiar, also, with the experiments now under way, believe that it is quite possible that we may see a 5,000 horsepower aeroplane within the next year.

"We ought to have plenty of machines capable of making better than 130 miles per hour when we need them for trans-Atlantic mail carrying.

"Before the war an aeroplane flew for twenty-four hours and ten minutes without landing, and a continuous flight of 1,400 miles was made on another occasion. THE WAR HAS ADVANCED AVIATION AT LEAST TWENTY YEARS."

The Chicago Aero Mail

Postmaster General Burleson announced on October 24 that the New York-Chicago aero mail route will be inaugurated between December 1 and December 15. The exact time of the establishment of the service will depend upon the time of the receipt by the Post Office Department of the necessary aeroplanes to operate the line.

The city of Cleveland has set apart for use as a mail field Wooland Hills Park, a magnificent pleasure ground, and will place on it a hangar costing $10,000. Work on this aviation field was begun this week.

The city of Chicago has given the use of Grant Park as an aviation field for the landing of mail ships, and the Aero Club of Illinois has tendered the use of Ashburn Field for hangars, workshops and bunk houses for the mechanical forces. The Association of Commerce of Chicago voted an allotment of $15,000 for the construction of a mail hangar. Work on the Chicago field will begin at once.

Bryan, Ohio, the intermediary stopping point between Chicago and Cleveland for exchange of mail and gassing of aeroplanes, has furnished the Post Office Department with a suitable ground and hangar. Work on the Bryan field was begun last week.

Representatives of the Post Office Department will be in Clarion, Bellefonte, and Lehighton, Pa., this week to arrange for the immediate erection of hangars and preparation of fields at those points.

The New York-Chicago route will be laid out in three legs, the first from New York to Bellefonte, Pa., a distance of 215 miles, with an emergency station and machine midway at Lehighton; the second leg from Bellefonte to Cleveland, a distance of 215 miles, with an emergency station at Clarion, Pa., a distance of 87 miles from Bellefonte; the third leg from Cleveland to Chicago, a distance of 323 miles, with an intermediate mailing station at Bryan.

The plan of operation during the unfavorable winter months contemplates the aeroplanes leaving Chicago and New York at 6 o'clock each morning, with a capacity of about 20,000 letters, and making the trip, including all stops, within a period of ten hours.

The French Aerial Mail

The Paris correspondent of the *Daily Telegraph* writes on August 18:

A postal service by air has been started for the first time in France between Paris and St. Nazaire. Aeroplanes, carrying mails, left Le Bourget Aerodrome, near Paris, shortly after ten, and one of the two machines, the other having had an accident, reached St. Nazaire at 8:30 p.m., after a stoppage at Le Mans. The total distance from Paris to St. Nazaire is some 250 miles.





Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to District supervisor, Houston, Texas.

Note 3—Report to Air Service Training School, West Point, Ky.

Note 4—Take Station at the District Office, Buffalo, N. Y.

Note 5—Report to C. P. I., 235 West 23rd St., New York City.

Note 6—Report to District Mgr., Aircraft Production, Postal Telegraph Bldg., San Francisco, Cal.

Note 7—Report to District Officer, 480 Lexington Ave., New York City.

Note 8—Report to Commanding Officer, Indianapolis, Ind.

Note 9—Report to District Mgr., A. P., Detroit, Mich.

Note 10—Report to Aviation Gen. Supply Depot, Middletown, Pa.

Note 11—Report to Duesenberg Motors Corp., Elizabeth, N. J.

Note 12—Report to Aviation Gen. Supply Depot, Little Rock, Ark.

Special Orders Nos. 239 to 244, Inclusive

Armour, Philip D. ..... HHN
Adams, Amos Ervin ..... SLA; RWT
Anderson, Charles Le Roy ..... SLA; CWT
Allen, Bridger Bailey ..... SLA; SBI
Abney, Louis D. ..... CPA
Allen, Charles Walter ..... SLA; RWT
Apelt, Carl P. ..... SMM
Austin, Charles A. ..... TFT
Alexander, John Alco ..... SLA; SAG
Allison, Roy Gordon ..... SLA; CRI
Adams, Jack R. ..... CGC
Anderson, Seymour E. ..... CGC
Acosta, Bertram Blanchard ..... CPA; DAP
Atwater, Donald V. ..... TFT
Anderson, Karl H. ..... KST
Allen, Bridger B. ..... EOT
Arthur, Ira W. ..... TFT
Akers, Claude ..... CGC
Agar, William M. ..... WFO

B

Bergbon, Charles Ephraim ..... FLA
Bourgoine, Joseph John ..... FLA
Bowlus, Edgar Stanley ..... FLA
Brenneke, Augustus Martin ..... FLA
Barbee, Stanley N. ..... CGC
Barksdale, Julian N. ..... TFT
Brinkman, Walter E. ..... TFT
Bohlman, Harold R. ..... PWM
Boess, Murray R. ..... CGC
Buell, Arthur C. ..... CGC
Birkett, Howard ..... FLA
Bunnell, Miron ..... FLA
Bernard, Clifford S. ..... AGC
Beckwith, Clifton Warren ..... SLA; CWT
Beckstrom, Elmer Gust ..... SLA; ABC
Binge, Walter ..... SLA; TFT
Blackburn, Ernest Winfield ..... FLA
Brand, Smart ..... SLA; CRI
Barber, Frank Herbert ..... SLA; RWT
Bowell, Lloyd Franklin ..... SLA; UTA
Billups, Val T. ..... AGC
Barton, George William ..... SLA; CAF
Bailey, Worth Arlington ..... SLA; ABC
Baker, William De Ford ..... FLA; DAP
Bernard, Frederick Springer ..... SLA; ELA
Blundell, Thomas Aspinwald ..... SLA; TFT
Boothby, Wallace J. ..... TFT
Bigelow, James L. ..... CGC
Beach, George L. ..... CGC
Buckley, John Francis ..... SLA; ELA
Bond, Frederick E. ..... SLA
Berry, Thornton A. ..... TFT
Brown, Raymond R. ..... PWM
Banks, Frank ..... FLA; MDO
Brandt, Gustavus S. ..... PFO
Bagnell, Edgar Wirt ..... CPA
Bradley, Lyman C. ..... TFT
Boylston, Joseph E. ..... WFO
Bradshow, Leland Douglas ..... SLA; HHN
Brown, Lawrence Raymond ..... SLA; SAG
Blanton, Edgar Powell ..... SLA; SBI
Broughton, Berlin Arthur ..... SLA; GLC
Burkhart, Leslie E. ..... SMM
Bates, Lew A. ..... CGC
Browning, Dudley Barnitz ..... SLA; AAD
Brunson, Elmer Bruce ..... SLA; SAG
Butcher, Jesse S. ..... DMA
Bamberger, Raymond S. ..... JMA
Beltz, John Shafer ..... SLA; GLC
Brandt, Howard C. ..... CGC
Brooks, Thomas ..... CGC
Blanchard, David ..... CGC
Bishop, Lionel M. ..... PFO
Benson, John David ..... SLA; CWT
Bloom, George Barnett ..... SLA; AAD
Brown, Owen S. ..... FOB
Browne, Lloyd Dean ..... SLA; MAT
Bragg, Caleb Smith ..... CPA; MDO
Boyce, Charles W. ..... Note 3
Birch, Leland Watts ..... FLA; OSU
Bloomer, James Ralph ..... FLA; Note 10
Beekley, Archie G. ..... CGC

Blystone, Raymond J. ....CGC
Bell, Harry S. ....TFT
Brown, Homer ....TFT
Boyd, William L. ....CGC
Bullis, Leland S. ....CGC
Bumstead, John Henry ....CGC
Buell, William Charles ....SLA; MAT
Ballard, Gerald Edgar ....SLA; Note 8
Belote, George Harold ....SLA; AAD
Blevins, Charles E. ....CGC
Bush, Lyle K. ....CGC
Burns, John V. ....CGC
Blaich, Ernest G. ....TFT
Butler, Lawrence O. ....TFT
Bonisteel, Roscoe Osmond ....CPA; DAP
Buff, Frederick William ....SLA; VBW
Bach, Hollis Sebastian ....SLA; ABC
Barksdale, James B. ....KST

C

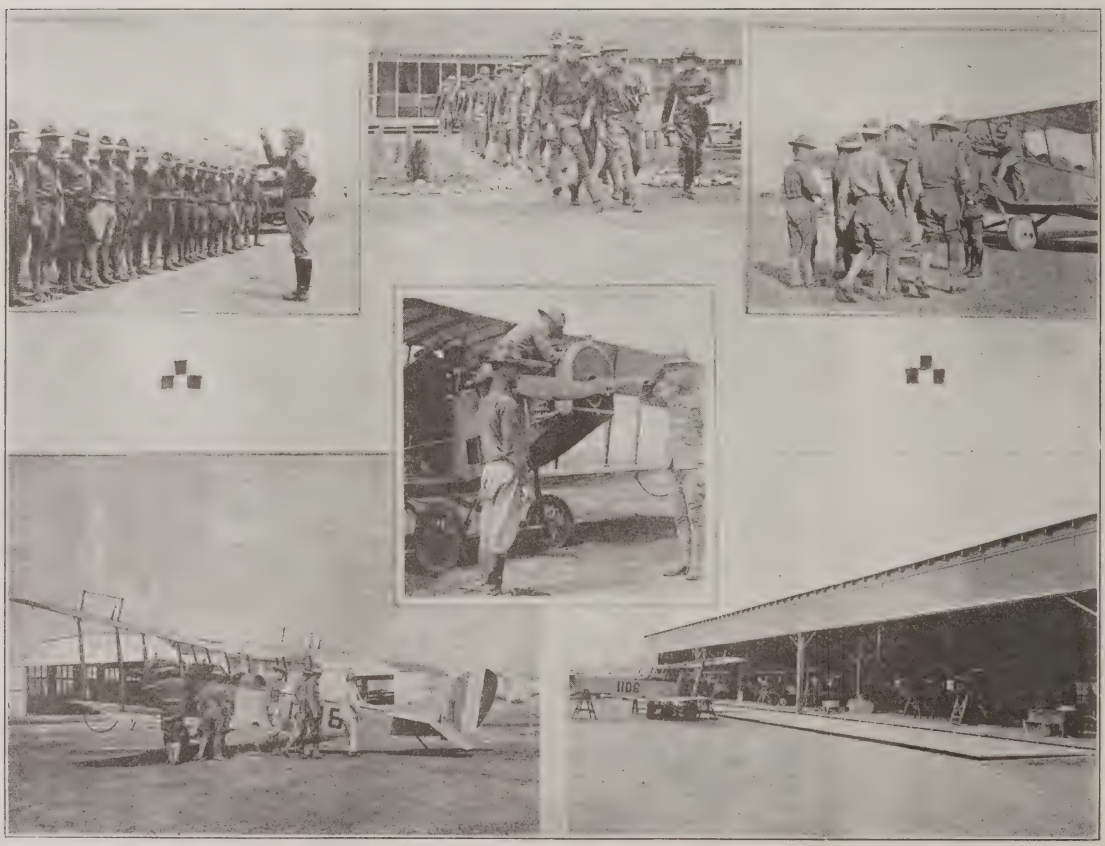
Craig, James C. ....RSD
Clay, Lucius J. ....RSD
Clark, William P. ....RSD
Carpenter, Charles H. ....RSD
Croom, Marvin E. ....SBI
Chamberlain, Leo W. ....AGC
Carlson, Elmer Hugo ....SLA; SAG
Cooper, Ralph E. ....REL; ABC
Campbell, Thomas P. ....TFT
Cannon, Thomas O. ....TFT
Clark, Ben Hammond ....SLA; CFT
Clark, George Douglas ....SLA; ELA
Campbell, Robert V. ....TFT
Crank, James H. ....TFT
Clemens, Jere Joseph ....SLA; MAT
Coray, Claude Laville ....SLA; MAT
Carter, Warren R. ....KST
Cole, Myron A. ....DMA
Claar, Stewart B. ....AGC
Cole, Perry C. ....AGC
Conrad, Franklin Elmer ....SLA; BFT
Cameron, Charles Putnam ....FLA; HHN
Cathcart, Sewall C. ....TFT
Cleary, Maurice Garrett ....CPA
Cady, Frank William, Jr. ....SLA; CUI
Chapman, Albert K. ....CAP
Coleman, Russell Lowell ....FLA
Catlett, Landon Carter, Jr. ....SLA; AAD
Christopher, Luke ....MIA
Cartwright, Monroe Edward ....SLA; SAG
Carey, Walter Ray ....SLA; MAT
Chauchoin, Charles A. ....AGC
Culley, Oscar L. ....DMA
Cauffiel, Paul Wendell ....SLA; CRI
Crawford, Carleton T. ....RSD
Craig, Robert M. ....FWM
Craig, Edwin Park ....CPA
Carrigan, Robert McClellan ....CPA
Clowes, Randolph ....TFT
Castor, Bernard T. ....CAF
Chritzberg, James ....CGC
Cottrell, George W. ....LHV
Chapman, William A. ....SMM
Clarkson, Edward D. ....SMM
Campbell, Hugh S. ....CGC
Clark, Robert E. ....CGC
Clark, Hobart ....CGC
Cumming, Robert Worthington ....SLA; GLC
Chapman, Lester M. ....CGC
Cassidy, Charles Walter ....SLA; AAD
Cragon, Miller Murray ....SLA; SBI
Coleman, John C. M. ....CGC
Clark, Charles ....CGC
Coates, Aaron Thompson ....CGC
Crowe, Dorsey R. ....CGC
Campbell, Lloyd K. ....TFT
Chrisman, Thomas L. ....TFT
Coulter, Marion E. ....TFT
Cardoff, Earl F. ....CGC
Clark, William B. ....CGC
Canny, Ralph G. ....TFT
Clarke, Jeremiah E. ....TFT
Crawley, Edward H. ....TFT
Chambers, Howard Elmer ....SLA; MAT

D

Dawes, Denton Foote ....SLA; GLC
Dow, William Alonzo, Jr. ....SLA; MAT
Davidson, Arthur William ....SLA; AAD
Davis, Kenneth W. ....BFT
Dickman, Frank A. ....MIA
Degen, Albert G. ....RSD
Diehl, Norval Eugene ....SLA; BFT
Dugas, Graham C. ....FRF
Dempsy, Raymond Francis ....SLA; PWM
Dunning, Clifford Alexander ....CAP
Davis, Carl H. ....FLA; SRC
Dining, Beecher, John ....SLA; PMT
Day, Harold M. ....BST
Dickson, Charles Martin ....CPA
Davis, John E. ....CAF
Decker, Kenneth ....MIA
Downs, Roland ....SLA; GLC
Doak, Carroll D. ....CGC
Davis, Homer H. ....CGC
de Learie, George Robert ....CGC
Dick, Guy Henry ....CGC
Davidson, Rufus Benjamin ....SLA; AAD
Donahey, John W. ....CGC
Dickey, Leslie J. ....CGC
Day, Olin L. ....CGC
Deeves, Edwin P. ....LHV
Deacon, Ralph A. ....ABC
Degan, Albert Gustav ....SLA; MAT
Douthitt, Laidley E. ....CGC
Delaplane, Edwin S. ....CGC
Dowling, Glen A. ....CGC
Dunn, Charles A. ....CGC
Day, Curtiss L. ....CGC
Durfee, Charles P. ....CGC
Darby, Alexander L. ....DMA; Note 12; Note 1
Dunn, Stanley M. ....TFT
DeVoe, Elmer Paul ....SLA; PMT
Danziger, Maurice ....SLA; EOT
Deane, Frederick J. ....TFT

E

Eaton, Alfred V. ....TFT
Eaton, Samuel C., Jr. ....MIA
Ewing, Hugh W. ....TFT
Edrington, John P. ....PFO
Ehrenberg, Conrad E. ....PFO



AT AN AMERICAN AVIATION FIELD

Lower left-hand corner—Aeroplane just rolled out of hangar, plane crew of cadets in charge, under an instructor. A plane crew consists of five men, a sergeant, a corporal who is the motor man, two first-class privates who have charge of the wings, and a third-first-class private who looks after the fuselage and controls. Center—A good view of the propeller and nose of an aeroplane. An officer is receiving the report of the cadet-crew chief upon the condition of the plane, and the motor man is looking after some detail of the engine. The wheels of the plane are Ackerman wheels. Lower right—View of an aeroplane shed or hangar with planes assembled and partly disassembled. Upper pictures—Cadets being instructed, marching to mess, and on the line with a machine. The enlisted skilled workman does most of the things the cadet has learned to do at Ground School

Eddy, Louis Elsmere ..... SLA; CRI
Everett, Edward C. ..... TFT
Earle, Murray ..... CPA
Ellis, Frederick K. ..... SMM
Evans, Walter G. ..... DAP
Ely, Newell D. ..... CGC
Early, John M. ..... CGC
Ehlers, George Washington ..... CGC
Eager, Alfred G. ..... CGC
Eubank, Carr N. ..... CGC
Evans, John M. ..... RSD
Engebretson, Francis E. ..... LHV
Eldredge, James Sharp ..... SLA; MAT

F

Flack, Robert William ..... SLA; CWT
Frewer, John W. ..... CGC
Fogarty, John Lee ..... SLA; MAT
Falcon, Guildord W. ..... CAF
Federbusch, Isadore S. ..... SLA
Field, Lewis Henry ..... FLA; HHN
Faxon, Donald Eugene ..... SLA; AAD
Feltus, Russell H. ..... CAF
Fraser, Frank W. ..... CAF
Fuller, Eugene White ..... SLA; TMA
Ford, Bernard W. ..... FLA
Fuchs, John Oscar ..... CPA
Felton, James Briggs ..... CPA
Faggella, George Arthur ..... SLA; SAG
Fisher, Stanton B. ..... CGC
Fogel, Martin ..... CGC
Fern, Charles James ..... SLA; MAT
Flynn, Edward J. ..... CGC
Filbert, David Hershey ..... SLA; AAD
Field, John B. ..... CGC
Foran, Stanley W. ..... RSD
Feeney, Francis J. ..... CGC
Ferrell, Raymond W. ..... CGC
Fickel, Jacob E. ....REL; CFT; WDM; Note 1
Fetters, Jay March ..... SLA; MAT
Frenhoff, Fred B. ..... CGC
Fisher, Robert L. ..... CGC
Foley, Andrew Edward ..... SLA; BFT
Francis, Paul Robertson ..... SLA; AAD
Fyfe, Henry McNaughton ..... SLA; PMT

G

Geisendorf, Louis C. ..... CWT
Graham, James L. ..... CGC
Godelin, Reuel A. ..... SMM
Guinn, Joseph Edwin ..... SLA; TMA
Grady, Harold A. ..... ELA
Gutenkunst, John G. ..... DIS
Gifford, Raynold M. ..... CGC
Goodman, Timothy Seymour ..... SLA; SAG
Garnett, Joseph H. ..... CAF
Gladish, David F. ..... BFT
Grantz, Raymond L. ..... CAF
Garver, Benjamin G. ..... CGC
Gottschalk, Oliver Allen ..... SLA; GFT
Gibbons, James Ammi ..... SLA; RWT
Genung, Arthur L. ..... CGC
Gray, Ralph M. ..... CGC
Gates, William A. ..... CGC
Gaylord, Elmer J. ..... CGC
Garvin, Willard S. ..... CGC
Gaston, Alexander H. ..... CGC
Gifford, John ..... CGC
Grant, William Wulfind ..... CGC
Gambrill, Richard, Jr. ..... CGC
Gallup, Marvin ..... CGC
Gilson, Fred E. ..... CGC
Goembel, William P. ..... CGC
Gray, Lynwood William ..... SLA; GLC
Gower, John Maurice ..... SLA; HHN
Glose, Charles William ..... SLA; TMA
Green, Henry Oliver ..... SLA; EOT
Grimes, Plumer William ..... SLA; DAF
Grady, William A. ..... CGC
Guinther, Lawrence O. ..... CGC
Gentry, Benjamin A. ..... CGC

H

Hall, Edwin P. ..... TFT
Hall, Spencer, ... SLA
Heinzelmann, Gerald Matthias ..... SLA; CAF
Holt, Hobart Clayton ..... SLA
Hoyt, Richard Henry ..... SLA
Heppeard, Thomas Hussy ..... SLA; SBI
Hildebrand, Floyd R. ..... RSD
Hass, William Carl ..... SLA; SAG
Hand, Howard Austin ..... SLA; MAC
Harlow, Leo McAvoy ..... FLA
Hoffman, Samuel Gordon ..... SLA; DAF(2)
Hutchinson, Frank Young ..... SLA; TMA
Hamiel, Dorman Ellsworth ..... SLA; SAG
Harris, John W., Jr. ..... RWT
Hanscom, Charles L. ..... CGC
Henderson, Edmund M. ..... KST
Hyde, Lincoln Spencer ..... SLA; SAG
Hamilton, Mark A. ..... CGC
Haller, Carl A. ..... MIA
Hoffman, Albert J. ..... KST
Holland, James C. ..... FLA; FOB
Haase, Gus ..... SLA; CFT
Horne, Henry Abbott ..... CPA; DAP
Hotchkiss, Henry Stuart ..... Ita
Hall, Elzor, Eugene ..... SLA; HHN
Hoyt, William Lathrop ..... SLA; SAG
Hewitt, Robert P. ..... MIA
Harned, Doyce H. ..... TFT
Hass, William C. ..... CAF
Hyde, Lincoln S. ..... CAF
Heffner, Roy Jackson ..... CPA
Hoag, Earl Seeley ..... CPA
Haynes, Stephen W. ..... RSD
Hausman, William A. ..... RSD
Harrington, Robert C. ..... CAF
Hamer, Edward B. ..... BFT
Hendry, Frank Cross ..... CPA
Heffley, Armor S. ..... SMM
Hough, Romeyn B. ..... EOT
Hay, William I. ..... SMM
Hutchinson, Harry J. ..... SMM
Hayne, Walter Elliott ..... SLA; GLC
Harper, John Wetzel ..... SLA; GLC
Howie, Gardner, Dugald ..... SLA; ABC
Hill, James M. ..... CGC
Hoatson, Thomas L. ..... CGC
Horning, Clare Albert ..... SLA; GLC
Hudson, Thomas Stewart ..... SLA; ABC
Hagerty, William J. ..... CGC
Hall, Spencer J. ..... SLA; MAT
Holt, Hobart Clay ..... SLA; MAT
Heath, Fred T. ..... CGC
Hopkins, Frederick M. ..... CGC
Hoey, Henry James ..... SLA; AAD
Hart, John V. ..... TFT
Holtzendorf, Preston B., Jr. ..... TFT
Hay, Malcolm ..... TFT
Hird, John D. ..... TFT
Hough, Walter B. ..... TFT
Hunter, Leon W. ..... TFT
Hamlin, Charles E. ..... CGC
Hem, John Erwin ..... CGC
Howard, John C. ..... CGC
Herington, George B. ..... CPA; VBW
Hoyt, Richard Henry ..... SLA; MAT
Harrison, Benjamin Demas ..... SLA; LDT
Hughes, Archibald J. ..... TFT
Hutton, Harry I. ..... TFT
High, Stanley H. ..... CGC
Harper, Floyd K. ..... LHV
Horton, Clarence F. ..... CGC
Heebner, Miller B. ..... LHV
Huston, Aubrey ..... DAP
Hall, Frank L. ..... DMA
Hannon, Martin Edward ..... SLA; GLC
Hoffman, Henry A. ..... GLC
Haines, Frank, B. ..... CGC
Holmes, Elmer M. ..... CGC
Hull, Perry Albanis ..... SLA; SAG
Haasl, Charles H. ..... CGC

I

Innis, Cecil R. ..... CGC

J

Jones, Lloyd B. ..... BFT
Jeffries, Simeon Jackson, Jr. ..... FLA
Jacob, William Carl ..... FLA
Jones, Edward Davis ..... FLA
Jackson, Leo Sterling ..... FLA
Johnson, John Newton ..... SLA; SAG
Jordan, Richard C. ..... FLA
Jones, John D. ..... CPA
Jones, Kenneth H. ..... RSD
Johnson, Arthur C. ..... BST
James, Wallace Owen ..... SLA; SAG
Johnson, Ross Seymour ..... SLA; ABC
Johnson, Walter M. ..... SMM
Just, George A. ..... REL; DMA
Jones, William Dale ..... SLA; KST
Jameson, Jay William ..... SLA; PFO
Johnson, James V. ..... SRC
Johnson, Joe D. ..... TFT



The "Breguet" biplane with the Renault motor

FOREIGN NEWS

BRITISH

The following official communication dealing with aviation was issued on October 25:

We heavily attacked the railway junction at Hirson Wednesday during the day. Four enemy machines were shot down. Ten of our machines are missing.

A new German aviation squadron made its appearance over the lines in the vicinity of St. Juvin. Some of the machines were painted bright vermillion and others dark gray with a plain black cross on them. Some of the machines had flaming red noses. Many of them dropped propaganda.

A War Office communication dealing with the operations of the British forces on the Italian front, issued on October 27th, says:

"Our own and allied aircraft has displayed much activity, carrying out powerful bombing operations against the enemy's lines of communications and repeatedly attacking his troops in positions and on the march with machine-gun fire. Ten hostile aeroplanes were brought down in aerial combats. On the railway station of Levico, which was surprised in full activity, 500 kilograms of bombs were dropped last night by one of our airships."

Reports describing operations of the British forces in Italy under Lord Cavan pay high tribute to the brilliant and successful work of the royal air force. From March 10th to September 14th no fewer than 294 enemy aeroplanes were brought down, and nine hostile balloons destroyed with a loss to the British of only twenty-four machines.

The proportion of ten enemy machines destroyed for every British machine reported missing, it is pointed out, reveals the very striking superiority in airmanship of British pilots over that of the Austrians.

"Thirty-two enemy machines were destroyed on October 28th and ten were driven down out of control," says a British official communication dealing with aerial operations.

The British Independent Air Force has again been busily engaged in bombing German positions far behind the battleline and has met with good results, according to another official statement.

"On Monday we carried out heavy attacks on the Morhange and Frescati airdromes," says the communication. "Monday night we attacked the Badische soda factory at Mannheim and the railways at Treves and Saarbröcken. The railway junctions of Longuyon, Tecouviez, and Thionville were also attacked with excellent results.

"Today the railway juunction of Longuyon and the aerodrome at Jamainetz were attacked."

FRENCH

The official report of the War Office for October 26th says of aviation activities:

On October 25th our air squadrons gave our troops effective co-operation during the battle along the front of the Fifth Army. Our pursuit patrols likewise circled over the field of battle at a height of from one to two hundred meters, assuring security of the air.

Our observation planes, flying still lower, machine-gunned the enemy troops, convoys and batteries, supporting the tanks in their attacks, regulating the fire of our artillery and marking the advance of the infantry.

One air crew fearlessly carried out its work forty meters above the earth, braving the fire of the German machine-guns, which were reported to our troops by signals. Another at an altitude of less than 300 meters carried out a reconnaissance five miles inside the enemy lines and was able to report large enemy reinforcements arriving by camions in the region of St. Fargeau, which were immediately taken under our fire.

The work of our air squadrons continued on October 27th with great success. Our observers carried out numerous reconnaissances over the areas behind the enemy front and brought back highly important reports for the commanding officer and numerous photographs. They reported fires at many places on the right bank of the Aisne, which are still in the hands of the enemy, as well as in the Serre Valley, between Marle and Montcornet.

Our bombing machines carried out expeditions in the region of Serraincourt. This village, which is at the junction of several roads, is of considerable importance in the revictualing of the enemy.

One hundred and twenty bombing aeroplanes and eight pursuit machines engaged in an enterprise in successive groups, attacking special objectives, especially revictualing convoys, munition depots, and barracks in that region, as well as troops reported in the ravine south of Serrincourt. Thirty-three tons of projectiles and 150,000 cartridges were utilized, causing serious losses to the enemy and great disorganization, and at certain points stopping traffic entirely. Several fires broke out in the barracks, and an explosion in a munitions depot resulted from these operation.

In the course of the day nine enemy aeroplanes were brought down and one captive balloon was burned.

On October 30th aerial observers, in reconnoitering expeditions, brought back important reports. Many fires were observed in the region of Marle and Montcornet. Seventeen enemy aeroplanes were brought down or seen to fall in a damaged condition, and one balloon was burned. Our bombing machines dropped 26,850 kilos of projectiles on the railway stations at Longuyon, Mezières, Hirson, Dommary-Baroncourt, Spincourt, Launois, Chimay, Montcornet, and Vervins, as well as on cantonments and bivouacs in the region of Chaumont-Porcien and Montcornet.

The French official report for October 29th contains the following on aviation:

"Our reconnoitering machines have pressed very far into the enemy zone and brought back hundreds of photographs, many of them being taken between thirty and fifty kilometers from the front. Nine enemy aeroplanes were downed or fell out of control. A captive balloon was set on fire.

"During the night our bombing squadrons dropped sixteen tons of projectiles on large railway stations and important points of concentration, particularly on the railway stations of Hirson, Vervins, St. Gobert, Mont Cornet, Marle, and Audun-le-Roman, and on the aviation grounds of Mars-la-Tour and on large depots at Provizy. Numerous fires were started by our projectiles, namely, at Provizy, Hirson and Marle."

The official report on aerial operations says:

October 29th our observation aeroplanes spread over the areas behind the enemy's front and pushed forward for more than thirty kilometers inside the lines. Some proceeded as far as eighty kilometers (nearly fifty miles), while one got as far as 120 kilometers into the zone occupied by the Germans. The patrols brought back 1,350 photographs and useful reports.

Bombing machines dropped more than 37,000 kilos of explosives on and fired 20,000 cartridges at enemy concentrations and convoys in the region of Remaucourt, Son and Seraincourt. In the course of these operations and cruising enterprises by fighting planes twenty enemy machines were brought down or fell in a damaged condition and three Drachen balloons were burned.

During the night our bombing machines attacked enemy railway stations where activity was being displayed. They dropped 18,000 kilos of projectiles with good results on the junctions at Givet, Mezieres, Hirson, Vervins and Montcornet, and on depots and bivouacs in the region of Provisy and Montcornet.

GERMAN

During October 27th and 28th we have shot down forty-nine enemy aeroplanes.

Berlin, Oct. 30th (via London).—The official statement of the General Staff for October 30th reads:

We shot down twenty-seven enemy aeroplanes yesterday.

Referring to October 29th, General Headquarters says: "There was particularly lively activity yesterday. We shot down fifty-eight enemy aeroplanes and two captive balloon."

ITALIAN

On October the 4th, the bombing squadrons bombarded with great success the enemy's lines of communication, and at a low altitude have fired by machine-gun on the aviation field at Tirana.

The renewal of favorable atmospheric conditions increased the aerial activity. In an aerial fight four enemy machines fell.

On October the 5th, the activity of our bombing squadrons was considerable during the entire day, making its effects felt on depots and on concentration camps. The results of the numerous aerial fights were four enemy machines sent to earth.

On October the 6th, our aviators were very active. Enemy squuadrons attempted to pass the lines at Val Lazarrina, but they were faced and put to flight. One enemy machine fell on Lusegana.

The enemy aviation fields at Alto Adige were bombarded with great success by our squadrons, and with incendiary bombs the destruction of the hangars was accomplished. Other squadrons bombarded the rear of the enemy's lines on the Alsipiano di Asiago.

On October 7th. During the nights of the 6th and the 7th our dirigibles bombarded with great effect the enemy's aviation fields in the Venetian Plains and the military camps of Premolano and Uscine. During the numerous aerial flights, two machines fell to the earth.

A squadron of bombing machines dropped several tons of bombs on the Navy Yard of Pola with very good results. Two enemy aeroplanes were brought down and three others forced to land out of control.

Major Gabriele D'Annunzio, at the head of the pilots who made the raid on Vienna, was presented by King Victor Emanuel the High Decoration of "Officer of the Military Order Savoy." A dozen of the British pilots on the Italian front received the Italian silver medal for valor.

After the ceremony there was the largest review yet held of the Italian Flying Corps.

The aerial activity was handicapped by the bad weather prevailing on the whole front; nevertheless, three enemy aeroplanes were brought down by our pursuit machines.

On October 17th, our aeroplanes made reconnoitering raids on the Friulan and Venetian plains. An enemy balloon was downed over Oderzo. The weather was still very bad. It was raining in the lower valleys and in the plains, and snowing in the mountain zone.

On October 18th, notwithstanding the continuous bad weather, our aeroplanes were partially active on the front. Troops being transported were gunned with effective results.

On October 18th and 19th, there was little aerial activity on account of the very bad weather. On the 19th our planes were active on the Piave, making reconnoitering raids.

On October 21st, there was very little aerial activity on account of the weather.

On October 22nd, our aeroplanes bombed enemy centers of communication and brought down three enemy machines.

On October 23rd, our aeroplanes bombed military objectives in the region of Fonzaso and Sacile. The weather was still bad along the whole front.

On October 24th, Italian bombing squadrons dropped bombs over the enemy camps in the region of Fonzaso and over the large enemy depots in the neighborhood of the station of Sacile.

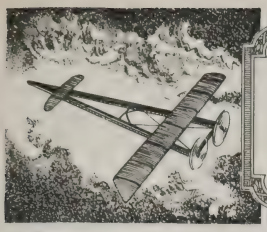
On October 25th, our airships, bombing and pursuit planes were very active on the Brenta, Cismon, Feltre and Fonzaso regions, helping to carry on our big drive against the Austrians. More than ten tons of explosives have been dropped on military centers. Three enemy machines were brought down.

On October 26th, squadrons of our aeroplanes, operating in following rings, bombed very severely and with splendid results enemy camps and depots, bombed and destroyed columns of marching troops and dropped altogether more than two tons of bombs on Val Sugana, Val di Cismon, and on the Conca di Arten. Two tons of bombs were dropped during the night by airships over the railway junction. Two enemy machines were brought down by our aviators. In Albania numerous reconnoitering raids were carried on by our aeroplane squadrons.

On October 27th, during our big drive across the Piave, the aerial machines participated continuously with extreme daring to the fight. More than fifteen tons of high explosive were dropped on the enemy lines. Enemy troops were machine-gunned from a very low altitude by our machines. Eleven aeroplanes and three balloons were dropped down in the aerial battle. Col. Piccio got his twenty-fourth victory.

During the week of October 20th-27th, the aviation of the Italian navy made frequent reconnoitering raids along the Albanian coasts and rear stations of the enemy, going farther than Antivari. On the 22nd of October, Italian hydroaeroplane squadrons bombed the big Lagosta hangar. On the 23rd, 43 bombing machines, of which 13 were American, dropped more than three tons of explosives over Pola with very efficient results, destroying many of the big Austrian hangars. Notwithstanding the Austrian anti-aircraft guns and useless enemy's machines, all our machines came back safely.

On October 31st, in spite of bad weather conditions, our aviators succeeded in bringing down two enemy aeroplanes and one observation balloon.



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

A FAST machine will require a small angle of incidence, and flying slowly a greater angle. So in order to sustain a certain weight we can alter angle of incidence, area or speed.

The ratio of lift to drift determines the efficiency of a wing, the higher the L/D the smaller the dragt for lift and weight of machine at a certain speed, and of course less power is required. The highest L/D for the U. S. A. No. 1 curve is at 4 degrees and this is the angle the wing will be most efficient, but when used in a speed scout every pound of resistance cuts down the speed and instead of selecting an angle of 4 degrees we would have to select one where Kx or resistance is lowest. This is found at zero degrees.

Under the heading "Distance of C. P. from the leading edge in fractional part of the Chord" will be found the location of the center of pressure for each angle. Suppose we wished to locate the center of pressure for a U. S. A. No. 1 wing section with a six-foot chord a 4 degree angle of incidence.

Looking in this column opposite 4 degrees we find .340 and to locate the C. P. we simply multiply 6 feet by .340.

Then reducing 6 feet to inches we have

$$72 \times .340 = 24.48 \text{ inches.}$$

Then the center of pressure at 4 degrees will be 24½ inches from the entering edge of the wings. By using the ratio alongside of each angle the C. P. of any wing at all angles can be found.

The writer has used only U. S. No. 1 wing section in the preceding work, but these equations can be applied to any wing curve if a table of the lift, drift, etc., are given.

Wing Curve No. 1 is for a fast machine of light weight. Should we have a medium fast machine to carry more weight we would use Wing Curve No. 3. For heavy machines such as flying boats, seaplanes and the like we would use a curve like No. 4, because its maximum lift coefficient is high .00364 which occurs between 14 and 15 degrees.

It is interesting to know that a wing will give lift even when the entering edge is lower than the trailing edge. Upon consulting the table we see that the three wings under consideration show a lift even when the wing is set at an angle of minus 2 degrees. It is not good practice to set a wing at this angle, first, because the resistance is greater than when set at a low positive angle, and secondly, because any slight change in the course of the machine downward would cause it to pitch or nose dive.

When designing a fast machine the designer generally sets the wings at an angle in which the Kx (resistance) is lowest. For curve No. 1, this occurs at zero angle. Again some designers prefer using an angle where the L/D is the greatest; in this case it would occur at 4 degrees. This seems rather high for a fast machine, but it is the most efficient angle and is used extensively on British scouts.

As mentioned in another article, the angle speed or surface of a wing can be altered at the will of the designer; for instance, you can use a wing of 160 sq. ft. at an angle of 2 degrees traveling at 120 M.P.H., which, when figured, gives a lift of 2,640 lbs., or you can reduce the speed and make the angle of the wing greater; for instance, changing the speed to 90 M.P.H. and the angle to a little over 8 degrees, which will also show a lift of 2,640 lbs., but the horsepower required to drag the wing through the air will have to be greater.

While speaking of horsepower it might be well for us to stop here and study the method used in figuring the H.P. necessary to pull the wing through the air.

Test shows that 1/375 horsepower is needed to overcome a resistance of 1 pound at one mile per hour. The Kx of a Wing having the No. 1 curve set at an angle of 1 degree is .000067, and to figure the resistance at 120 M.P.H. we proceed as follows: we will say that the surface is 200 sq. ft. Then to find the resistance multiply .000067 by 200 and this product by the square of 120 or .14400, which gives us 192.96, or roughly 193 lbs.

Now, if it takes 1/375 H.P. to overcome 1 pound at 1 mile per hour, then by multiplying 193 lbs. (which is the resistance) by 120 (which is the speed) and dividing this product by 375 we will find the actual horsepower required.

$$\frac{193 \times 120}{375} \text{ or } 23160 \div 375 = 61.5 \text{ H.P.}$$

This 61.5 H.P. is the actual horsepower required, but the horsepower supplied by the engine must be greater on account of the loss of power through the slipping of the propeller. This loss is generally figured as 25%, or, for example, an engine developing 100 H.P. would only show 75 H.P. at the propeller. The horsepower required for the body is also figured in this way (resistance and horsepower required for bodies will be taken up later).

When an aeroplane is traveling slow the angle of the wings to the wind is high and the resistance is high, but as the speed increases the angle diminishes with a corresponding reduction in resistance until a certain speed is reached; then the resistance starts to climb again because of the speed. By checking up we can find the angle and speed where the least resistance occurs, and, of course, the least H.P. is required. This applies to the wings only. The resistance and horsepower required for body, struts, wires, etc., starts low and gradually increases until the maximum speed is attained.

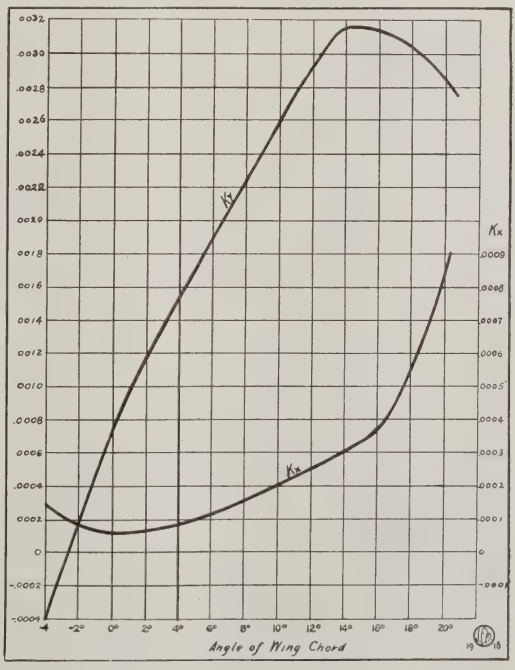
The resistance of these parts is known as parasite resistance, or resistance of non-lifting surfaces, and is figured separately from the wings.

A lift and drift chart accompanies this article, and it would be advisable for the reader to become acquainted wtih the method of reading one. The two heavy black lines show the life and resistance coefficients at different angles this one has been constructed from data on the U. S. A. No. 1 Curve.

The reader will note different degrees along the bottom of the chart. Should we wish to find the Ky at 10 degrees, we simply run our pencil up the line over this point until it reaches the Ky curve; then glancing to the left along the horizontal line we find the Ky coefficient to be .0026. Now suppose we wished to find the Ky at 6 degrees, running our pencil up this line, we find it meets the curve half way between .0018 and .0020. Half way between these points would give us a Ky of .0019.

Kx (resistance coefficient) is found in the same way, only after finding the horizontal line where the curve meets the perpendicular we glance to the right.

(To be continued)





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Semper Paratus

Brother (to sister whom he has found stitching a pink silk collar to a "nightie"): "Hello, sis, What ho, wedding or air-raid?"

As the Printer Will Have It

We notice by one of the recent papers that "Kite Balloons, operated from shops, are being used to watch for submarines." Doing yeoman's service, maybe.

War in Britain

1st Tommy (to 2nd Tommy just back from leave): "Well, Bill, did you get on any better with the missus this time?"

2nd Tommy: "Yes, much better—I really didn't see much of her. Half the day she was in a margarine queue, and the other half she was working on the allotment."

A Miracle

When you come to the end of a "sweetless" tea—
The dregs of a bitter brew—
When you think of things as they used to be,
And the cup that of old you knew,
You yearn for the vanished sugar lumps,
And o'er them in fancy gloat:
And as you yearn, lo! your sad heart jumps
For a "lump" comes in your throat.

Someone points out that the first item in the index to the Year Book issued by the Royal Aero Club is "Accidents, Fatal: British," and suggests that the well-known Army formula, "Officers, for the use of," might be added. A gruesome jest, indeed, but every aviator is an optimist, and trifles like this will not discourage him.



Courtesy N. Y. Globe

Sometimes
Us newspapermen
Get into a
Tight corner,
In that we
Have to squeeze
A story of some
Kind
Into a corner just
Such
As this is.
Going back to
The First subject
Of our discourse
This evening, I
Said We call
Ourselves
Newspapermen.
Other people
Call us
Other things
Often.
Sometimes they
Call us things
Which We cannot
Print. But we
Live for our
ART.
By this time you
Have probably
Found out that
We
Were stalling round
Doing something by
Writing this
Way.
The fact of the matter
Is,
This long narrow
Bit of space has
Got
To be filled,
Somehow.
The Boss says he
Don't care how
It is filled, but
IT
MUST
Be filled.
It really
Was the
Fault of the
Art Department
Because they
Made this
Pic'ure on the
Left, so
Infernally
Big, there is
No Room for any
Honest to Column
News.
So Mr. Printer I
Leave it to your own
Good Judgment to
Fill it up.
If there is too much
We can keep it until
The Art Department
Overflows
Again. Maybe we can find a place
To put it next week.

(*Continued from page* 471)

The first voucher presented by the Packard Company for this development work was for $104,500, which was paid on August 11, 1917, upon a certificate of Mr. Deeds, then a civilian in charge of the Equipment Division. While Mr. Deeds was familiar in a general way with the work, it does not appear that he or anyone else acting for the Government, except Mr. Vincent, had detailed information as to what had been done or as to actual cost. The exact amount of the outlays could not then be stated either by the company or by Mr. Vincent, and while definite amounts were placed opposite the particular services and engines described in the voucher, these amounts were mere estimates. The voucher did not so state, but the payments were virtually payments on account. Included in this first voucher (paid August 11) were the salaries and travelling expenses, as estimated, of those in the engineering organization which Mr. Vincent had effected for this development work, including the salary of Mr. Vincent himself after he came to Washington as above stated. As he testified:

"In other words, this item was intended to cover not only the making of drawings, but the moving of engineers here to date and also a lot of travelling expenses incident thereto . . . that was all lumped under original design work . . . Q. Was there any itemization of that anywhere? A. There was not, because it was impossible to make any such itemization. I knew roughly what it would cost. . . Q. How much of that amount of $37,000 included in that voucher (that is, the voucher for $104,500) was for salaries? A. I should say about one-third. Q. For what period were those salaries allowed? A. They were allowed for the period that the men were actually on the job.

* * * * * *

"Q. Is your salary included in the $37,000? A. I think it is."

Another voucher in similar form for $73,194.72 was presented by the Packard Company on November 20, 1917. It was accompanied by a letter from Major Vincent, representing the Engine Design Section of the Signal Corps, to Colonel Deeds which stated:

"I have personally supervised this work and hereby certify that all of the above material has been delivered to the Government and is now being used for Government purposes.

"The prices at which the engines are billed are only approximately correct and may be high or low, but this cannot be determined until a final checkup is made when the job is completed. There are several engines yet to be delivered and before we pay for the final ones, I will arrange to have a checkup made in order to insure that the total amount paid for the entire job is entirely fair to both the Government and the Packard Motor Car Company. I would ask that payment be made the Packard Motor Car Company promptly in this connection, as they are going to a great deal of trouble to do this experimental work for us."

A third voucher for $60,000, for three engines, which was also a mere estimate, was paid on December 6, 1917, on Colonel Deeds' certificate.

The fourth, and final, voucher was paid on January 19, 1918, for the two remaining engines, which were put down at $5,732.19 each so as to bring the total amount expended for the development work within the above-mentioned allotment of $250,000. The Packard Company at this time submitted an itemized statement of its outlays which Major Vincent examined and approved. This statement purported to show the total cost of the entire work, that is the cost of material, and of labor, the direct expense (including travelling and other expenses of the organization which Mr. Vincent brought to Washington for the purpose of working on the design of the Liberty Motor) and the overhead charges. These items aggregate $221,474.75, to which a profit of 12½ per cent. ($27,684.35) was added, making a total of $249,159.10. Major Vincent wrote the following letter to Colonel Deeds in submitting the final voucher with his approval of the itemization of cost:

"Dayton, Ohio, January 19, 1918.

"From: Major J. G. Vincent, Airplane Experimental Engineering Department, Lindsey Bldg., Dayton, Ohio.

"To Colonel E. A. Deeds, Southern Railway Bldg., Washington, D. C.

"Subject: FINAL PAYMENT ON THE LIBERTY ENGINE DEVELOPMENT ORDER.

"1. I am enclosing herewith bills from the Packard Company for the last or No. 6 8-cylinder engine, and the last or No. 5 12-cylinder engine. These bills have been held in abeyance until the Packard Company could furnish us with a final accounting covering the cost of the job.

"2. You will remember that the joint Army and Navy Technical Committee set aside an appropriation of $250,000 to cover the cost of this job. At the time they set aside this amount and asked me to have ten engines built, I was afraid it could not be done within the appropriation, but am glad to be able to advise you that altogether we built eleven engines, as well as two wooden models and ran several tests under this order and still kept within the appropriation. You will note that the last two engines are built at $5732.19 each, as this just balances out the net cost to the Packard Company plus 12½ per cent. profit.

"3. As a matter of general information I want to point out that the Packard Company co-operated with us to the limit on this job, and many of their executives gave a great deal of their time to this work for which they received no pay whatever. It is also a fact that this work was put ahead of a great deal of other work, causing losses which can never be computed. They did this cheerfully because their heart was in the job, and my only object in mentioning it is to, in some degree, give them credit for their attitude, as I know no one at Washington can possibly realize what this brand of co-operation costs.

"4. I want to go on record as stating that I do not know of any other place in the world where this job could have been done at anything like this cost.

"5. During the last two years that I was with the Packard Company they spent approximately a half million dollars on aircraft development work—the spending of this money not only put me in position to know what should make an aircraft engine, but it also resulted in the development of an organization at the Packard plant which was ready and waiting to grab this Liberty job. I think you will find the brief resumé of costs entirely satisfactory, but I simply want to state that the Packard Company, of course, have a complete record of all the transactions, if they should ever be required. I think, however, that this job is so obviously reasonable that nothing else will be required. I want to urge that you have final payment made to the Packard Company immediately, as they are carrying on a lot of development work for us and are, therefore, carrying considerable investment at all times.

(Signed) J. G. VINCENT,
Major, S. C., U. S. A."

The irregularity of proceeding in this manner without a contract or proper order in writing is apparent. No price had been fixed for the work or materials; if only outlays were to be reimbursed, it was necessary that outlays should be appropriately proved before payment was made, and this had not been done in the case of the first three payments. Nor does it appear that at the time the first voucher for $104,500 was passed, on or about August 11, 1917, Mr. Deeds had any authority in the absence of a written contract or a proper written order to give the certificate. The Chief Signal Officer testifies that he did not have such authority. Nor was his certificate itself accurate in its terms, as there was no agreement for a price, and if there was an agreement for the reimbursement of actual outlays, the voucher, being a mere estimate, was not in accordance therewith.

It should be said, however, that the evidence does not afford ground for the conclusion that the Government was defrauded or that there was any intent to defraud the Government on the part of any of the parties concerned. The work was development work, these first engines being made by hand in advance of tooling up for quantity production in order to standardize the design, and it does not appear that the services rendered were not worth the amount paid or that the estimates of the outlays were not fair estimates; that is, that the amounts as estimated were not actually expended as set forth in the final statement. Both Major Vincent and Mr. MacCauley, the president of the Packard Motor Car Company, testify that the amount paid under these vouchers as finally adjusted did not embrace any expenses incurred in the original work of the Packard Company in developing an aircraft engine, that is, prior to the time when Mr. Vincent came to Washington on May 27, 1917. Viewed as an arrangement for services on a cost plus basis, the allowance of profit does not seem to be excessive. While the vouchering was irregular, there is no sufficient basis for a charge under the statutes relating to false and fraudulent vouchers or the facilitating or obtaining of payments with intent to defraud the Government.

A distinct question, however, is presented as to Lt.-Col. Vincent. Section 41 of the Criminal Code explicity prohibits any person who is directly or indirectly interested in the pecuniary profits or contracts of a corporation from acting as an officer or agent of the United States for the transaction of business with such corporation. It is manifest that Lt.-Col. Vincent acted as an officer and agent of the Government for the transaction of business with the Packard Motor Car Company in which he was a stockholder, and that this was in violation of the statute.

Lt.-Col. George W. Mixter

Lt.-Col. Mixter, formerly vice-president of Deere & Company, of Moline, Illinois, manufacturers of agricultural machinery, came to Washington in July, 1917, to undertake the organization of the Inspection Department of the Aircraft Engineering Division of the Signal Corps. He was later chief of the Inspection Department of the Equipment Division of the Signal Corps. He was commissioned as an officer in the Signal Corps, with the rank of Major, about August 15, 1917. The work of the Inspection Department covered the inspection or acceptance of material and manufactured articles furnished to the Signal Corps, including the inspection of airplanes and engines manufactured under contracts with the Government. As chief of the department, Major Mixter dealt with the matters of organization and personnel and exercised a general supervision over the department in matters of administrative policy. In May, 1918, Major Mixter was made production manager and on the reorganization which resulted in the establishment of the Bureau of Aircraft Production he continued to carry the title of Production Manager, being directly under Archer A. Landon, who is Director of the Production Division which is broadly charged with the actual execution of the aircraft program after the receipt of engineering data.

Prior to his connection with the Government, Mr. Mixter held 25 shares (par value $2500) of the preferred stock of the Curtiss Aeroplane and Motor Corporation. He has not disposed of this stock. He testifies that he had sold his common stock in the company about two years ago and that he had not given thought to the retention of the few preferred shares; that his personal accounts are kept at his office in Moline, and are in charge of his secretary. The Curtiss Company had important contracts with the Government for the production of aeroplanes and Lt.-Col. Mixter was in charge of the organization of the inspection of materials and products at its plant as well as at other plants, and he visited the Curtiss plant from time to time in the exercise of his authority as head of the inspection department and as production manager, and as an officer of the Government he dealt with such questions at this plant as required attention.

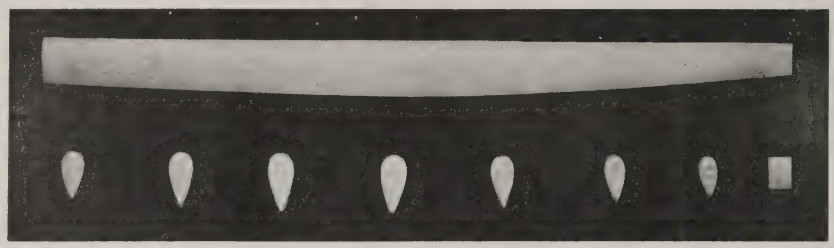
The statutory phrase "transaction of business" is broad enough to embrace the activity of officers or agents of the United States who are heads of divisions having charge of the inspection of products under contracts requiring the action of Government inspectors in course of performance. It would be a narrow construction to hold that the statue (Crim. Code, Sec. 41) is limited to the making of contracts or the placing of orders or transactions relating to payment or discharge. It would seem to be quite as important that the chief of a department of inspection, selecting the inspectors who act under his instructions at the plants of contractors, should be free from interest in the corporation whose work is inspected, as the inspectors themselves, and both the chief of an inspection department and the inspectors may properly be regarded as agents of the Government for the transaction of business with the corporation. The same would be true of the production manager having supervision of production under contracts with the Government. No ruling in the Federal Courts with respect to the applicability of the statute to such an officer or agent of the Government has been found. In the view that the statute has the scope suggested, Lt.-Col. Mixter acted as an officer or agent of the United States, contrary to the prohibition, for the transaction of business with the Curtiss Aeroplane and Motor Corporation, in which he was a stockholder. His holdings were small, but it cannot be said that for that reason the statute is inapplicable.

Major Howard C. Marmon

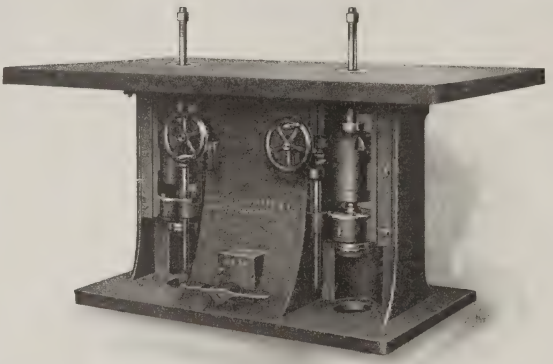
Major Marmon joined the Signal Corps about June, 1917, and almost immediately was sent to Europe with the Aeronautical Commission. On his return he was assigned to duty with the Aeroplane Experimental Department at McCook Field, Dayton. Prior to his service with the Government he was vice-president and engineer of the Nordyke & Marmon Company of Indianapolis, which was engaged in manufacturing mill machinery and motor cars, and he held $15,000 in par value of the stock of that company, its book value being several times its par. On entering the Army, he gave to his brother a power of attorney to dispose of his shares and they were transferred to his mother, Mrs. Elizabeth C. Marmon, and have since stood in her name. The transfer was a gift; Major Marmon testifies that he has no interest in the stock. His mother turns over to him the income of other property which is the equivalent of the salary he had previously received from the Nordyke & Marmon Company.

The Nordyke & Marmon Company has a contract for 3,000 Liberty Engines, and spare parts, and previously had a contract, which was

(*Continued on page* 491)



THIS AEROPLANE STRUTT



Direct Motor Driven
Double Spindle Shaper

Was cut on a

WHITNEY SHAPER

No trick to do it

Do you want to know how?

Write

Baxter D. Whitney & Son

Winchendon - - Mass.

K

Kendrick, Frank E. ..... EOT
King, Edward Herschel ..... SLA; TMA
Kane, Clarence Peyton ..... FLA
Kearney, John J. ..... SMM
Kuhns, Herbert Rhoads ..... SLA; SBI
Kermott, Edward Eugene ..... SLA; SAG
Kinnebrew, Edward R. ..... CWT
Kane, Thomas F. ..... KST
Keefe, Robert A. ..... PWM
Kamm, Philip S. ..... RWT
Knowles, John A. ..... TFT
Keever, Frank Lynn ..... SLA; AAD
Kinberg, George John ..... CPA
Kearns, Thomas Francis, Jr. ..... SLA; MAT
Kallmeyer, August William ..... SLA; GLC
Kent, Lee Carson ..... SLA; GLC
Kitchen, Benjamin F. ..... CGC
Kendrick, Frank Elwin ..... SLA; MAT
Knight, Everett Samuel ..... SLA; CWT
Kellogg, Rossiter Henry ..... Note 11
Kuhne, Frederick ..... DAP
Kassler, Edwin Stebbins, Jr. ..... SLA
King, Charles Willoughby ..... FLA
Keller, Dallas C. ..... TFT
Kent, Arthur O. ..... CGC
Kirby, Marquis Lafayette ..... CGC

L

Lewis, James Clifford ..... FLA
Lodge, Welling Montagu ..... FLA
Law, Bernard A. ..... CPA
Lord, Albert C. ..... CPA
LaBelle, Claude A. ..... SLA
Lindsay, Gordon J. ..... TFT
Long, Frank Jackson ..... SLA; PWM
Lewis, Raymond Charles ..... SLA; CRI
Lewis, William Emmett ..... SLA; DMA
Leek, John B. ..... MIA
Lipman, Mayer ..... SLA; EOT
Lewis, Arthur R. ..... CWT
Little, Archibald ..... CPA
Lawall, George Ralph ..... SLA; GLC
Lamson, Leon L. ..... SLA; PMT
Lawrence, Lynn George ..... SLA; MAT
Lawson, John T. ..... CGC
Lucas, Donald T. ..... CGC
Logan, George ..... CGC
Levy, Saul ..... Note 7
Love, Robert J. ..... REL; DMA
Langman, Victor J. ..... TFT
Lemon, Hobart F. ..... TFT
Lackey, Myron Elmo ..... SLA; MAT
Leddy, Edward F. ..... TFT
Levy, Charles Henry ..... SLA; BFT
Leigh, Kenneth G. ..... CGC
Lan'tz, Lyman Southard ..... SLA; MAT
LaParle, Walter Enders ..... CGC

M

Mayer, Frederick J. ..... TFT
Mann, Laurence C. ..... CPA
Merrick, Louis M. ..... DMA
Maxwell, Robert L. ..... RSD
Monroe, Harry H. ..... SLA
Merrell, Cyrus Walbridge ..... FLA
Mumby, Earle M. ..... FLA
Martin, Virgil Wilson ..... SLA; AAD
Martin, Harry Joseph ..... SLA; SAG
Muehlman, Harry G. ..... LHV
Moyer, Max Frederic ..... SLA; ABC
Martin, Pardoe ..... EOT
Mackall, John Chichester ..... SLA; CRI
Molter, Bennett Arthur ..... CPA
Maranville, Clarence H. ..... CJW
Mucke, Henry C. ..... TFT
Marshall, Robert J. ..... CJW
Murchie, Harry Foster ..... SLA; PMT
Meehan, William Stephen ..... SLA; BST
Martin, Milton R. ..... TFT
Meredith, Russell L. ..... HHN
Mezger, William Winslow ..... SLA; EOT
Moulton, Carl John ..... SLA; CRI
Montgomery, James Norton ..... SLA; SAG
Mears, Mortimer Whitelaw ..... SLA; PWM
Meyer, Henry Charles ..... SLA; ABC
Montfort, Louis B. ..... CPA
Mathews, George C. ..... SBI
Musselman, Gordon E. ..... CPA
Moss, Douglas R. ..... CAF
Mulvihill, William H. ..... CAF
Mook, Harold F. ..... PWM
Morrisey, Merle F. ..... CWT
Moore, Alonzo H. ..... SMM
Miller, Wallace Henry ..... SLA; MAT
Miller, Arthur Glen ..... SLA; ABC
Mackey, George B. ..... CGC
Maddox, Glenn J. ..... SLA; AAD
Massey, Bert V. ..... CGC
Mowry, Jared J. ..... CGC
Mack, George Karl ..... FLA
Moore, Percy Samuel ..... FLA; HHN
Marshall, Norman Harold ..... SLA; EOT
Meinzer, Fred H. ..... CGC
Moretti, Louis R. ..... CGC
Madenford, Raymond Sheridan ..... CGC
Mills, Harry H. ..... CGC
Munice, Floyd H. ..... CGC
Mattson, Alfred S. ..... CGC
Molter, Bennett A. ..... WFO
Marsh, Carl Alphonso ..... SLA; GLC
Martin, Burban A. ..... TFT
Morgan, Charles L. ..... TFT
Micander, Herbert C. ..... TFT
Moss, Fulton C. ..... TFT
Monger, Walter Victor ..... SLA; AAD
Morner, Edward C. ..... CGC
Moore, Kenneth L. ..... HHN
Madden, Edward Charles ..... SLA; BFT
Martin, Pardoe ..... SLA; MAT
Morgan, Louis R. ..... CGC
Mallers, John Bernhard ..... SLA; AAD
Mell, Robert Emerson ..... SLA; EOT
Murray, Harold E. ..... CGC
Morris, Glenn D. ..... CGC
Miller, Harold John ..... SLA; EOT
Manau, Fred Anthony ..... SLA; SBI
Mason, Jones M. ..... CGC
Mullowney, John Julian ..... SLA; VBW

Mc

McClelland, Ellis Dinsmore ..... SLA; TMA
McKinney, Michael Alton, Jr. ..... CPA
McCabe, David A. ..... CPA
McGraw, Le Roy E. ..... CPA
McBride, Clarence E. ..... TFT
MacBey, Sydney John ..... FLA
MacNeill, Homer Charles ..... FLA
MacCauley, Morris Baker ..... SLA; ELA
McCutcheon, Perry Ralph ..... SLA; MAT
McArn, Theodore A. ..... TFT
McDonald, John Q. ..... TFT
McDowell, Lloyd J. ..... CWT
McMillan, Neil T. ..... AGC
McLaughlin, Luke James ..... SLA; RSD
McRae, Nelson ..... TFT
McCabe, Edward L. ..... TFT
McKenna, Edmund P. ..... MIA
McEachin, James S. ..... FLA
MacDonald, Donald B. ..... CUI; LHV; Note 1
McGregor, Kenneth Campbell ..... SLA; ELA
MacMichael, John H. ..... LHV
McLeod, Willard W. ..... CGC
MacIlwain, William Henry ..... SLA; ABC
McClymonds, James Douthett ..... SLA; CRI
McPherson, Andrew Frank ..... SLA; EOT
McClain, Charles Palmer ..... SLA; RSD
McGill, Raymond J. ..... CGC
McDaniel, Wilson Franklin ..... SLA; SAG
McCall, Lewis L. ..... CGC
McCormack, Robert D. ..... CGC
McNally, Sellers M. ..... CGC
McKay, Leo Hugh ..... CGC
McKinstry, Augustus Tremaine ..... CGC
McIlhiney, Donald W. ..... CGC
McClintock, Ralph A. ..... CGC
McElroy, Paul E. ..... CGC
McKinley, Howard W. ..... TFT

N

Noonan, Daniel ..... SLA; KST
Norton, Alwin W. ..... CGC
Nelson, Fred ..... SLA; SMM
Nunn, Charles H. ..... BFT
Nourse, Roderick ..... MIA
Nietz, Adolph H. ..... FLA

Thomas

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Nutter, Farr .....CAF
Newhouse, Sewell Omer .....SLA; SBI
Nuttall, Richard Voight.....SLA; DMA
Nash, Roland L. .....CGC
Norton, John D. .....CGC
Nason, Walton H .....CMV
Noland, Raymond R. .....CGC
Nunn, Richard Edwin .....SLA; SBI
Neville, Eugene E. .....MJA
Neal, Byron Wilkenson .....SLA; PWM
Nilson, Harry Baird .....SLA; MAT

O

Olsen, Luther Henry .....SLA; SBI
Omlie, Vernon Cleophas .....SLA; AAD
Ocker, William C. .....CGC
Ogden, James Russell .....SLA; AAD
Opel, Selmar T. .....CGC
Owens, Celeste F. .....TFT
Ordway, Lucius P., Jr.....CPA
Olds, James H. S. .....CGC
Osborn, John C. .....CGC
Owens, William C. .....BST
Osborne, Percy Lamar.....SLA; GLC
Owens, Leo E. .....LHV
O'Brien, Bernard Joseph.....CGC

P

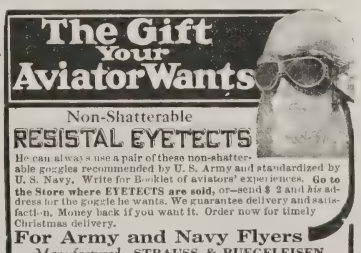
Phenicie, Hubert Ellsworth .....SLA; SBI
Phelps, Raymond W. .....CWT
Penick, Dan Easley .....SLA; WFO
Pollock, Jacques J. .....CGC
Patch, Robert Buckingham.....SLA; AAD
Pollard, Fred D. .....TFT
Percy, LeRoy Pratt .....SLA; BFT
Pearse, Max Milton .....SLA; CRI
Phillips, George Cnauncey.....SLA; TMA
Prosser, Harvey W. .....CGC
Pritchard, Ernest William .....SLA; GLC
Pavey, Smith W. .....ELA
Page, Silas .....KST
Paine, Grosvenor R. .....TFT
Paustain, Franz Henry .....SLA; BFT
Powelson, Karl DeWitt .....SLA; MAT
Pearson, Clarence W. .....TFT
Prosser, James R. .....TFT
Pennefather, James Sheridan .....FLA
Pink, Louis P. .....SLA; DAP
Phelan, Joseph P. .....PWM
Palmer, LeRoy Clark .....SLA; AAD
Pemberton, George H. .....CGC
Parks, Robert Chester .....SLA; GLC
Polick, Arthur .....PFO
Painter, Walter .....SLA; SAG

Q

Quarenberg, Paul R. .....CGC

R

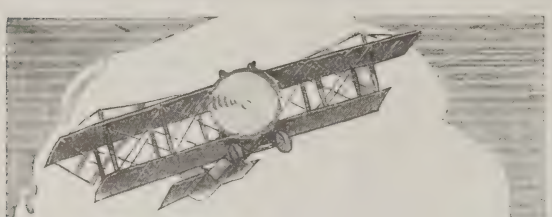
Rodgers, Benjamin G. .....CGC
Roop, Walter William .....SLA; RWT
Robesky, Robley Melville .....SLA; MAT
Rutledge, Erwin Brooks .....SLA; SAG
Roche, Felix Robertson .....FLA
Rhoads, Tilford W. .....TFT
Rice, George Kenneth .....SLA; GLC
Rooney, Bernard Patrick .....CPA
Randolph, Roy J. .....CGC
Roberts, James Albert .....SLA; PWM
Riley, Boyd Tolbert .....SLA; CFT
Reid, Edward S., Jr. .....RSD
Rogan, James Stewart .....CPA
Rogers, Edward Dana .....SLA; TMA
Ryan, Arthur W. .....EOT
Reid, Edward Solomon, Jr.....SLA; SBI
Rothstein, Arthur .....PFO
Robinson, Frank J. .....SLA; CUI
Rombough, Miles D. .....SBI
Russell, Scott .....SLA; CRI
Reed, Clyde Thaddeous .....SLA; SAG
Roe, James A., Jr. .....TFT
Rehlmeyer, August G. .....CGC
Reid, Charles A. .....DMA
Randall, John Ralph .....FLA; ASM
Ramsey, John P. .....LHV
Reynolds, John W. .....CGC
Record, Harold Jordan .....SLA; CRI
Reynolds, Bruce Dodson .....FLA
Rowley, William Perry .....SLA; BFT
Reavis, Charles F. .....DMA



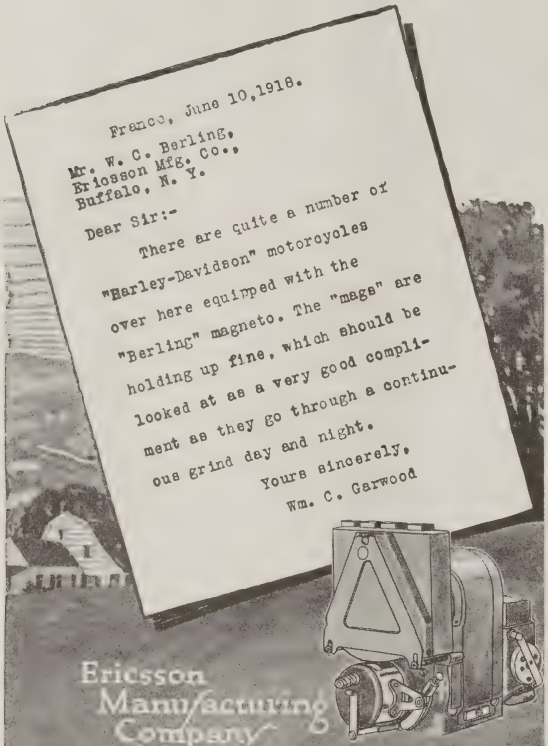
Reinbrecht, Downing Althans.....SLA; TMA
Ryan, James Francis .....SLA; CFT
Riebe, Herbert F. .....CGC
Ryan, Robert E. .....CGC
Reynolds, Harry I. .....CRI
Robertson, Hugh .....SLA; SBI
Ramage, Alfred H. .....CGC
Rowley, Enos J. .....TFT
Reed, Clyde T. .....CAF
Roach, Howard L. .....CGC
Rowlinson, Walter S. .....CGC
Roeder, Frank E. .....CGC
Regan, Francis M. .....TFT
Rice, George Edgar .....CGC
Rider, William N. .....CGC
Reese, Paul J. .....CGC
Riley, Joseph E. .....CGC

S

Shine, Melville Carl .....SLA; GLC
Speidel, Jess Wheat .....FLA; DAP
Schelling, George L. .....AGC
Schannell, James Joseph, Jr. .....SLA; ABC
Strother, Samuel P. .....AGC
Schneider, Max F. .....TFT
Silberman, Moe W. .....TFT
Sherwood, Horace M. .....BST
Schmidt, Edward William .....SLA; ABC
Stites, James W. .....AGC
Stanley, Robert H. .....AGC
Schneider, Raymond F. .....CAF
Sharpnack, John W. .....CGC
Sack, Isidor .....DAP
Swope, John G. .....SLA
Snyder, John A. .....MIA
Slaughter, Ivan S. .....RSD
Sheppard, Edward Burgess.....SLA; KST
Smith, Charles Francis .....FLA
Stampfer, Joseph F., Jr. .....SMM
Sieg, Lee Paul.....LHV
Scully, William Augustine.....CPA
Stewart, Earl F. .....MIA
Steele, Dudley M. .....MIA
Smith, Edward S. .....RSD
Santee, Alvin L. .....RSD
Smith, Harry L. .....TFT
Stanley, Thomas Corwin .....SLA; BST
Somers, Paul Edmund .....SLA; TMA
Schneider, Raymond Fred .....SLA; SAG
Smith, Donald Brainard .....SLA; SBI
Stewart, Walter J. .....LHV
Scarritt, Arthur D. .....BFT
Shankle, Clarence E. .....CAF
Steel, Walter H. .....PWM
Stout, Minor W. .....LHV
Spender, Clarendon R. .....CGC
Staerker, Otto .....TFT
Shekelton, Vincent .....TFT



France gives trying test to Berling



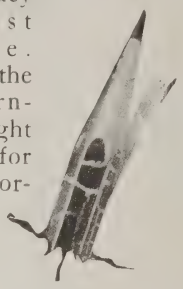
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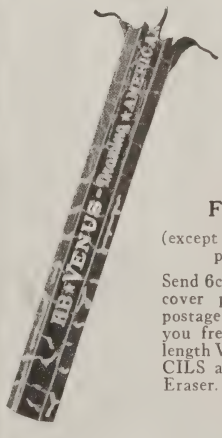
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Smith, Kenneth W. ..... SLA; Note 6
Sheldon, Sherwood McKinney ..... SLA; SBI
Schroth, Herbert H. ..... DMA; CWT; Note 1
Saunders, Guy D. ..... CGC
Seavey, Calvin C. ..... CGC
Sonntag, William D. ..... CGC
Stephens, Orville L. ..... CGC
Scouten, Harry E. ..... CGC
Snow, George W. ..... CGC
Spain, Thomas H. ..... CGC
Stone, Harry D. ..... CGC
Shaw, Francis E. ..... TFT
Skow, Charles T. ..... TFT
Spiers, Robert H. ..... TFT
Steller, Adolph W. ..... TFT
Simons, Leroy Simeon ..... MJA; Note 9
Stearnes, Harry Arthur ..... SLA; CWT
Sand, James Harvey ..... SLA; GLC
Schleinkofer, George Norman ..... SLA; GLC
Slaughter, Ivan Stanton ..... SLA; SBI
Sheldon, Frederick Henry, Jr. ..... SLA; MAT
Silbert, Samuel B. ..... CGC
Seanor, Paul Blackburn ..... SLA; MAC
Sharn, Marion Bates ..... SLA; MAT
Storring, David S. ..... DAP
Sproul, Harry Allan ..... SLA; MAT
Sanders, Ralph L. ..... CGC
Stimson, George W. ..... FLA; DMA
Spalding, Russell A. ..... CGC
Shapley, Charles S. ..... CGC
Strum, Elmer A. ..... CGC

T

Taylor, Newell Eastman ..... SLA; AAD
Thiers, Lucas Clapp ..... SLA; AAD
Turner, Milton Marston ..... SLA; CFT
Titzell, George Graham, Jr. ..... SLA; TMA
Towle, Ellingwood H. ..... SLA; MDO
Taylor, Charles Fred ..... SLA; SAG
Taney, Theodore ..... AGC
Teaze, Stewart J. ..... AGC
Trival, Herbert ..... MIA
Trefz, Walter ..... CGC
Thompson, Wilbur Stouder ..... SLA; SBI
Thompson, Frank Burton ..... SLA; TMA
Thompson, Alexander Campbell ..... SLA; AAD
Thennisch, John Joseph ..... SLA; ELA
Thompson, Roland S. ..... TFT
Tilley, Norman Nevil ..... SLA; SAG
Townsend, Edward M. ..... MIA
Thomas, Alfred H. ..... CGC
Tait, Arthur L. ..... CAF
Taliaferro, Charles A., Jr. ..... TFT
Taylor, Bayard C. ..... CGC
Thomas, George Kenneth ..... FLA
Troy, William Wylie ..... SLA; BFT
Turner, Lambert ..... WFO
Taylor, Alfred B. ..... CGC
Thomas, James R. ..... CGC
Thweatt, William K. ..... TFT
Trippe, Graham ..... SLA; ABC
Tuerk, John ..... SLA; Note 5
Teasdale, Lawrence W. ..... SLA; AAD

V

Vandenberge, Joseph V., Jr. ..... SLA; AAD
Van Auken, Harry James ..... SLA; ABC
Van Ordstrand, Earl Baker ..... SLA; CRI
Vickery, Merritt A. ..... TFT
Vollman, Roy W. ..... CGC
Vogel, Henry W., Jr. ..... PWM

W

Westby, Louis I. ..... RSD
Warren, Jim C. ..... CGC
Watson, Charles Otto ..... SLA; BST
Wright, Sidney Gates ..... SLA; KST
Willcox, Albert Miles ..... CPA
Ward, Allen B. ..... CGC
Wolfangle, George Henry ..... SLA; CRI
West, James Robert ..... SLA; GLC
White, Noel Robinson ..... SLA; TFT
Wulp, George Adolf ..... SLA; AAD
Witt, Keith L. ..... PWM
Warfield, Robert Graves ..... SLA; SBI
Wallen, John Victor ..... SLA; MAT
White, Albert R. ..... EOT
Wiggins, Grafton ..... SLA; CUI
White, Charles Drummond ..... SLA; MAT
Willmering, Joseph F. ..... CGC
Willrodt, Emil ..... SMM
Wallenstein, Philip Nicholas ..... SLA; SAG
Windham, Jesse M. ..... TFT
Ward, Paul Albert ..... SLA; MAT
Walter, Jay Douglas ..... SLA; GLC
Woodruff, Frederick William ..... CPA; DAP
Warren, Douglas Carroll ..... SLA; MAC
Wenger, Henry Edmund ..... SLA; LHV
Waltz, Henry Washington, Jr. ..... SLA; MAT
Wheeler, John B. E. ..... KST
Wallis, Edmund C. ..... AGC
Wadden, Thomas Antony ..... SLA; DAP
Woolfolk, Roper Blackerby ..... SLA; GLC
Waldron, Clarence H. ..... CGC
Wright, Marcus H. ..... CAF
Welch, Peter W. ..... LHV
Warren, Jim Clarke ..... SLA; CFT
Whitney, Cornelius V. ..... CGC
Wentworth, Ralph Preston ..... SLA; DAP
Wilson, Alexander H. ..... LHV
Williams, Earl C. ..... EOT
Wachtel, Morris F. ..... CGC
White, Leon Hosea ..... SLA; ABC
Waldo, Herbert Strong ..... SLA; EOT

Y

Young, George, Jr. ..... FOB
Yeazel, Lloyd H. ..... CGC
Yocis, Anthony J. ..... CGC

Pershing Decorates Thaw

Word was received at the Aero Club of America on October 24 that General Pershing had awarded the Distinguished Service Cross, with two citations, to Major William Thaw, American ace and known as the dean of American aviators in France.

This is the first American award received by Major Thaw, who has received several French decorations, among them the Croix de Guerre and the Medal of the Legion of Honor. Those awards were in recognition of Major Thaw's exploits as a member of the Lafayette Escadrille before he entered the American service.

Lieut. Frank Luke, Flyer, Is Missing

With the American Army Northwest of Verdun, —Lieut. Frank Luke of Phoenix, Ariz., one of the most daring of the American aviators, has been missing since the night of Oct. 20. On that night he started out on a bombing expedition, and so far has failed to return.

Lieut. Luke made a specialty of "getting" balloons, and first came into prominence among the American flyers for his prowess in this respect. He was pronounced an expert at "getting" the "gas bags" in their beds, and on one occasion dropped down to within 150 feet of his intended victim.

It is asserted that he once set a balloon afire while it was being towed to its observation post, the attack being delivered before those in charge of the balloon knew he was in the vicinity.

Lieut. Luke was believed to have destroyed nine enemy planes, although he was not officially an ace. He had downed fourteen balloons.

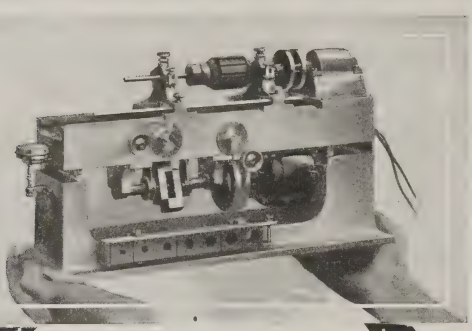
Captain Edward Rickenbacher on Oct. 30 achieved his twenty-third and twenty-fourth air victories. He was over enemy lines doing a bit of boche hunting when a Fokker sped below him. Diving on the German flier, he brought him down in flames.

As Rickenbacher turned to come home he saw an observation balloon on the ground below him and sent an incendiary bullet into it, burning it.

Twenty-one German aviators were downed on Oct. 30 by American chasing aviators. It was a banner day in American aviation.

Two American airmen are missing.

The aerial activity began early this morning, and, aided by the clear weather, American bombers were successful in attacking various enemy points of troop concentration both in the morning and in the afternoon.



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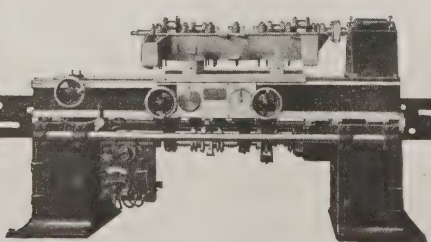
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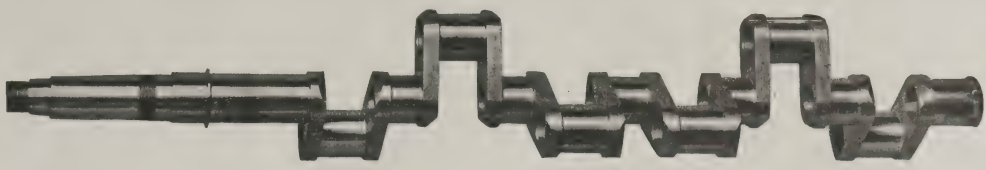
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Land Machines—Seaplanes—Flying Boats

Steele's Adv. Service

(*Continued from page* 485)

filled, for 1,000 Hall-Scott engines and spares. The evidence is that Major Marmon had no part in the negotiations relating to these contracts or with the supervision of inspection, production or payments. He has been engaged in the aeroplane experimental department, or engineering department at McCook Field. It does not appear that he has had any transaction with the Nordyke & Marmon Company save that he sent to that Company, with others, from McCook Field, the blueprints for the Liberty Engine. It also appears that he signed a communication from McCook Field relating to a Marmon automobile which had been ordered by Lt.-Col. Vincent for that department. Taking all the facts into consideration, there is no sufficient ground for a charge of violation of the statute in his case.

2d Lt. Samuel B. Vrooman, Jr.

In a subsequent portion of this report, reference is made to the Mahogany Manufacturers and Importers Association, a voluntary association of the leading mahogany manufacturers of the United States, which was formed last January in connection with negotiations for the purchase by the Government of mahogany for airplane propellers. One of the members of the Association is the S. B. Vrooman Company of Philadelphia. 2d Lt. Vrooman is the son of Samuel B. Vrooman who was the head of this company until his death a short time ago. 2d Lt. Vrooman is thirty-one years of age and for upwards of nine years was at work in his father's company, handling lumber, inspecting and selling. On his marriage in June, 1917, his father gave him $10,000 in par value of the company's stock, which for some years has paid 20 per cent. dividends annually. This stock he still holds. In addition to the dividends on his stock, the S. B. Vrooman Company has continued to pay him, since he entered the service of the Government, the sum of $50 a week, which is the equivalent of the compensation he previously received for his services to the company.

In December, 1917, S. B. Vrooman, Jr., identified with the equipment Division of the Signal Corps as a civilian and was made an inspector of mahogany purchased by the Government. In February, 1918, he was put in charge of the inspection of all propeller lumber. He selected the district officers, who in turn selected the inspectors. Mr. Vrooman issued instructions to the district officers, visited the plants to see that the inspectors were doing their duty and passed on disputed points. He has continued in this service and in July, 1918, received a commission as Second Lieutenant. Among the plants subject to his jurisdiction as head of inspection of propeller lumber is that of the S. B. Vrooman Company, which has had contracts with the Government and is within the territory assigned to the district office at New York. S. B. Vrooman, Jr., selected the head of this office, Mr. McCullough, who was responsible to him for the efficiency of the inspection and for the carrying out of his instructions, which related to the inspection at the Vrooman plant as well as others. The conclusion is not to be escaped that S. B. Vrooman, Jr., was the agent of the Government directly responsible for the proper inspection of the mahogany delivered by the S. B. Vrooman Company to the Government under its contracts, and that his acting as such agent for the transaction of business with the corporation in which he was a stockholder was in violation of the statute.

(*To be continued*)

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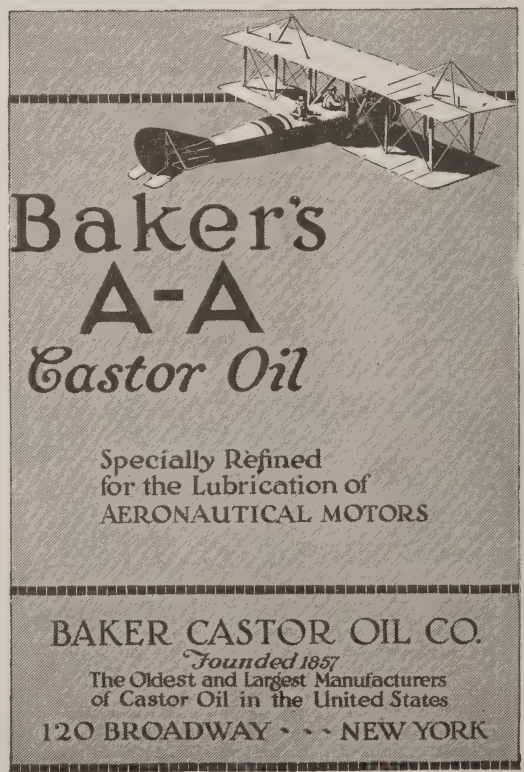
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Aeronautics
NOV 20 1918

AERIAL AGE WEEKLY

Vol. 8, No. 10 NOVEMBER 18, 1918 10 CENTS A COPY



A flight of aeroplanes flying in formation at an American training school

GERMANY SURRENDERS

AERO CLUB ANNUAL MEETING

SHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
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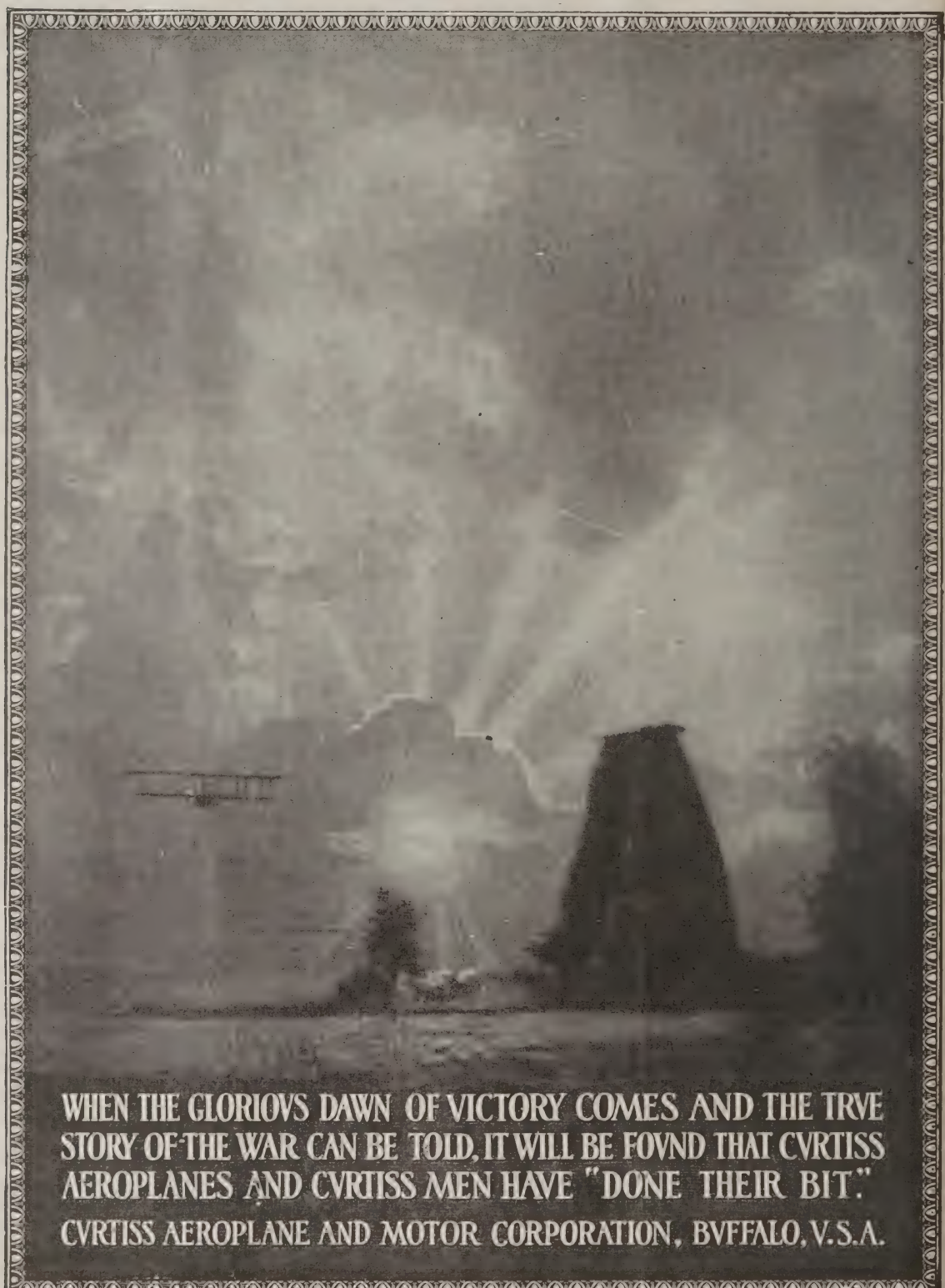
TABLE OF CONTENTS

PAGE

Germany Surrenders 509
Annual meeting of Aero Club 510
The Hughes Aircraft Report 511
Statement from Curtiss Aeroplane & Motor Corp 516
News of the Week 517
The Aircraft Trade Review 519
U. S. Aerial Mail 520
Military Aerostatics 521
Power Curve of the Aerial Propeller 522
Spencer Heath, Pioneer in Propellers 526
Naval and Military Aeronautics 527
Foreign News 530
Elementary Aeronautics and Model News 531
Aeronitis 532

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879


WHEN THE GLORIOVS DAWN OF VICTORY COMES AND THE TRVE STORY OF THE WAR CAN BE TOLD, IT WILL BE FOVND THAT CVRTISS AEROPLANES AND CVRTISS MEN HAVE "DONE THEIR BIT."
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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
WASHINGTON OFFICE: 619 *Union Trust Bldg.*
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Nov. 18, 1918
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, NOVEMBER 18, 1918 NO. 10

GERMANY SURRENDERS

ON November 11th President Wilson addressed the Congress and announced the terms of the armistice, as follows:

I.—Military Clauses on Western Front

One—Cessation of operations by land and in the air six hours after the signature of the armistice.

Two—Immediate evacuation of invaded countries: Belgium, France, Alsace-Lorraine, Luxemburg, so ordered as to be completed within fourteen days from the signature of the armistice. German troops which have not left the above-mentioned territories within the period fixed will become prisoners of war. Occupation by the allied and United States forces jointly will keep pace with evacuation in these areas. All movements of evacuation and occupation will be regulated in accordance with a note annexed to the stated terms.

Three—Repatriation, beginning at once and to be completed within fourteen days, of all inhabitants of the countries above mentioned, including hostages and persons under trial or convicted.

Four—Surrender in good condition by the German armies of the following equipment: Five thousand guns (2,500 heavy, 2,500 field), 30,000 machine guns. Three thousand minenwerfers. Two thousand aeroplanes (fighters, bombers—firstly, D, seventy-three's and night bombing machines). The above to be delivered in situ to the Allies and the United States troops in accordance with the detailed conditions laid down in the annexed note.

Five—Evacuation by the German armies of the countries on the left bank of the Rhine. These countries on the left bank of the Rhine shall be administered by the local authorities under the control of the allied and United States armies of occupation. The occupation of these territories will be determined by allied and United States garrisons holding the principal crossings of the Rhine—Mayence, Coblenz, Cologne—together with bridgeheads at these points in thirty kilometer radius on the right bank and by garrisons similarly holding the strategic points of the regions. A neutral zone shall be reserved on the right of the Rhine between the stream and a line drawn parallel to it forty kilometers to the east from the frontier of Holland to the parallel of Gernsheim and as far as practicable a distance of thirty kilometers from the east of the stream from this parallel upon the Swiss frontier. Evacuation by the enemy of the Rhine lands shall be so ordered as to be completed within a further period of eleven days—in all, nineteen days after the signature of the armistice. [Here the President interrupted his reading to remark that there evidently had been an error in transmission, as the arithmetic was very bad. The "further period" of eleven days is in addition to the fourteen days allowed for evacuation of invaded countries, making twenty-five days given to the Germans to get entirely clear of the Rhine lands.] All movements of evacuation and occupation will be regulated according to the note annexed.

Six—In all territory evacuated by the enemy there shall be no evacuation of inhabitants; no damage or harm shall be done to the persons or property of the inhabitants. No destruction of any kind to be committed. Military establishments of all kinds shall be delivered intact as well as military stores of food, munitions, equipment not removed during the periods fixed for evacuation. Stores of food of all kinds for the civil population, cattle, &c., shall be left in situ. Industrial establishments shall not be impaired in any way and their personnel shall not be moved. Roads and means of communication of every kind, railroad, waterways, main roads, bridges, telegraphs, telephones shall be in no manner impaired.

Seven—All civil and military personnel at present employed on them shall remain. Five thousand locomotives, 50,000 wagons, and 10,000 motor lorries in good working order with all necessary spare parts and fittings shall be delivered to the Associated Powers within the period fixed for the evacuation of Belgium and Luxemburg. The railways of Alsace-Lorraine shall be handed over within the same period, together with all pre-war personnel and material. Further material necessary for the working of railways in the country on the left bank of the Rhine shall be left in situ. All stores of coal and material for the upkeep of permanent ways, signals and repair shops left entire in situ and kept in an efficient state by Germany during the whole period of armistice. All barges taken from the Allies shall be restored to them. A note appended regulates the details of these measures.

Eight—The German command shall be responsible for revealing all mines or delay-acting fuse disposed on territory evacuated by the German troops, and shall assist in their discovery and destruction. The German command shall also reveal all destructive measures that may have been taken (such as poisoning or polluting of springs, wells, &c.) under penalty of reprisals.

Nine—The right of requisition shall be exercised by the Allies and the United States armies in all occupied territory. The upkeep of the troops of occupation in the Rhine land (excluding Alsace-Lorraine) shall be charged to the German Government.

Ten—An immediate repatriation without reciprocity according to detailed conditions, which shall be fixed, of all allied and United States prisoners of war. The allied Powers and the United States shall be able to dispose of these prisoners as they wish.

Eleven—Sick and wounded who cannot be removed from evacuated territory will be cared for by German personnel, who will be left on the spot with the medical material required.

II.—Disposition Relative to the Eastern Frontiers of Germany

Twelve—All German troops at present in any territory which before the war belonged to Russia, Rumania or Turkey, shall withdraw within the frontiers of Germany as they existed on August 1, 1914.

Thirteen—Evacuation by German troops to begin at once, and all German instructors, prisoners, and civilian as well as military agents now on the territory of Russia (as defined before 1914) to be recalled.

Fourteen—German troops to cease at once all requisitions and seizures and any other undertaking with a view to obtaining supplies intended for Germany in Rumania and Russia (as defined on August 1, 1914).

Fifteen—Abandonment of the treaties of Bucharest and Brest-Litovsk and of the supplementary treaties.

Sixteen—The Allies shall have free access to the territories evacuated by the Germans on their eastern frontier either through Danzig or by the Vistula in order to convey supplies to the populations of those territories or for any other purpose.

III.—Clause Concerning East Africa

Seventeen—Unconditional capitulation of all German forces operating in East Africa within one month.

IV.—General Clauses

Eighteen—Repatriation, without reciprocity, within a maximum period of one month, in accordance with detailed conditions hereafter to be fixed, of all civilians interned or deported, who may be citizens of other allied or associated states than those mentioned in Clause Three, Paragraph Nineteen, with the reservation that any future claims and demands of the Allies and the United States of America remain unaffected.

Nineteen—The following financial conditions are required: Reparation for damage done. While such armistice lasts, no public securities shall be removed by the enemy which can serve as a pledge to the Allies for the recovery or reparation for war losses. Immediate restitution of the cash deposit in the national bank of Belgium, and in general immediate return of all documents, specie, stocks, shares, paper money, together with plant for the issue thereof, touching public or private interests in the invaded countries. Restitution of the Russian and Rumanian gold yielded to Germany or taken by that Power. This gold to be delivered in trust to the Allies until the signature of peace.

V.—Naval Conditions

Twenty—Immediate cessation of all hostilities at sea and definite information to be given as to the location and movements of all German ships. Notification to be given to neutrals that freedom of navigation in all territorial waters is given to the naval and mercantile marines of the allied and associated Powers, all questions of neutrality being waived.

Twenty-one—All naval and mercantile marine prisoners of the allied and associated Powers in German hands to be returned without reciprocity.

Twenty-two—Surrender to the Allies and the United States of America

of one hundred and sixty German submarines, (including all submarine cruisers and mine laying submarines,) with their complete armament and equipment in ports, which will be specified by the Allies and the United States of America. All other submarines to be paid off and completely disarmed and placed under the supervision of the allied Powers and the United States of America.

Twenty-three—The following German surface warships, which shall be designated by the Allies and the United States of America, shall forthwith be disarmed and thereafter interned in neutral ports, or for the want of them, in allied ports, to be designated by the Allies and the United States of America, and placed under the surveillance of the Allies and the United States of America, only caretakers being left on board, namely: Six battle cruisers, ten battleships, eight light cruisers, including two mine layers, fifty destroyers of the most modern type. All other surface warships (including river craft), are to be concentrated in German naval bases to be designated by the Allies and the United States of America, and are to be paid off and completely disarmed and placed under the supervision of the Allies and the United States of America. All vessels of the auxiliary fleet, trawlers, motor vessels, &c., are to be disarmed.

Twenty-four—The Allies and the United States of America shall have the right to sweep up all mine fields and obstructions laid by Germany outside German territorial waters and the positions of these are to be indicated.

Twenty-five—Freedom of access to and from the Baltic to be given to the naval and mercantile marines of the allied and associated Powers. To secure this the Allies and the United States of America shall be empowered to occupy all German forts, fortifications, batteries and defense works of all kinds in all the entrances from the Cattegat into the Baltic, and to sweep up all mines and obstructions within and without German territorial waters, without any question of neutrality being raised, and the positions of all such mines and obstructions are to be indicated.

Twenty-six—The existing blockade conditions set up by the allied and associated Powers are to remain unchanged, and all German merchant ships found at sea are to remain liable to capture.

Twenty-seven—All naval aircraft are to be concentrated and immobilized in German bases to be specified by the Allies and the United States of America.

Twenty-eight—In evacuating the Belgian coasts and ports, Germany shall abandon all merchant ships, tugs, lighters, cranes and all other harbor materials, all materials for inland navigation, all aircraft and all materials and stores, all arms and armaments, and all stores and apparatus of all kinds.

Twenty-nine—All Black Sea ports are to be evacuated by Germany; all Russian war vessels of all descriptions seized by Germany in the Black Sea are to be handed over to the Allies and the United States of America: all neutral merchant vessels seized are to be released; all warlike and other materials of all kinds seized in those ports are to be returned and German materials as specified in Clause Twenty-eight are to be abandoned.

Thirty—All merchant vessels in German hands belonging to the allied and associated Powers are to be restored in ports to be specified by the Allies and the United States of America without reciprocity.

Thirty-one—No destruction of ships or of materials to be permitted before evacuation, surrender, or restoration.

Thirty-two—The German Government will notify the neutral Governments of the world, and particularly the Governments of Norway, Sweden, Denmark, and Holland, that all restrictions placed on the trading of their vessels with the allied and associated countries, whether by the German Government or by private German interests, and whether in return for specific concessions, such as the export of shipbuilding materials or not, are immediately cancelled.

Thirty-three—No transfers of German merchant shipping of any description to any neutral flag are to take place after signature of the armistice.

VI.—Duration of Armistice

Thirty-four—The duration of the armistice is to be thirty days, with option to extend. During this period, on failure of execution of any of the above clauses, the armistice may be renounced by one of the contracting parties on forty-eight hours' previous notice.

VII.—The Limit for Reply

Thirty-five—This armistice to be accepted or refused by Germany within seventy-two hours of notification.

CAPRONI'S PLANS FOR 18,000 HORSE POWER CAPRONI AIR CRUISER MADE KNOWN AT AERO CLUB OF AMERICA ANNUAL MEETING

IT was announced on November 11th, at the annual meeting of the Aero Club of America, that Mr. Gianni Caproni, the famous Italian aeroplane constructor, is planning to construct an air cruiser of the aeroplane type, with a number of motors aggregating 18,000 horsepower.

The armistice having lifted the ban on the discussion of coming aeronautic developments, the Transatlantic Flight Committee of the Aero Club of America, of which Mr. Henry A. Wise Wood is chairman, made known the fact that there are several aeroplanes already being designed, each to be equipped with 5,000 horsepower. Caproni has one such machine, and it was in connection with the discussion of this type that it became known that Caproni has an 18,000 horsepower air cruiser under consideration, which will be capable of carrying a large number of passengers in non-stop flights across the Atlantic.

The famous British constructor, Handley Page, is also planning to manufacture a 5,000 horsepower machine, and similar plans are under consideration in the United States.

The Aero Club of America received an offer from Mr. Harry N. Atwood, the veteran aviator, who, representing a group of prominent patriotic men, offer to pay the expenses of constructing a Transatlantic air cruiser for the Aero Club of America.

Officers Re-Elected by 1,000 Votes

The present officers of the club were re-elected, 1,000 votes being cast for them, and there being no opposition. The officers elected are as follows:

President, Alan R. Hawley; vice-president, Henry A. Wise Wood; second vice-president, Godfrey L. Cabot; third vice-president, Rear Admiral Bradley A. Fiske; fourth vice-president, Charles Jerome Edwards; governors, Class A, term expiring 1922, Lt. Col. James A. Blair, U.S.A.; Henry Woodhouse; Allan A. Ryan; Rear Admiral Bradley A. Fiske; Class A, term expiring 1921, William Hawley; governors, Class B, Major Albert B. Lambert, U.S.A.; Henry B. Joy; Lieut. Godfrey L. Cabot, U.S.N.; George M. Myers; John Hays Hammond, Jr.; Alberto Santos-Dumont; Brig.-General Robert K. Evans, U.S.A.; Major Max C. Fleischmann, U.S.A.; treasurer, Lieut. Col. Charles Eliot Warren.

General Pershing, Vice-Admiral Sims, and Postmaster General Burleson were elected honorary members of the club.

Letters were received from the highest military and naval authorities in the United States and overseas, including Admiral Sims, praising the patriotic work of the club and its officers.

So-Called "Opposition" Could Not Muster 100 Proxies in Four Months of Efforts

The so-called "opposition" presented 67 proxies, some dated as early as July and September, but on checking these proxies it was found that some of the signers had notified the secretary of the club since that they had signed them under a misunderstanding, not knowing that the names of prominent sportsmen used in the so-called opposition were used without their authority and had since voted for the regular ticket. Others invalidated their former proxies when they found by the annual report the enormous amount of patriotic work which the present management of the club had done and voted for the present administration. The secretary of the so-called opposition requested permission of those present to withdraw the so-called opposition ticket. This was granted.

Aero Club Has 1,960 Members and Has Issued 5,000 Pilot Certificates

Major F. L. V. Hoppin, chairman of the membership committee, reported that the club has 1,960 members and has gained close to one thousand members during the past year. The club's service flag has over one thousand stars, every military member in the service being a commissioned officer and every civilian member in the service holding a position of importance.

Mr. Alan R. Hawley, chairman of the Contest Committee, reported that the club has issued over 5,000 pilot certificates. Other reports showed that an enormous amount of patriotic and constructive work was done by the club during the past year.

The summary of the important work done and planned covered forty closely typewritten pages and lack of space prevents AERIAL AGE from printing it. It covers the activities of the club in the United States and overseas, and work for winning the war as well as for the development of aeronautics for peaceful purposes and to provide employment for aviators after the war.

THE HUGHES AIRCRAFT REPORT

(Continued from last week)

FOURTH—THE AIRCRAFT PROGRAM

At the time of our entry into the War we had no combat planes, and only a few planes for training and scouting purposes. Approximately 100 aeroplanes had been delivered to the Army up to the year 1917. There were few flyers and still fewer who had any acquaintance with aviation engineering. The aeroplane manufacturing industry was in its infancy in this country. But these difficulties were not concealed. The necessity of prompt endeavor to surmount them and of securing at once the full benefit of foreign experience was obvious.

On May 22, 1917, the Joint Army and Navy Technical Aircraft Board, consisting of officers of the Army and Navy especially qualified by reason of aeronautical experience, made a series of recommendations to the Secretary of War and the Secretary of the Navy, which were duly approved by each Secretary. It was recommended that there should be purchased by the Army (from the Curtiss Aeroplane and Motor Corporation) "700 Curtiss JN-4 advanced training planes, equipped with the Curtiss OX-5 engines, with 50% extra engines and appropriate amount of engine and aeroplane spares." The purchase of 100 Gnome engines (40 for the Navy and 60 for the Army) from the General Vehicle Company was also advised. It was recommended "that no action be taken on the suggestion by the Aircraft Production Board for the purchase of the Standard J aeroplanes, pending tests of this machine by Army flyers." Other recommendations were as follows:

"9. The Board recommends that the Aircraft Production Board take immediate steps to obtain complete working drawings, complete machines for use as samples, and to arrange for the manufacture in this country of the following aeroplanes and engines:

AEROPLANES.

Sopwith, 1½ strutter.
Spad, 1-place pursuit type.
S. E. 5, 1-place pursuit type.
Sopwith, 130 H. P. Clerget, 1-place pursuit type.
D. H. 4, 2-place reconnaissance.
B. E. 2 D, 2-place reconnaissance.
White, Gnome pusher, seaplane.
Two types of Fairey seaplanes; 130 H. P. Clerget type and also a Campania type.
Farman, with a 150 H. P. Hispano Suiza engine, seaplane.

ENGINES.

Lorraine-Dietrick, 250 H. P.
Clerget, 130 H. P.
Hispano Suiza, 200 H. P.
Rolls-Royce, 270 H. P.
B. H. P. 200 H. P.
Gnome Mono-soupape, 170 H. P."

The same Board on May 23rd made further recommendations to the Secretary of War and Secretary of the Navy, which were also approved, as follows.

"3. It is estimated that the needs of the United States Army for heavier-than-air aircraft until July 1, 1918, will be as indicated hereinafter and it is recommended that a building program to accomplish these needs be started at once.

Under the present conditions in order to meet the needs of the United States Army only.

Type of Aeroplane	Number Required	Type of Engine	Number Required
J. N.-4	3,500	OX-5	7,000
DeH.-4	1,750	R-R or equivalent	3,500
S E-5	600	H-S	1,200
S.P.A.D.	600	H-S	1,200
Sopwith	600	Clerget 130	1,200
J. N.-4 (Stop gap order)	0	Hall-Scott A-7-a	1,000

In the event that the United States are called upon to train foreign flyers in addition to United States Army flyers.

TRAINING

Type of Aeroplane	Number Required	Type of Engine	Number Required
J. N.-4	5,000	OX-5	10,000
DeH.-4	2,500	R-R or Equivalent	5,000
S E-5	800	H-S	1,600
S.P.A.D.	800	H-S	1,600
Sopwith	800	Clerget 130	1,600

* * * * * * *

"6. It is recommended that the Aircraft Production Board of the Council of National Defense take steps immediately to advise concerning the formulation of the plans how best to obtain in this country the following aeroplanes and engines with the designs of these aeroplanes and engines and the rights to manufacture them in this country.

AEROPLANES.

Type	Number	Type	Number
DeH.-4	2	R-R	4
S E-5	2	H-S	4
S.P.A.D.	2	H-S	4
Sopwith 1½ strutter	2	Clerget 130	4
B E 2 C	2	R A F	4
Farnam seaplane	2	H-S	4
Martinsyde	2	R-R-190	4
Sopwith	2	Clerget 110	4
Handley-Page twin	4	R-R	16
Caproni	2	C U R 92 Rh 110	4
Savoya	2	With engine	4
Savoya	2	With engine	8

"7. In addition all such modern German aeroplanes complete with engines as it may be possible to obtain. These may be obtained either from the allies or from Holland.

"8. ADDITIONAL ENGINES DESIRED.

4 Lorraine-Dietrick, 250 H. P.
3 Clerget, 130 H. P.
2 Hispano Suiza, 200 H. P.
3 Rolls-Royce, 270 H. P.
2 B. H. P., 200 H. P.
4 Gnome Mono-soupape, 170 H. P."

Report of Aeronautical Commission

Two months after we had entered the War, an Aeronautical Commission was sent to Europe. This Commission, which sailed on June 17, 1917, in charge of Major (afterwards Colonel) R. C. Bolling, was composed of Army and Navy experts and civilians. Captain Virginius E. Clark and Captain Edgar S. Gorrell represented the Army, and Navy Constructor G. C. Westervelt and Lieutenant Warren G. Child represented the Navy.

Major Bolling's report was sent from Paris on August 15, 1917. The governing principle for the American Production program was stated by Major Bolling to be:

"First. The United States must first provide itself with all aeroplanes and engines required for training purposes in America.

"Second. The United States must next provide the aeroplanes and engines necessary for use strictly in connection with the operation of American forces in the field. It is best known in Washington what will be the size and composition of the American forces in the field at any given dates in the future. You have the information as to the number of types of aeroplanes required in direct connection with military operations of these forces. We have learned nothing to change the views on that matter which were held by Major Foulois when we left Washington.

"Third. After these first two considerations comes the American programme of putting into the field next year air forces in excess of the tactical requirements of its army in France. It is greatly desired that the United States shall do this. Such air forces should consist of fighting aeroplanes and bombers." (Then follows a statement of the proportions deemed advisable.)

The conditions of European production were described; and the advisability of obtaining through foreign orders the supply of aeroplanes and engines required for use at the front and in training abroad for a period extending to July 1, 1918, was strongly emphasized, as is shown by the following extract from the report:

"In our opinion these American needs may be divided into two periods: First period, from the present time to July 1st, 1918. Second period, subsequent to July 1st, 1918. With every confidence in the ultimate performance of the American production program our investigations of production experience over here and of the sea tonnage situation have convinced us that aeroplanes and engines produced in America cannot be actually delivered at the front in any great quantity prior to July 1st, 1918. Subsequent to July 1st, 1918, we believe that American production will not only take care of our needs, but may become a large factor in maintaining the air forces of our Allies. In considering the period between now and July 1, 1918, due weight must be given to the experience of all foreign countries and manufacturers in the delays in aeroplane and engine production which were not and could not be foreseen. Only at close hand can one appreciate how many and how great those delays have been. . . .

"After long and careful consideration of this subject, we and all others here have come to the very strong conviction that most of the aeroplanes and engines for American use at the front and for our training here between now and July 1st, 1918, must be produced either in France or Italy where effective and successful methods of production are already in full operation. Because we consider this imperative and absolutely essential to prevent failure of our air campaign next year, an arrangement has been made with the French Government under which they are to produce for us the aeroplanes and engines shown on the attached table which also includes a schedule of guaranteed deliveries. . . .

"You will also find annexed a schedule of approximate prices of these aeroplanes and engines and a draft of the proposed agreement between the American and French Government which is now in the final stages of execution, although the orders have been actually placed by the French Government with its manufacturers. This agreement has been prepared after conference with the Judge Advocate General and his staff here and considerations of the arrangements under which England is having engines built in France." . . .

FOREIGN ORDERS

Accordingly Major Bolling reported that the following orders had been placed abroad:

IN FRANCE.

TRAINING AEROPLANES.

725 Nieuports with Le Rhone engines and 150 Spads with Hispano engines. Deliveries to be in time to meet U. S. training program in France.

SERVICE AEROPLANES.

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1500 Breguet (Renault & Fiat)	60	60	460	460	460			
2000 SPAD (200 HP Hispano)				135	300	400	550	615
1500 New Spad (150 Gnome) or 1500 Nieuport (150 Gnome)			50	100	200	300	350	500
			300	400	400	400		

SERVICE ENGINES.

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1500 Penault (300 HP)	60	60	460	460	460			
4000 Hispano (200 HP)			135	375	565	755	945	1225
3000 Gnome (150 HP)			400	400	400	600	600	600

IN ITALY.

500 S. I. A. 6 B (reconnaissance and day bombing aeroplane similar to the Breguet). Deliveries to begin October and be completed in December.

200 to 300 Caproni Biplane with the new Isotta-Fraschini engine. Deliveries prior to June 30, 1918.

A formal contract was made between General Pershing and the French Government under date of August 30, 1917, for the 5,000 service planes and 8,500 engines above described. The French Government entered into this contract upon the express condition that the United States should furnish the machine tools and raw materials which were fully listed. In order to perform this condition, a contract was made under date of October 4, 1917, by the United States Government with The J. G. White Engineering Corporation, by which the latter was to act as an agent for the purchase of the required materials on the basis of cost plus three per cent. as compensation. It turned out that there was great difficulty in obtaining these materials as the French specifications in important instances could not be met at the time by American manufacturers. While the contract with the French Government called for deliveries of materials for planes two and one-half months before delivery of the finished planes, and materials for engines three and one-half months before delivery of finished engines, and that all materials advanced by the French Production Service should be replaced not later than November 1, 1917, it appears that only 14 per cent. of the required materials had been placed at points of embarkation in the United States by November 1st, for shipment to France, 46 per cent. by January 1, 1918, and 67 per cent. by March 1, 1918; 91 per cent. was delivered at points of embarkation by June 1, 1918, and 99 per cent. before the end of August. From information recently received it appears that all materials shipped under the contract arrived safely in France and that substantially all have been satisfactory as to quality. For the materials thus delivered during the fiscal year ending June 30, 1918, there had been paid to The J. G. White Engineering Corporation $9,005,074.31, of which $8,742,412.29 represents the purchase price and $262,662.02 the agreed compensation.

It is understood that in December, 1917, in view of the existing conditions, and the serious need for aeroplanes on the part of the French, the original contract was modified by a new contract calling for about one-quarter of the deliveries within the period contemplated in the first contract. The exact terms of the second contract are not now available here. It is also understood that further orders were placed with the French Government from time to time.

The deliveries originally contemplated on the foreign orders were not made; most likely by reason of the delays on the part of the United States in furnishing the required materials and the increased pressure of the needs of the Allies.

Deliveries on Foreign Orders

Up to February 1, 1918, it appears that only about 600 planes had been received under the orders placed with the French Government, of which only about 70 were fighters and bombers. The situation as it then existed is disclosed in the cable from General Pershing under date of February 16, 1918:

"P. 610, Paragraph 1-A. Dated Feb. 16, 1918.

"Conference to-day between Chief of Air Service A. E. F. and French under Secretary of State for aeronautics develops fact that due to non-arrival in France of sufficient raw materials French production of aeroplanes and engines is insufficient to meet needs of French and American air service during the next three months. 9 American squadrons will be available for front line service next month and if military necessity requires that they be put into front line service several of these squadrons must be equipped with inferior types of aeroplanes purchased from the French Government, a procedure which is strongly disapproved. Urgently important every effort be made to expedite remainder shipment of J. G. White & Co. materials destined for France,—almost 14,000 tons, and also urgently request no delay in shipment of service aeroplanes from the United States. Pershing."

Plight of Our Cadets Abroad

There may also be noted at this point the serious delays which occurred in securing adequate provision for the training of American cadets abroad. Hundreds of these cadets were held at concentration camps and other places for several months without suitable training. This was the more regrettable because these students embraced a large number who were exceptionally proficient and who had gone abroad early on the assumption that they would have important and superior advantages in training. It is said that their numbers were larger than the capacity of the French and British schools which it was expected would receive them.

In his cable of March 13th, General Pershing speaks of the plight of these cadets as follows:

"P. 726, Paragraph 1. Dated March 13th, 1918.

"For Chief Signal Officer. Approximately 700 cadets are now under flying training in Europe. These cadets had to wait an average time of three months before commencing flying training. Approximately 700 cadets in Europe awaiting flying training. These Cadets have already waited from three to five months for training and it is estimated that some of them will have to wait at least four months before their training can be commenced. All of those cadets would have been commissioned prior to this date if training facilities could have been provided. These conditions have produced profound discouragement among cadets. In order to remedy injustice and to relieve Cadets in Europe on equitable basis of rank with Cadets trained in the United States request approval of plan to immediately issue to all Cadets now in Europe temporary or reserve commissions in Aviation Section Signal Corps subject to revocation in all cases where on completion of training Cadets so commissioned are found not to have requisite qualifications for officers in the Air Service. If plan approved will recommend Cadets by groups according to seniority. Strongly recommend approval.

"Pershing."

The Secretary of War observed this condition during his visit to France in the Spring and cabled that these cadets should at once receive their commissions, which were to be held subject to revocation if later they were not found to be qualified. General Pershing stated in his cable of March 30, 1918, that this relieved the principal difficulty so far as training was concerned and the situation as it then existed was "difficult because of lack of machines for front and not because of lack of training facilities."

Lack of Information Here as to Exact Status of Foreign Orders

Despite constant interchange of cables, information was lacking here as to the exact status of the foreign orders. While cable inquiries had been made from time to time, it appears from a letter written by Lt.-Col. Horner for the Chief Signal Officer to Colonel Bolling, as late as March 12, 1918, that the desired information had not been obtained. There had been apparently an utter lack of an adequate system of communication by which proper records could be kept here of the transactions abroad. Tables and charts of the foreign orders and deliveries were finally received here, but it seems that there still was considerable uncertainty as to the extent of the foreign obligations, and at the beginning of this investigation the extraordinary statement was made by Lt.-Col. S. E. Wolff, then head of the Finance Division, that notwithstanding repeated inquiries, extending over many weeks, he had been unable to ascertain within $100,000,000 what obligations had been incurred abroad.

Agreement with French Government of May 3, 1918

On May 3, 1918, a new agreement was made with the French Government by which the contract of August 30, 1917, was cancelled. Provision was then made by the French Government for the acceptance of orders of the American Government for aeronautical material, and for the acceptance by the American Government of orders of the French Government for raw materials and other supplies. As these orders would be intended to meet, in the common interest, the military needs of each country presenting them, it was agreed that each Government should fill the orders so far as compatible with its own requirements and resources. It was further agreed that upon the arrival in France of the raw materials included in the contract of August 30, 1917, they should be delivered to the French Government on the assurance that they would be utilized in accordance with the conditions set forth in the new agreement; and also, that until the American Army should be able to meet its own requirements in aeronautical material, the French Government should place at the disposal of the American aviation units, and such instruction units as may be required, the same aviation material as used by the corresponding French units, both as to quality and quantity.

It would seem that by May 23, 1918, there had been delivered by foreign governments for our use abroad about 1,400 training planes and about 350 service planes. Since that time there have been additional deliveries and according to a list obtained by General Kenly the approximate number of aeroplanes received by our forces from European sources to July 31, 1918, were as follows:

School or training planes	1617
Service or combat planes	1512

PRODUCTION IN THE UNITED STATES

Recommendations of Bolling Commission

While Major Bolling's Commission, in anticipation of delays here, placed large orders abroad, it is evident that the speediest production in this country that was possible, of a variety of aeroplanes and engines, was contemplated. The Bolling Commission recommended for production here:

"AEROPLANES.

"Advanced training Bristol Scout with 80 Le Rhone.

"Division or Corps d'Armee Bristol Fighter with 200 Hispano.

"Long Range reconnaissance and day bombing D. H. 4 with Rolls-Royce or some other equivalent engine to be later adopted. Fiat 300 has proved successful here.

"Fighting or Pursuit (fixed engine) Spad with 200 HP Hispano.

"Fighting or Pursuit (rotary engine) New Spad with 150 Gnome. (This aeroplane is now undergoing final tests).

"Night bombing Caproni Triplane with 3 Isotta Fraschini 270 HP engines or other equivalent engine to be later adopted. For very long distance bombing with heavy loads the Italians are now arranging to use the Caproni Biplane with 3 Isotta Fraschini engines instead of the heavier Fiats now used. For distances of 400-500 miles (out and back included) the much greater consumption of gasoline and oil by the Triplane gives it little greater bomb carrying capacity than the Biplane with Isotta-Fraschini engines and the Biplane can be produced much more quickly and in greater quantities. It is also much easier to house at the front. For bombing at shorter distances nothing gives such great bomb carrying capacity as the Triplane.

"ENGINES.

"80 Le Rhone for training purposes.

"200 Hispano Suiza for fixed engine one place fighters and division or Corps d'Armee aeroplanes.

"150 Gnome Monosoupape for rotary engine fighters.

"Rolls Royce for U. S. production only under some special arrangement of a Rolls Royce factory in U. S. This engine is not considered suitable for great quantity production. It also requires very skillful mechanics to keep it in commission at the front.

"While we have investigated many other excellent engines such as Renault, Fiat, Isotta-Fraschini and S. P. A. all of them are too heavy per horsepower to be recommended as engines for great quantity future production in the U. S. Renault, Fiat and Isotta Fraschini all have new designs now under test which may prove very desirable. The Bugatti engine appears perhaps to offer the most interesting future development for light weight per horsepower and ease of quantity production. The developments with our U. S. engine now under test are probably the most important consideration in this question of engine production in the U. S. Of course, we are without any adequate information over here as to these developments."

Recommendations of Army and Navy Technical Members of Bolling Aeronautical Commission

Captain Clark, U. S. A. S. C., Captain Marmon, U. S. A. R. S. C. Naval Constructor Westervelt, U. S. N., and Lieutenant Child, U. S. N., the Army and Navy technical members of the Bolling Commission, on their return to the United States made a report to the Secretary of War and the Secretary of the Navy under date of September 4, 1917, which embraced the following recommendations:

"23. So far as land aeroplanes are concerned, the types at present indicated as necessary, are the following:

"(A) Primary training—dual control—about 90 H. P.

"(B) One or two types of machines for training toward the fast fighter—Single seater—using for the present, the 80 H. P. Le Rhone rotary engine.

"(C) Army observation—two seater—using probably between 225 and 250 H. P.

"(D) Single-seater fighter—using a rotary engine of about 170 H. P. (If a water-cooled engine can be built which will, at altitudes, give more power per total weight than the rotary, this type of aeroplane should be eliminated.)

"(E) Single-seater pursuit—should mount an engine which will give about 150 H. P. at 20,000 ft. altitude.

"(F) Day bomber—should mount one engine which will give about 325 H. P. at 15,000 feet.

"(G) Night bomber—should mount two or three of the engines mentioned under (F).

"In order to minimize the number of types of engines, it might be desirable to use the same engine in the Army Observation and in the single-seater pursuit Such an engine should give about 180 H. P. at 15,000 feet."

Recommendations of Captain (afterwards Lt.-Colonel) Clark

Captain Clark, who had a larger experience in aeronautics prior to our entry into the War than any other member of the Commission, was the expert largely relied upon to make suggestions as to the planes which should be manufactured. He visited numerous factories in England, France and Italy and also observed the types of planes in operation at the front. He testifies that his final recommendations on his return to this country in early September, 1917, after learning the situation with respect to engine production here, were for the production of the following types of planes:

Day bomber DeH-9 with the Liberty direct drive, 12 cylinder high compression engine.

Army observation Bristol fighter with the same engine.

Night bomber, a Caproni triplane with 3 Liberty low compression geared engines (Handley-Page an acceptable substitute).

Two-seater fighter, a Bristol fighter with the Liberty 8-cylinder, or with that number of cylinders which should be developed.

Single-seater pursuit,—the Spad, with the Hispano-Suiza.

Single-seater combat with a rotary engine, 150 H. P. Gnome.

Advanced training machine, Bristol Scout, with 85 H. P. Le Rhone.

PROGRAM AS ADOPTED

Elementary Training Planes

There were selected for production to be used as elementary training planes the Curtiss type known as the JN4-D, with the OX-5 engine, and the Standard type known as SP-1 with the Hall-Scott or A-7a engine. The program called for 4,800 JN4-Ds (later reduced to 3,700, and his number was somewhat increased after May, 1918); for 1,600 SJ-1s; for 7,950 OX-5 engines and 2,750 Hall-Scott, or A-7a engines (reduced to 2,250).

Advanced Training Planes

For advanced training, it appears that there were originally chosen the Bristol Scout with the Le Rhone 80 H. P. engine, the Thomas Morse S-4 with Gnome 100 H. P., and the U. S. Training with the Hispano (150 H. P.). There were modifications which resulted in the adoption of the types known as S4-B (with Gnome 100 H. P.), the S4-C (with LeRhone 80 H. P.), the JN4-H and JN6-H (with the Hispano 150 H. P., and the Penguin (with the Lawrence 28 H. P.).

Service or Combat and Bombing Planes

The types first selected for production were the Spad (single-seater pursuit) with the 200 H. P. Hispano Suiza engine; the Spad using the U. S.-8 engine; the Spad Monocoque, using 150 H. P. Gnome engine; the Martinsyde; the DeH-9, the Caproni and the Handley-Page, with the Liberty engine (U. S.-12). Subsequently the Martinsyde and the Spads were rejected, the production of the DeH-9 was first limited and then postponed, the Caproni and the Handley-Page were not treated as a part of the immediate program, and the plans for production were centered on the DeH-4 and the Bristol Fighter with the 12-cylinder Liberty engine (U. S.-12).

The program charts which were prepared show extraordinary variations with respect to quantities and surprising expectations as to deliveries. Thus the program for DeH-4s shows a total program on August 2, 1917, of 8,000; August 16, of 7,500; August 22, of 5,000; August 24, of 6,000; August 25, of 15,000; August 31, of 6,000; September 4, of 15,000; October 17, of 250; October 29, of 1,000, at which number it appears to have been continued until January 18, 1918, from which time it was increased until 4,500 appear in the program of February 11, 1918, and 8,000 in that of February 19 and thereafter.

According to this program or schedule it seems to have been anticipated on August 2, 1917, that 25 DeH-4s would be delivered in October; 100 in November; 425 in December; 750 in January, and 1,000 in February; and more in each of the succeeding months. Even as late as September 4, 1917, the schedule shows expected deliveries of 62 in October, 1917; 250 in November; 1,063 in December; and in the program of November 5, 50 were scheduled for delivery in December, 100 for January, etc.

The program of September 5, 1917, for the DeH-9s calls for 2,000 of this type; that of October 9, for 4,000; October 17, 6,750; October 25, 7,750; October 29, 7,000, at which it continued until January 18, 1918, when it became 7,500, to be reduced on February 1, to 5,400; and on February 12, the DeH-9 schedule was cancelled.

On September 5, 1917, according to this schedule, deliveries of DeH-9s were expected as follows: November, 1917, 50, December 200, January 250, and 300 in February, March, April, May and June. On November 5, 1917, 50 seem to have been expected in January and 300 in February, 1,050 in March, 1,500 in April, 1,900 in May and 2,200 in June. As late as January 18, 1918, 40 are scheduled for March and 500 for April.

The program for the Bristol Fighters started on August 2, 1917, with 1,000. It appears to have been raised to 3,000 on August 16, 1917, within one week it was dropped again to 1,000, and on November 26 the program was finally raised to 2,000. It seems that on August 2, 1917, deliveries of 25 were scheduled for October, 50 for November, 100 for December, 125 for January, etc. On November 5, 1917, the schedule calls for 50 in January, 150 in February, 200 in March, etc.

On August 9, 1917, the Caproni program called for 500; on August 16, for 9,000; on August 22, for 2,000; on August 24, for 500, and there were other variations until the program appears to have settled down after September 28, 1917, to 1,000. On February 19, 1918, the program dropped to 50; it called for 250 on May 3, 1918, and was afterwards increased to 1,000.

On August 9, 1917, when the program for Capronis called for 500, monthly deliveries of 100 were scheduled to begin in February, 1918. A week later, on August 16, 1917, when the program was increased to 9,000, deliveries of 900 were scheduled for December, 1,350 for January and each month thereafter. When the schedule was dropped to 1,000, deliveries appear to have been expected of 100 in February; and in February deliveries of 100 seem to have been looked for in May.

The Handley-Page program shows on September 5, 1917, a total of 1,500, with anticipated deliveries of 100 in December, 300 in January, 400 in February, etc. As late as January 8, 1918, deliveries were scheduled for February of 110, 190 for March, 200 for April, etc. On March 18, 1918, the program had dropped to a total of 50.

These programs, with their variations and schedules of deliveries, appear to be grotesque in the light of the actual facts, but they bear the *imprimatur* of the Planning Department of the Equipment Division with the countersign (except in the case of the DeH-9s) of official approval.

Suspension of the Program for Single-Seater Pursuit Planes

On October 5, 1917, in reporting the failure of the Spad Monocoque, the cablegram from our representatives overseas also contained the following advice as to single-seater pursuit planes with rotary engines:

"Recommend you build no rotary engine single-seater pursuit aeroplanes to be sent to Europe existing machines this type will be outclassed by changing time yours arrive, build only what you need for use in United States training purposes."

This, however, did not touch the Spad intended to be used with the fixed engine, that is, with the Hispano Suiza engine. That machine was not experimental. As early as July 15, 1917, there was official advice that "200 H. P. Hispano Suiza (is) now fighting on front in Spad aeroplanes." Colonel Bolling reported in his cablegram of August 1, 1917, that the Spad with that engine is "the best fixed engine fighter now in service." There is no reason why this fighting plane should not have been produced here in quantity many months ago. The failure to do so was not due to lack of facilities, but simply to a change of opinion at a critical time as to what was advisable.

Responding to repeated and urgent recommendations for production of Spads in this country, an order for 3,000 Spads was placed with the Curtiss Aeroplane and Motor Corporation under date of September 19, 1917. But this order had barely been placed when doubt was cast upon the enterprise, and after preparation for production was well under way the order was cancelled on November 7, 1917. This is the date of the cancellation, as testified by Mr. Morgan, then Vice-President of the Curtiss Company. It was nearly six months later that the production of a single-seater pursuit plane (the S. E. 5) was undertaken, and thus there was a serious loss of time through a reversal of judgment which was in turn reversed.

It should be noted that virtually all the cables of advice sent by our military representatives abroad are signed "Pershing", but doubtless they most frequently come from subordinate officers, and with respect to the subject under consideration, from those in charge of the Air Service overseas. In a cablegram received here on October 5, 1917, the following appears:

"If USA 8 cylinder heavier than Hispano Suiza pounds per horsepower build no monoplace pursuit aeroplanes with USA 8 cylinder engines. Machine will be useless by time it arrives here. Increase number DH 4s or DH 9s by number monoplace pursuit aeroplanes. This is necessary provided USA 12 is success. Useful loads increasing so rapidly here that engines now in United States are not considered powerful enough to meet requirements. Two-place pursuit aeroplanes considered most urgently needed aeroplanes next year."

The view thus set forth found support in influential quarters here. On October 27, 1917, Lieut.-Col. Clark in a memorandum sent to Mr. Coffin expressed the opinion that "all fighting and bombing by day will be done in two-seaters flying in regular formation." And he added, "The single seater will be eliminated." A few days later the following cablegram was received:

Nov. 8, 1917. No. 252 (S. D. 2709) Par. 1.

"Your 359, paragraph 7, and other cables concerning American engine program. Situation here has changed much during three months since original recommendations and continues changing constantly. Following general principles appear clear to us. First. Single seater fighter will probably become obsolete general use next year, although small numbers will always be used special purposes. Recommend you produce number already actually under contract and started. Believe we can obtain here all this type required future above number actually under contract here and America. This applies both single seater fighter aeroplanes and engines. Second. Two seater fighter aeroplane with stationary engine will supersede single seater. 400 horsepower probably sufficient next six months, after that five hundred horsepower necessary. This summarizes cables already sent you."

It will be observed that while this message recommended against further production, it distinctly stated that the number, already under contract and started, should be produced. But this was not done.

On November 30, 1917, Colonel Deeds cabled:

"Curtiss company have completed drawings and ordered material for Spad for 220 H. P. geared Hispanos. We have cancelled that order. Tulasne suggests possibility of helping the French program by building Spad planes here to be equipped with 220 H. P. geared Hispano engines built in France. We could get production in February without materially affecting output of two-place fighters. We are not urging this because of the fact that we have ordered material which can be utilized in other machines, but if it would help your program here is a quick source for these machines."

To this there was a reply (from London) on December 14, 1917, as follows:

". . . With reference to paragraph 1 your cablegram 461 do not recommend unionized production Spad aeroplanes for France. No such request received from French here. Believe they can produce all these aeroplanes they need. Think our only efforts should be applied aeroplanes and engines already on our program. United States should leave production single place fighter to Europe."

The Spad contract having been cancelled and preparations for the production of single seaters in this country abandoned, in less than two months there was an urgent request from our military representatives abroad that Spads be produced here. As early as February 10, 1918 it was recommended that steps be taken to "put into production 1,000 Spads one-place with 220 H. P. Hispano Suiza engines for earliest possible delivery in France." It was said that "French delivery of one-place Spads very uncertain and can not be depended upon. Should have more definite information next two weeks as to whether your production Spad one-place fighter should be further increased." While this new proposal was evidently the result of the breakdown in the French deliveries, it seems that a closer inquiry into the progress of our deliveries of raw material abroad and the conditions of French manufacture would have revealed the serious importance of continuing

the production of single seaters in this country in accordance with the original program.

However, the authorities here were not then ready to follow the new recommendation, and two weeks later, on February 25, 1918, they cabled the following reply:

"Production of Spads with 220 H. P. Hispano Suiza engines does not fit well into our program because engines cannot be put in production without material delay. Probably first deliveries in France in December. We could somewhat more easily produce the 300 H. P. Hispano Suiza engine. We are now producing large number of 150 H. P. engines for training planes, and could even increase production. We believe with this information you will probably decide not to request production of Spads here. Please give us your full advice."

It was not until March 9, 1918, that this cablegram was answered, with the statement that "question being considered. Will advise you soon." On April 6, 1918, Mr. Potter cabled that the British Air Board had advised that they could supply at once two hundred SE-5 planes without engines. He added, "We can arrange production for 180 H. P. Hispano Suiza engines for same at rate of five per day within 30 to 60 days. Shall we arrange engine supply. If so, will you arrange contract for planes." On the same day Colonel Deeds cabled:

"We could within four weeks begin to supply 180 H. P. high compression direct drive Hispano Suiza engines to be shipped to England, to be installed in the planes by the plane manufacturer. Would this type of fighting machine be of value to you, and if so shall we proceed to provide them for you? We are advised that this type is in successful use by the British on the front."

On April 19, 1918, the following urgent message was received from our representatives abroad:

"The United States should make immediate preparations for the production of single seater machines to supplement those we may receive from France and England."

But on April 21, 1918, there was a further cablegram (referring to Mr. Potter's cable of April 6, 1918) stating that the whole subject was still under consideration. This message was (in part) as follows:

"Will the production of 180 H. P. Hispano Suiza engines be interfered with by contracts placed by French or English. If not, we strongly recommend production of this motor for our needs this year on following basis." (Giving delivery dates.) . . . "The situation with reference to single seater fighters for remainder of 1918 is as follows: Both France and England have a plane production in excess of their engine production and as the 180 H. P. Hispano Suiza is already in production in United States in small quantity, our only practical means of securing the necessary number of single seater fighters will be for the production of this engine for overseas duty to be increased so as to provide the number indicated and for us to distribute these engines here month by month as conditions require. The entire question of the provision of single seater aeroplanes for 1918 and 1919 is being thoroughly investigated and a comprehensive report with all data necessary will be forwarded by an officer familiar with the entire situation."

On April 24, 1918, Mr. Potter cabled that contract could be made with the British Government for SE-5s at the rate of 30 per week beginning July 1st; that 180 H. P. high compression Hispano-Suiza motors could be supplied from here for those planes at the same rate, and that the same machine could be put into production here and shipments begun in September. He asked quick advice if arrangements were desired which would permit of "quickest possible delivery of single seater fighting planes on the front", and he added "SE-5 equipped with 180 Hispano is the only machine we can produce quickly."

To this an answer was received on May 4, 1918, disapproving the production of SE-5s, as follows:

"Production of SE-5 for 180 Hispano in America disapproved since it appears that necessary planes for this engine can be obtained in Europe either SE-5, Spad or both."

This was followed on May 12, 1918, however, by a cablegram stating that the question was still open pending final report of Board of Air Service officers and that final recommendation would be cabled in about ten days.

On May 15, 1918, Mr. Potter cabled referring to the message from overseas of April 19, 1918, urging immediate preparation for production of single-seater fighters and calling attention to the fact that the cablegram of May 4, 1918, was an exact reversal of the former recommendation. He said:

"We took immediate action on this recommendation and have given orders for 1,000 SE-5s. You 1052, par. 2-A exactly reverses these recommendations. In view of this inconsistent information and also due to requests for production of SE-5 from Air Division for training purposes, we have decided not to change our orders for production on these machines, and request that samples be sent promptly in accordance with our London 81, par. 3."

The final result is that there has been no renewed order for the production of Spads, and that the order for SE-5s is being proceeded with, but that the American machine of the type is still in an experimental stage. It is understood that the machines are being tested, and that the questions which have arisen and have been brought to the attention of the authorities are receiving their consideration. We have not as yet sent from this country to the battle front a single pursuit or combat plane, as dintinguished from the heavy observation or bombing planes, and, after giving due weight to all explanations, the fact remains that such pursuit planes could have been produced in large quantities many months ago had there been prompt decision and consistent purpose.

Delayed Program for the Handley-Page and Caproni Bombing Planes

Although the Handley-Page and Caproni planes remained in the program, production was delayed. Both these types of bombing planes were included in the modified recommendations of the Joint Army and Navy Technical Board, on November 21, 1917, and these recommendations were approved by the Secretary of War and the Secretary of the Navy.

Handley-Page Planes

On January 25, 1918, a resolution recommending a contract for Handley-Page planes with the Standard Aero Corporation was tabled by the Aircraft Board, in view of the fact that such an order might interfere with work already undertaken by the company. On February 8th the Board discussed the advisability of concentrating upon the manufacture of a single type of night bomber, and it was stated that due to the lack of history as to the comparative performance of the Handley-Page and Caproni, the decision had been made to put both types into production in the United States. Arrangements had been made for the assembly in England of Handley-Page machines for the American service, and on February 19ht the minutes of the Aircraft Board show that a cable had been received on February 14th by the British War Mission, indicating that it would be serious to cancel these arrangements. The minutes add that in view of "a cable received February 18th from General Foulois recommending the building of both the Handley-Page and Caproni types, because of the military needs for the immediate future, it was decided that at present both types should be constructed", and the Secretary was asked to keep before the Board's attention the necessity of making a decision prior to July 1, concerning the concentration on the manufacture of one of these types for the year 1919.

On March 19th the Aircraft Board recommended that a contract be placed with the Standard Aircraft Corporation for the assembling of 500 Handley-Page planes and the furnishing of such parts (other than wood parts) as the Government might require, these planes to be assembled and taken down and disassembled and packed for export shipment to such extent as the Engineering Department should require, but not more than ten per cent. of these, that is, 50 planes to be fully assembled for testing and flying in this country. Orders for 1,000 sets of wood parts, and for various metal parts, of the Handley-Page were placed. In a letter to Colonel Bloomfield, Air Division, under date of March 20, 1918, M. W. Kellog, Director of Production, thus summarizes what had been done up to that time:

"2. Sometime ago miscellaneous orders were placed from time to time, either by letter or word of mouth with people that our Production Department felt could facilitate this matter by having manufacturers start on the work. These manufacturers, as per list attached, have done more or less work. The ones that are further advanced are the W. R. Mullins Company of Salem, Ohio, who are supplying approximately 75 per cent. of the metal parts to be used, also the Grand Rapids Aeroplane Company of Grand Rapids, Michigan, on the wood parts, they having at this time received about 250,000 feet of spruce and I understand that a large part of this has been in the kilns and they will start work in a short time which we would judge to be approximately from a week to ten days, manufacturing some of the parts. The other manufacturers are in a more indefinite condition. We are now trying to adjust the questions between them and the Signal Corps by giving them a formal contract, and at the same time ascertaining as far as possible the exact conditions of their detail part of the work. Some of these sub-contractors have very small items. As an example, the two tire companies have only been instructed to develop and make the molds for the tires and have manufactured a very few tires each. Other companies have only made dies for a very small percentage of the stampings, etc., etc.

"3. We gave a contract a week ago for the assembling of the machines that are going to be assembled, to-wit: fifty, and for the marking, listing, packing, etc., for export abroad for four hundred and fifty, to the Standard Aircraft Corporation who, in connection with our engineers, will use their best efforts to push the work.

"4. We are just starting at this time to line up our Production Department on an aggressive assembling of this material and a correlation of same with a view that if it develops that any of the manufacturers are in such a position that they would seriously delay the work, to put pressure upon them to try to overcome such a condition.

"5. We are advising you of all these facts to as clearly as possible give you a picture of the situation so that you can use your own judgment and do as he sees fit in this connection.

"6. You will note that while we have ordered numerous parts for 1,000 planes, our assembling contract only covers 500. This was done with the distinct understanding that if the contractors did their work efficiently and well and in proper time, we would favor them with a further order of not less than 500 more machines."

The first Handley-Page plane assembled in this country was flown in the early part of July.

The Standard Aircraft Corporation, it appears, was able to produce the first Handley-Page machine within ninety days from the time they were given full authority for that purpose, and the testimony is that making allowance for whatever advantage existed by reason of the fact that previous contracts had been let for certain parts the first machine could have been produced, at the outset, within one hundred and twenty days. Further time, of course, would have been required for quantity production, but for the long postponement of the program of the Handley-Page no satisfactory reason is shown.

Caproni Planes

In the minutes of the Aircraft Board, under date of February 12, 1918, it was recited that the Italian manufacturer Caproni had sent to this country samples of his triplane and biplane, with his production engineer, Captain D'Annunzio, expert fliers, and thirteen factory experts to assist the United States in placing Caproni's into production. On February 7, the Board had recommended that a contract be made with the Standard Aircraft Corporation for the manufacture of fifty Caproni planes. Mr. Coffin urged on February 20 that plans be laid for quantity production of Capronis, to be assembled in Italy, but it was the feeling of the Board that the matter should be held in abeyance until the production of sets of Caproni parts for the Italian Government were under way.

On April 11, 1918, it appears to have been the sense of the Aircraft Board that the Caproni should be put into immediate production in view of (1) repeated cable advices to that effect; (2) the actual experience in Europe with the Caproni; (3) the fact that Captain D'Annunzio had assured the Signal Corps that there would be no difficulty in the installation of the Liberty motor. On March 21, 1918, Mr. Potter advised the Board that the Italian Government did not desire a contract for the manufacture of Caproni parts in this country, because of the remoteness of contemplated deliveries, and inquired the disposition of the Board as to the manufacture of 50 complete Capronis, as recommended on February 7. On March 26, 1918, the question of manufacturing the Caproni was again raised in the Board and after discussion was referred to the Chief Signal Officer for the consideration of Colonel Waldon, with especial reference to the question of the establishment of an assembly plant in France. On April 2, a letter addressed by the Italian Ambassador to the Chief Signal Officer was referred to the Board, inquiring whether the American Government intended to build Caproni planes for its own use, and if so, how many. Discussion was had of the question,—"in view of cables recently received urging such production and the expense already incurred by the Government in preparation therefor."

On April 23rd Mr. Potter stated to the Board that a verbal order had been given to the Fisher Body Corporation for 250 Caproni planes and that preparations for production were under way. On May 9th it was further stated by Mr. Potter that arrangements had been made with the Fisher Body Corporation and Captain D'Annunzio for the manufacture of 500 sets of Caproni parts by that company, contract for which would be let as soon as funds were available and that preparation for production was under way, which, however, was not promised before September. Contracts were made in June, 1918, with the Fisher Body Corporation and the Curtiss Aeroplane and Motor Corporation, each for five hundred Capronis. There were arrangements several months ago, apparently of a tentative character,

with the Standard Aircraft Corporation for four Capronis of which one has been built.

There appears to be no adequate reason for this long delay in putting the Caproni planes into production. If it was due to congestion in plants selected for production, this could have been obviated by a better and wider distribution of work. This is, of course, so far as the matter of plane production is concerned. The immaturity of the Liberty motor doubtless had its effect, but it would seem that orders for the motors sufficient to meet all appropriate demands should have been distributed in such a way that there could have been no occasion for delay in the building of planes because of the lack of orders for the engines to go with them.

Postponement of the DeHaviland 9

In his recommendation, on his return from Europe in September, 1917, the DeHaviland 9 was preferred by Captain Clark, as the DeH-4 appeared to him to be obsolescent at the time the Bolling Commission was in England and the DeH-9 was designed along the same general lines as the DeH-4, but with its weaknesses, from a military standpoint, corrected. In other words, he regarded the DeH-9 as far better suited for bombing than the DeH-4. The principle distinction is that on the DeH-9 the rear man—the gun fighter—is moved back about twenty inches from his position on the DeH-4; the pilot is moved back so that he is placed immediately in front of the gun fighter; the fuel is moved forward so that it is near the engine, and between the fuel tank and the pilot is a bomb compartment.

The contracts with the Dayton Wright Airplane Company, the Fisher Body Company and the Standard Aircraft Corporation, originally called for DeH-9s. When, on September 22, 1917, the program, as it then stood, was submitted to Colonel Bolling on behalf of the Chief Signal Officer, it called for 2,000 DeH-9, and the reply was that the number was not sufficient and should be doubled. It may also be noted that in the same cablegram (September 22nd) from the office of the Chief Signal Officer it was stated that the first deliveries of the DeH-9 with the Liberty 12, and synchronized Marlin piston type aeroplane gun, would be made in November, 1917.

The sample machine, however, which was first received from England was the DeH-4. The DeH-9 had not yet been put into service at the front. Apparently there was no sample DeH-9 available here until at the end of February, 1918, and it seems to have been thought that progress had been made to such a degree in the developing of the design of the DeH-4 for production that it was advisable to concentrate upon the production of the DeH-4 to the virtual exclusion of the DeH-9. Consequently, in the substitution of contracts, the DeH-4 took the place of the DeH-9 and it appears that in February, 1918, directions were received from Colonel Deeds and Colonel Montgomery that orders for DeH-9s were to be cancelled for the present, pending information from abroad.

It seems that with an adequate production program, this improved type, or its American equivalent, could have been produced here some time ago, but it has not yet been put into quantity production. It is said, however, that the DeH-9 is now "being put out of production abroad" because of the "coming in" of the DeH-9A which is a further improvement.

Result

For obvious reasons, it is not deemed advisable to make public the details of the present aircraft program. That can be stated by the military authorities whenever they think it wise to do so. For the present purpose it may be said that the abandonment of the program for the Spads left us, until recently, without any program for single-seater pursuit planes, and that also, until recently, so far as service planes were concerned, there remained a program for immediate production which was virtually limited to DeHaviland 4s and Bristol Fighters.

The Bristol Fighter as redesigned to take the Liberty Motor proved to be a failure and after a series of fatal accidents was discarded. The Bristol was so far removed from a machine that could carry an engine of that power that it has been admitted by high authority that it was "a very foolish thing to put the two together."

Thus, nothing is left of last Fall's program for service planes save the DeHavilands 4s. The course of production of these planes is hereafter stated. It appears that after the remedying of various defects, they are being successfully used as observation and bombing planes. There are certain limitations, which it is not necessary to describe, of their military effectiveness for this purpose, and machines of the later and improved types are to be provided. By reason of a lack of manouverability the DeHaviland 4 cannot serve the purpose of a pursuit plane.

Engines for Service Aeroplanes

The Bolling Commission's recommendations for the production of engines in the United States for service aeroplanes embraced the 200 H. P. Hispano-Suiza for fixed engine single-seater fighters, the 150 Gnome for rotary-engine fighters, and the Rolls-Royce for United States production only under some special arrangement for a Rolls-Royce factory in the United States. It was said that the Rolls-Royce engine was "not considered suitable for great quantity production. It also requires very skillful mechanics to keep it in commission at the front." It was added that the Renault, Fiat, Isotta-Fraschini and S. P. A. were too heavy per horse power to be recommended for great quantity production in the United States and that the first three mentioned had new designs under test which might prove very desirable. Special attention was directed to the development of the Bugatti engine. And this statement of the Bolling Commission concluded with the observation that the developments in connection with the United States (Liberty) engine now under test "are probably the most important consideration in this question of engine production in the United States."

Rolls-Royce and Sunbeam Engines—British Experience

There has been considerable testimony as to the feasibility of securing, in the year 1917, the early production of certain foreign engines, notably the Sunbeam and the Rolls-Royce. In order that there might be an authoritative statement of British experience, there was obtained, through the courtesy of the British Ambassador, a memorandum under date of June 22, 1918, which has the authority of the British Air Ministry. From this it appears that when we entered the War, in April, 1917, the British had in use the following aeroplane engines: 160 H. P. Beardmore; 150 H. P. RAF4-A; 130 H. P. LeRhone; 130 H. P. Clerget; 190 H. P. Rolls-Royce; 150 H. P. Hispano-Suiza; 275 H. P. Rolls-Royce; 320 H. P. Cossack Sunbeam; 230 H. P. RAF3-A. The following engines at that time (April, 1917) were "coming on": 150 H. P. BR-1; 180 H. P. Viper Hispano; 220 H. P. Geared Hispano; 200 H. P. Arab Sunbeam; 220 H. P. B. R. 2; 270 H. P. Falcon, Rolls-Royce; 140 H. P. Clerget; 375 H. P. Eagle Rolls-Royce; 260 H. P. Maori Sunbeam. With respect to these engines, the memorandum furnished by the British Ambassador contains the following statement:

"Of those 'in use' in April, 1917, all were good reliable engines, but it was obvious that they could not remain in the front rank for very much longer.

"Of those 'coming on' the two Rolls-Royce engines and the 180 Viper Hispano were practically certain to be a success.

"The others were undeveloped and could not have been recommended at that time; so that in April, 1917, no Sunbeam engine could have been recommended for manufacture in America, and the general opinion in England was that the Rolls-Royce was quite unsuited to American methods of production."

A further communication from the British Ambassador state that what is quoted above on the Rolls-Royce and Sunbeam may be taken to apply equally to July and August, 1917. It should be added that in 1917 Colonel Bolling cabled advising against the production of the Sunbeam engine in the United States.

The Hispano-Suiza Engine

A different situation existed with respect to the Hispano-Suiza engine, which had been used extensively abroad. In the Summer of 1917 the 150 H. P. Hispano-Suiza engine was in production at the plant of the Wright-Martin Aircraft Corporation at New Brunswick, New Jersey. That company had received an order from the French Government in February, 1916, for 450 of these motors. Although the contract was to be fully performed by the late Summer of 1916, there was serious delay and deliveries did not begin until March, 1917. This delay was due in large part to the difficulty of putting into production an article of very fine workmanship and material which was entirely new to American shop practice. The greatest problem in this sort of work has been the procurement of materials of proper refinement and texture. The delay was also apparently due in considerable measure to conditions which could have been remedied, and a comparatively small force was engaged on the Hispano-Suiza motor work during the year 1916, the main effort of the company at that time being motor car production. (Since the Fall of 1917 virtually all the facilities at the New Brunswick plant of the Wright-Martin Corporation have been engaged in the manufacture of aeroplane engines.) By September 1, 1917, 202 engines had been delivered under the French contract, and by October, 1917, the difficulties had been surmounted; in that month 117 were produced and the French contract was completed in November, 1917.

The Signal Corps placed a number of contracts with this Company, reflecting changing purposes. Under date of July 31, 1917, it placed a contract for 500 of the 150 H. P. Hispano (Type A). In September, 1917, a further contract was made for 500 of the same type and this was cancelled on October 2, 1917. On the latter date the company received a contract for 4,000 of the 220 H. P. Hispanos (Type F), which were the 150 H. P. engines geared to high speed. This contract was cancelled on November 13, 1917, and was replaced by the contract of that date for 1,000, 150 H. P. Hispanos (Type A). On November 20, 1917, the company received a contract for 3,000, 300 H. P. Hispanos (Type H) which was modified by two contracts in the present year postponing the delivery dates, the second of which (May 11, 1918) provided for the manufacture of the 300 H. P. Hispanos in Long Island City and for a further postponement of deliveries. On February 2, 1918, another contract was awarded to the company for 1,000, 150 H. P. Hispanos (Type A). On February 25, 1918, a contract was made for 1,000 Type E or I Hispanos; and on May 25, 1918, another contract for 1,000 Type E or I Hispanos was placed with the same Company. Type E is Type A modified as to connecting rod construction, magneto drive construction, and the piston design so as to make possible the carrying of a higher compression and thereby greater power, that is, 180 H. P. at normal speed. Type I is 150 H. P. and has all the improvements of Type E except the high compression.

The 300 H. P. Hispano (Type H) was in an experimental stage last November and the first deliveries now due of Type H are in October. Under the contract of July 31, 1917, for 500 150 H. P. Hispanos deliveries were to begin ninety days from date of contract and determination of final details. Subsequently, October 25, 1917, was fixed as the date from which the ninety days were to be reckoned and the deliveries were actually completed in February. Under the contract of Novmber 13, 1917, for 1,000 150 H. P. Hispanoes, deliveries were to be completed in April, 1918, and with the exception of one motor they were completed in May, 1918. Under the contract of February 2, 1918, for 1,000 150 H. P. (Type A) motors, deliveries were to be completed in July and, by the end of July, 988 had been delivered.

The Type A, or the 150 H. P. Hispano, has been used for the advanced training plane known as the JN-4H. The 180 H. P. Hispano is adapted to single-seater pursuit planes such as the Spad or the SE-5 and is now in course of delivery.

On July 25, 1917, the Wright-Martin Aircraft Corporation submitted to the Aircraft Production Board a schedule for proposed deliveries of the Hispano-Suiza motor "of either direct driven or geared specifications" amounting to approximately 7,000 over and above the deliveries then due on the French contract. The offer was on the condition that "orders are placed with us or some definite arrangement made for same at once, so that we have sufficient assurance to warrant us in making the necessary capital expenditures and providing further that arrangements can be made for the Government to furnish us with the necessary working capital in excess of our present resources."

There is ample basis for the conclusion that had there been a sustained effort to produce single-seater pursuit planes, and with this definite purpose adequate orders had promptly been given so as to justify the provision of additional facilities by this Company and the speedy utilization of its highest capacity, engines for these pursuit planes could have been delivered in quantity through the Winter and Spring and large numbers of these engines would have been available by July 1, 1918, in addition to the production needed for advanced training planes and without interfering with the development of the high-power Liberty motor. This is aside from what could have been accomplished through timely arrangements made for production by other companies.

Rotary Engines

In the cable of October 5, 1917, in General Pershing's name, it was recommended that "no rotary engine single-seater pursuit aeroplane" should be built here to be sent to Europe. On November 9, 1917, Brigadier-General Saltzman, Acting Chief Signal Officer, requested the opinion of the Joint Army and Navy Technical Board as to the extent to which rotary motors should be included in the building program for aeroplanes and engines in the future. In response, the Joint Army and Navy Technical Board replied that as "the tendency in the design of fighting aeroplanes" appeared to point toward two-seater fighters of maximum power, it was believed that in the general

building program for the coming year "rotary engines should be considered of secondary importance." It was added, however, that in order "to anticipate improvements in the art or changes in the military situation" it was desirable that the art of building rotary engines be retained in the United States, and that for this purpose "the organization skilled in rotary engine production be preserved." Referring to the schedule of production of rotary engines, the Board expressed the opinion that the order for 2,500 80 H.P. LeRhone engines was larger than was necessary to preserve the art and that this order should be reduced to the minimum number that would accomplish the purpose, and it was further recommended that steps be taken to preserve the possibilities of production of the 160 H. P. Gnome engine. The immediate occasion of this inquiry was the pending question whether the Government should purchase the plant of the General Vehicle Company, of Long Island City, which was manufacturing Gnome motors. This purchase was made but the manufacture of Gnome motors was continued at this plant for a time. In May, arrangement was made for the use of the plant by the Wright-Martin Aircraft Corporation in the building of 300 H.P. Hispano-Suiza. Additional orders have been placed for LeRhone engines. The rotary engines have been used for advanced training planes.

The Liberty Engine

In the latter part of the year 1914 the Packard Motor Car Company decided to go extensively into the development of air motors. It had received one of the Mercedes motors, used by the Germans in their aeroplanes, which had been imported in a racing *chassis*. Taking certain features from that motor and from other motors, an engine was designed in 1915, a duplicate of which was used in a racing car. This engine developed 140 H. P. at 3,600 revolutions per minute. Another model, with greater power, was completed in December, 1916, and was also used in a racing car; this was rated at 200 H. P. at 2,180 r.p.m. It was described in a pamphlet exhibited at the Aeronautical Show in New York in January, 1917, as "The Packard Aircraft Engine", exhibited "as a stimulant to the new aviation industry". The work of developing these motors had been under the direction of J. G. Vincent, then Vice-President of the Packard Motor Car Company in charge of engineering. In the latter part of May, 1917, Mr. Vincent took his drawings to Washington for the purpose of laying before the Government the plan of the Packard Company to manufacture these engines in large quantities through enlisting the aid of other automobile manufacturers who had experience in high-grade motor work. Mr. Vincent met Mr. Deeds, Mr. Waldon and others. The design was not deemed to be adequate for the needs on the Western Front and it was necessary to increase the horse power of the motor with lighter weight per horse power. Mr. Vincent worked in Washington in conjunction with Mr. E. J. Hall, of the Hall-Scott Company, making sketches for the purpose of improving the motor, and in a few days a new motor was designed embodying to a considerable extent the engineering features which had been developed during the past two years of experimental work. The first efforts were directed to the development of an 8-cylinder motor, and in a few days Mr. Vincent returned to Detroit, taking the Washington sketches for the purpose of having a wooden model made by the Packard Company, and this was done. At the request of the authorities, Mr. Vincent was loaned by the Packard Company in order that he might take charge of the Engineering Division of the Aviation Section of the Signal Corps. The Packard Company made a full-sized operating model, which was sent to the Bureau of Standards on July 3rd. Later, about August, 1917, the production of an 8-cylinder engine was postponed and the immediate production of a 12-cylinder engine of the same type was decided upon. In developing the design for the purpose of quantity production various difficulties were encountered. Aside from minor changes found to be necessary in the course of production, the crank shafts, connecting rods and bearings in the first thousand engines were too light, creating a dangerous condition. The crank shafts, connecting rods and bearings had be redesigned. It was also found to be advisable to change the system of lubrication and, again, it was difficult to obtain a development of radiators that were suitable for a motor of this size. As late as June 25th of this year, General Pershing's cable described a series of defects in the motors which had been shipped abroad and these, it is understood, were speedily remedied.

It now appears to be conclusively established that the Liberty engine is a great success for observation and bombing planes, and for this purpose it has found high favor with the Allies. It is too heavy for the lighter pursuit planes. The following statement furnished by the British Ambassador with respect to British opinion of the Liberty motor, was received on June 22, 1918:

"No bench tests have been applied to the Liberty Engine in England but tests in the air, similar to those applied to British engines, have been carried out on a D.H.9-A with satisfactory results. Bench tests in France were observed by members of the British Technical Department and were satisfactory. The tests carried out in France were the Standard French Test and do not differ very largely from the Standard English tests, except that the power output was taken with a fan brake instead of a Froude Water Brake, as generally used in England. The results were excellent, except that the design of crankshaft and connecting rod was found to be faulty, but this was well known and had been modified in the United States. The carburation was also found to be unsatisfactory but is now in course of being remedied.

"The official opinion of the Liberty Engine is that it is an engine which, with a natural development in the prefecting of its details, will prove reliable and up to the power and consumption standards that have been claimed. It is eminently suited for bombing and reconnaissance aeroplanes, but not for fighting aeroplanes. The number of engines actually ordered for the British Government is 980, but 4,500 are required by the end of the year. The British Government would have prepared to place an order for 3,000 at once, but, at the desire of the American Government, the order was limited to 980, the number which was allocated for delivery up to the end of June. Up to date, 205 engines have been delivered from the Works.

"The following is the text of a telegram received from the Air Ministry on June 8th:

" 'The British technical authorities have reported to the air minister the the liberty engines have now been subject to sufficient air experiment in England to warrant confidence in this engine. Excellent results have so far been obtained which place the engine at once in first line of high powered air engines. Naturally service experiment in the field is still to be obtained but the liberty engine will be a most valuable contribution to the Allied aviation programme and the United States should develop production with every confidence.' "

The following further statement was supplied by the British Air Ministry, under date of September 27, 1918.

"No severe bench tests on the Liberty Engine were carried out in England, owing to the extensive tests in America.

"The only bench test in England was one short test, at nine-tenths power, for data re oil and fuel consumption. The result was quite satisfactory.

"One engine was stripped after 100 hours flying and was found to be in good condition.

"Tests in the air have been carried out in de Haviland 9-A and de Haviland 10, machines. In these the engines have performed uniformly satisfactorily.

"The performance of the Liberty Engine is at least as good as that of the Rolls-Royce in identical machines. The information officially expressed four months ago, that the Liberty Engine would prove satisfactory in service, is wholly confirmed."

The facts as to production will be given later.

(*To be continued*)

STATEMENT FROM CURTISS AEROPLANE & MOTOR CORPORATION

"Justice Hughes' report on the aeroplane industry after 22 weeks of investigation sets aside the charges so freely made at the opening of the Hughes' inquiry that a devious trail of graft would be uncovered. We can all, as Americans engaged in the greatest struggle in history, be glad of that result.

"The report indicates facts which should assure the American public of the efficiency possible now in government direction and in manufacturing facilities under the regime of John D. Ryan.

"No one denies that there was a constant bedevilment of production during the period under review by Justice Hughes, because of constant changes in contracts and designs for planes. The Curtiss company had a very full share of this inchoate situation. It was on that very promise that the great North Elmwood factory was constructed. The building covers 26 acres under a single roof, certainly the largest single aeroplane plant in the world. But it was not until recently that definite use could be realized of more than 30 per cent of the maximum capacity of this plant. That is a condition which, we believe, was true of some other plants in the country.

"The Buffalo public is familiar with some of the details. Among them were, first, the award of an enormous contract for the Spads, the fast fighting plane used by the French. Thousands of men were immediately employed to start on that programme. They were kept from day to day awaiting final drawings, completed plans and definite go-ahead. Next came the Bristol contract. Changes in the plans for this machine were as frequent as sunrise and sunset. Finally, when it was seen that the Bristol was so overpowered that the motor tore off the fabric of the wings and shivered the whole machine to pieces, that machine was abandoned. In the Senate committee's investigation, an army officer testified that he knew of more than 2,700 changes in essential features of design in planes and motor for the aviation programme.

"This was a condition that necessarily and unavoidably, as far as a contractor is concerned, meant a disruption of industry. Men were kept on in departments from day to day waiting for the order to "Go-ahead." It is hard to get men and women skilled in the variety of trades necessary to the building of aircraft. Thousands came here from out of town. They were an industrial asset. No one knew at what moment nor on what day the company could use their labor in the carrying out of the contracts scheduled.

"During the months before the present organization of the Curtiss company took the reins, instances such as Justice Hughes makes the subject of a general statement were not hard to find. These instances refer to the large number of employees on the payrolls. It probably would not be hard to find in any organization employing at times as high as 15,000 men and women instances of workers punching time cards for one another. But it will be recalled that when such men were caught they were promptly turned over to the city and county and federal officials in Buffalo for court action. Justice Hughes' remarks in this section of his report should not be construed by the people of Buffalo as reflection on the general body of Curtiss workers.

"There are bright spots in Justice Hughes' report to prove that. He mentions, for instance, that up to July, 1918, the aeroplane plants of the country produced 4,572 elementary training planes and 1,000 advanced training planes. In the same time, 7,662 engines for elementary training planes were delivered to the government. The Curtiss company is proud of its record in the production of training planes, without which the aviation training schools could not have operated. Of the 5,572 planes and 7,662 engines mentioned by Justice Hughes, the Curtiss Aeroplane & Motor Corporation built and delivered about 4,500 of the planes and about 55 per cent of the motors. The Curtiss model JN was early adopted as the standard training plane and practically all of them were equipped with the Curtiss OX engine. The Curtiss JN has been readopted recently as the standard training plane. Since it has been recognized by the Allies, the JN becomes practically the standard training plane of the world.

While the army combat plane programme halted and stumbled, the Curtiss company has achieved a remarkable construction record for the United States Navy. The Curtiss company has produced enormous quantities of flying boats which have, in a great degree, been the means of overcoming the U-boat menace. The story of Curtiss achievement in the production of flying boats for the Navy will be a proud page of American history when the full military and naval story of America's part in the war can be told.

"Attention may be directed to another phase of the Hughes' report, in which he says: "There have been persistent rumors of pro-German sympathies on the part of employees of the Curtiss company, but it has been impossible to ascertain to what extent, if any, the demoralization that, until lately, recently has existed at the North Elmwood plant of that company, was due to any influence of this hostile description. . . . Facts warranting a definite conclusion as to disloyalty on the par of employees in important positions is lacking." The Curtiss management has never doubted the loyalty of its workers as a whole. The men and women of the Curtiss family have, to date, subscribed more than $4,500,000 to the Liberty Loan campaigns, and in the Fourth Liberty Loan campaign, just closed, the workers of the Curtiss shops went over the top with a subscription of $1,035,000. In addition, the voluntary purchases of War Savings Stamps have average $75.00 a day.

"The only other important local mention of

(*Continued on page 526*)



THE NEWS OF THE WEEK



Liberty Motor and Thomas-Morse Scout Attract Air Service Recruits

The celebrated Liberty Motor was shown recently to the public for the first time in America as far as ascertainable in the window of the A. I. Namm & Sons department store, on Fulton Street, Brooklyn, N. Y. The display was arranged in connection with the recruiting campaign for the Air Service, conducted in Greater New York by Major Willard Wadsworth, Department Air Service Officer, for that district.

The model attracted widespread attention and interest. It was viewed by thousands of people, who on several occasions so completely blocked the sidewalks that police intervention was necessary. As a recruiting "stunt" it provided gratifying results. Hundreds of young men enrolled at the recruiting booth, which was opened in the store through the courtesy of Mr. Herman Neaderland, Advertising Manager.

In addition to the Liberty Motor there was also on display in the window a Thomas-Morse Scout plane, a Curtiss OX2 Motor and a Gnome Monosoupape. Every part of the aeroplane was labelled and described, so that the layman could get an idea of the terms used. The Thomas-Morse Scout created much interest because of the Aviation Carnival held a few days previous at Belmont Park, in which so many machines of this type took part.

The recruiting campaign for the Air Service is being conducted throughout the United States under a new authority. More than thirty thousand men are to be inducted as soon as obtainable. Trade Test Boards where applicants may apply for qualification are located in the following places:

New York City, 104 Broad Street; Atlanta, Ga., Georgia School of Technology; Boston, 739 Boylston Street; Chicago, 230 East Ohio Street; Dallas, Camp Dick; Fort Sill, Okla., Post Field; Los Angeles, Marsh-Strong Building; Minneapolis, University of Minnesota; San Antonio, Fort Sam Houston; San Francisco, 55 New Montgomery Street; St. Louis, 525 South Euclid Avenue; Canal Zone, Camp Sheridan.

The Air Service is seeking skilled mechanics in practically every mechanical and technical branch. The trades listed include the following: cabinet makers, electricians, motorcyclists, instrument repairmen, carpenters, riggers, propellermakers, chauffeurs, automobile mechanics, tailors, armorers, clerks, engine repairmen, stenographers.

Joffre Tribute to Wright

Paris.—Marshal Joffre pays tribute to the memory of Wilbur Wright in a letter to Baron d'Estournelles de Constant, Chairman of the committee for the Wright Memorial Celebration at Lemans.

"Wilbur Wright," says Joffre, "by his memorable experiments at Camp d'Ouvours made it possible for aviation to become a great and glorious factor in this war. We cannot forget that the first Americans who fought for us were aviators of the Escadrille Lafayette. Lafayette and Wright are two great makers of the Franco-American Entente."

Fonck's 75th Victory

Paris.—The official communication on aerial operations issued November 5 says:

Since November 2 Lieut. Fonck (the premier French ace) has downed six enemy machines, which brought the number of victories for this pilot up to seventy-five.

New Field Publication

AERIAL AGE takes much pleasure in announcing that a new field publication under the name of *The Rich Field Flyer* is to be added to the fraternity of aviation publications.

This publication is in magazine form and is published at Rich Field, Waco, Texas.

It is printed on very fine paper and is quite a pretentious venture. It contains quite an assortment of subjects, and taken as a whole is just another specimen of the "go ahead" spirit which prevails in the American camps.

The Managing Editor of *The Rich Field Flyer* is Lieut. John K. Gowen, Jr., and the exchange of publications is in charge of Lieut. F. L. Samuels.

Invitations to Aviators

The War Department authorizes the following:

Cities and towns of the Southwest under the air lanes used by Army flyers are rivaling each other in their hospitality to aviators. They are building landing fields, organizing the inhabitants into reception committees and raising money for entertainment. One town, which calls itself "The Dynamo of Central Texas," is sending out invitations by cards to flyers. The cards read:

"Upon presentation of this card all courtesies will be offered you, including shower and pool baths at the Y. M. C. A.'s $87,000 plant, country club's $75,000 plant, Elks Club's $47,000 plant. Coffee and sandwiches will be handed out by the Red Cross canteens; hair cut, shave and shine given free at any barber shop; cold drinks at the soda water fountains, also local carfare."

A Big Photographic Map

The War Department authorizes the following:

What is said to be the largest photographic map ever made in this country is just being completed of the territory in and around Fort Sill, Oklahoma, by the Photograph Section of the Air Service attached to Post Field. This map shows not only highways, lanes, trees, buildings, railroads, fances, and every landmark, but indicates every elevation and depression in the terrain. With over 4,000 separate prints pasted into one huge mosaic, the finished product covers a space sixteen feet long and six feet wide, representing a ground area of 310 square miles. The map takes as its center point the town of Lawton, which lies three miles south of Post Field, extending from this point east and west three and five miles respectively, and from the northern boundary of Fort Sill reservation, thirty-one miles south to a point below the town of Walters.

When work was started on this map, slightly over a month ago, the territory was plotted out on a ground map, and by figuring the exact area possible to cover with three magazines of plates, allowing for the proper overlaps, zones or strips of country were established to be covered on every aerial flight. Observers were sent up with assignments to cover specified zones or strips, and as fast as the finished negatives showed that these strips had been covered satisfactorily, the work proceeded to unfinished zones. Three planes went up daily at the start and negatives were produced with great rapidity. A summary of the negatives made shows over 4,200 separate exposures, but the number of prints, allowing for overlapping, spoilage, etc., will, of course, exceed this number. Figuring three magazines, or 72 exposures, on each flight, approximately 60 trips, averaging an hour and a half per trip, have been necessary to produce the map—or total flying time of some 90 hours.

Marine Flying Corps Notes

The first aviation unit organized in America and sent abroad using American-made material was the First Marine Aeronautic Company, equipped for water flying only, which is now stationed abroad at a naval base. This information is given in an announcement of the progress of Marine Corps aviation, which has just been made public at Marine Corps Headquarters.

In addition to the flying field maintained at Miami, Florida, where all training in actual flying is given, the aviation section of the Marine Corps gives candidates instruction in ground work at the Massachusetts Institute of Technology, Boston, Mass., and has two schools for instruction in aviation mechanics.

The course in actual flying at the Marine Flying Field, Miami, which covers a period of 75 days, includes preliminary, acrobatic and formation flying. All students receive instruction in bombing, gunnery and reconnoissance work. The reconnoissance work, the most hazardous feature of aviation, includes following up bombing squadrons for making photographic records. In obtaining these photographic records, the aerial photographers must make their way to the scene of activity and not only record the result of the bombing but evade the prepared enemy fire as well.

At the Massachusetts Institute of Technology, where all ground work instruction is given, there are now 289 students. One hundred and thirty-two men are in classes and 157 are awaiting assignment. When Marines are assigned to this



"High Fliers These." This picture made at North Island, San Diego, California, shows Lieutenant Barrett, former trainer of the New York Yanks, and Ensign Sullivan, of the Chicago Cubs, ex-infielder. They are now trainer and manager of the Army and Navy Aviators Baseball Club as well as aviators

School, they are enrolled as gunnery sergeants for the duration of the course and receive the pay allotted to this rank. Those who show themselves to be promising material are made officers after completing their training as flyers. The ground course lasts about 10 weeks, and 80 men are graduated each month. No break is allowed in the supply of men to the school, by keeping 100 men in reserve to be passed upon by aviation officers. If a man fails to be graduated, he has the option of being transferred to training for regular duty in the Marine Corps, or being discharged.

Of the two schools for mechanics, the larger is maintained at the Naval School for Mechanics, Marine Corps Section, Great Lakes Training Station, Chicago, Ill. Here Marines are trained as mechanics, riggers and armorers. At present there are 120 enlisted men taking the course at Great Lakes, and 60 men are sent each month from the Marine Corps. The total number of men allotted to the Marine Corps at one time is 360.

The second school for aviation mechanics is located at the Naval School, Marine Corps Section, San Diego, Cal. The training is the same as given at the Great Lakes School. Ninety-three enlisted Marines are taking the course at the present time. The capacity is 120.

Seaplane in Air Nine Hours

Washington.—A record flight made by a navy seaplane equipped with a Liberty motor is described in a report received November 2 by Secretary Daniels from Vice-Admiral Sims.

The plane remained in the air nine hours, carrying a full military load, four men, the regulation supply of gasolene, two bombs weighing nearly 500 pounds and two machine guns.

Flyers Carry Rations to Our Fighting Men

Washington.—American aviators now are delivering Red Cross emergency rations to American soldiers in the front lines who are pursuing the enemy at such a rapid pace that they have out-distanced army supply wagons. A despatch from France to the American Red Cross said by flying low the aviators are enabled to drop packages and newspapers at points where the soldiers are certain to get them.

New Commander at Chanute

Chanute Field.—With the departure of Commanding Officer Major Wilbourn, who was promoted to the rank of Lieut. Colonel just before leaving Chanute Field for Camp Green, S. C., Major A. H. Gilkeson has become chief officer in charge. He relieves Capt. Lewis who was the temporary C. O. and is expected to be permanently maintained as the new Chanute Field commander. He is a West Point man and not a stranger at the local field, having been commanding officer of the old 38th Squadron early last fall. Up until a few weeks ago he was stationed at Wilbur Wright field, coming here to take up the duties of flying officer. Lieut. Bretting moves up to the flying officer's berth with the promotion of Major Gilkeson to post commander.—*Rantoul Weekly Press.*

Chanute Field Has Aero Ambulance

The new aero ambulance, a Curtiss aeroplane equipped to carry one patient besides the driver, was on the field Sunday ready for its first trip in the air. The fuselage of the machine is so arranged that a stretcher bearing a wounded soldier can be placed into it securely for quick transportation to the nearest field hospital. The object of the machine is to equip the post hospital for such cases where a plane should fall where access to the spot would be impossible by ambulance.—*Rantoul Weekly Press.*

Omaha Selected as Overland Air Port

Omaha, Neb.—Omaha has been definitely selected as an air port for the Woodrow Wilson transcontinental aero mail service, according to army officials at Fort Omaha.—*March Field Flyleaf.*

Airman Fights off 60 Foe Machines

One of the most gallant deeds in the record of the British air force has been added in a battle recently fought in the Mormal Forest by a British Major, working singlehanded.

The Major had engaged a German aeroplane, and almost before he realized it was surrounded by a great flight of enemy machines, which attacked him fiercely from all sides. A battle royal ensued, which lasted about an hour, during which he had given battle to between fifty and sixty machines.

Early in the fight the Major sustained three crippling wounds. Unconscious at times, he continued to fight, until by brilliant manoeuvring he managed to escape to his own lines. He had destroyed four hostile planes and driven down out of control between four and six.

Once during the mad battle the Major concluded he was lost and deliberately charged a Boche with the expectation that both machines would crash and end it. He was working the machine-gun as he swept toward the enemy. Just as a collision seemed inevitable, the German machine burst into flames and dropped.

Chick Evans to Be an Aviator

Chicago.—Charles "Chick" Evans of Chicago, national amateur and open golf champion, has received word that he had been accepted for aviation service. Evans is twenty-eight years old and had been placed in deferred classification because of dependent parents, but he only recently succeeded in adjusting his affairs so he could enter the service.

Washington Reads Returns in Sky

A solid bar of light two miles long and three feet in diameter, projected straight into the sky by an army searchlight of approximately 1,750,000 candlepower, kept Washington and portions of Virginia and Maryland informed on the night of November 5 that election results were in doubt.

The searchlight was to flash a stream of light east and west if the Democrats won and north and south if the Republicans carried the day.

The thirty-six-inch searchlight from Washington Barracks was mounted on a huge army truck and taken to the corner of Thirteenth street and Pennsylvania avenue. The crew in charge were members of the Seventy-third engineers. Lieut. R. T. Alten directed the operation of the searchlight, assisted by Lieut. J. H. England, Sergeant Flansburg, Sergeant Patterson, and Privates M. L. Griswold, F. J. Mouler, J. J. More, L. Brack, A. H. Baumgart, F. H. Spector. Capt. S. R. Hursh and Capt. R. T. Kendall were detailed by Col. G. R. Lukesh, commanding the Seventy-third engineers, to observe the operations of the searchlight in regard to atmospheric conditions.

When the proper focus was made the huge stream of light was thrown straight into the air. So powerful was the glare that the rays penetrated two cloud layers.

Lieut. James C. Edgerton, army aviator stationed at Bolling Field, Anacostia, made two flights over the city, droping flares to announce for *The Times* the doubt regarding the result of the election.

When he went up for the first flight no definite returns had been made, so white flares were dropped, indicating that the result was in doubt. The plane left Bolling Field at 8:31, circled the field twice for altitude, and headed north toward the heart of the city.

The plane was dark, and for a time the two searchlights at Washington Barracks were unable to find the aviator. On his first trip five white Very lights were dropped.

Edgerton, after shooting his flares, flew through the beam of the searchlight, which, however, lost the plane. Turning, the plane again shot into the beam of light, and from then on until just before the landing was made, the machine was kept in full view of the thousands who were watching it.

British Aeroplane Takes 65 Germans Without Landing

London.—Two British aviators, flying low in one machine, recently brought about the surrender of sixty-five Germans, and without leaving their aeroplane shepherded the party across No Man's Land to the British lines, according to a story from the battlefield made public on September 24.

The pilot and his observer had been attacked from a trench and sunken road. The pilot dived and replied to the enemy fire with his machine guns, killing one and wounding three. The Germans in a panic ceased firing and hoisted a white handkerchief.

As there was no British infantry in that neighborhood, the pilot descended to within fifty feet of the ground and motioned the Germans out of the trenches, circling around them to insure that none escaped. All were safely brought in and handed over to the nearest British troops.

The aviators then resumed their patrol.



The famous Spad, French combat machine, equipped with 200 h.p. Hispano-Suiza motor, used by the leading French and American Aces on the Western front. Lieutenant Fonck, who has over 75 German planes to his credit, Lieutenant Nungesser, who has over 40 German planes to his credit, and Adjutants Madon, Douchy, and other noted members of the famous Stork squadron, fly Spad biplanes entirely

The AIRCRAFT TRADE REVIEW

They Call Each Other by Their Real Names

AERIAL AGE is in receipt of the following letter from the Standard Aero Corporation of Elizabeth, N. J., which serves to show the amicable feeling which obtains in that plant between the different departments.

Your Editorial Department will be interested in the attached reproduction of a memorandum from the files of the Standard Aircraft Corporation.

You will notice that the original was dictated by Captain D'Annunzio while he was stationed at the Standard Aero Corporation during the building of the first American Caproni. The reply which Mr. Mingle made is characteristic.

The entire document is a very human one and should make a bright spot in your pages.

To Mr. R. C. Taylor,
Standard Aircraft Corporation.

As the noise and heat surrounding me in this office is about to give me hydrophobia, before I bite someone, kindly give me without delay some office room elsewhere, where the heat will not be so great. G. D'ANNUNZIO.

Reply:

Kindly furnish Captain D'Annunzio with a muzzle and chain until satisfactory office facilities can be afforded him.
H. B. MINGLE.

Burgess Aeroplane Plant No. 2 Burns

Marblehead, Mass.—Plant No. 2 of the Burgess Aeroplane Company, which was filled with Government aeroplanes, was destroyed by fire on November 7. The fire was started by an explosion in the paint shop of the Burgess company.

The plant had been shut down in order to permit the workmen to celebrate upon receipt of reports of the signing of an armistice by Germany, and before the watchman could reach the scene the flames had gained great headway. Aeroplanes in various stages of construction were quickly ruined.

Insurance officials estimated the total loss at $300,000. It was thought the fire was caused by spontaneous combustion.

Liberty Motors Being Made Fast

Washington.—The actual output of Liberty motors in October was 3,878, according to an announcement authorized by the War Department. This is an increase of 1,500 over September. The Air Service expected 2,500 motors in September and deliveries were short 122. The quota for October called for 3,000.

The factories producing the motors are expected to turn out a minimum of 4,350 during November. With the big plants now in full operation, it is expected that the November figures will be far ahead of the number called for.

Wins Liberty Motor Flag

Indianapolis.—The Nordyke & Marmon Company of this city won the first honor pennant offered by the United States Government to the concern building and shipping 12-cylinder Liberty motors the most rapidly in October, it was announced here on November 1. The contest began October 1 and ended November 1 at midnight. The company made a production record of 225 per cent of its alloted quota in October. The contests are to be continued each month. Five other firms contested during October.

The flag was presented November 2 at one of the Indianapolis parks. It will remain at the plant of the winner until won by another concern.

New 24-Cylinder Aviation Engine in Production

Racine.—The Sieverkropp Engine Co. has started work on the construction of a 24-cylinder, two-cycle, rotary aviation engine, which is expected to develop 500 h. p. at 1,400 r. p. m. The engine is of a new type recently developed by Henry Sieverkropp, president and chief engineer of the company. The 24-cylinder engine is being built at the suggestion of the technical division of the Government aircraft board, on the basis of the performance of a smaller experimental engine completed by Sieverkropp about two months ago and submitted for official tests. The engine already constructed is a 12-cylinder, two-cycle, rotary type, rated at 72 h. p., but it has developed 140 h. p. at 2,800 r. p. m., without appreciable effort. Mr. Sieverkropp is confident that the 24-cylinder motor will weigh considerably less than 1.98 lb. per horsepower and by the use of aluminum cylinders and other economies in weight expects to reduce the ratio to practically 1 lb. per horsepower.

To Make Aeroplane Parts

Detroit.—The newly incorporated B. & H. Machine Products Co., 1161 Ellery Street, will confine its efforts to government machine production work entirely, manufacturing parts essential to aeroplane and truck engines.

Du Pont Heads Flint Varnish

Detroit.—W. W. Mountain, president and general manager of the Flint Varnish & Color Works, has resigned as the company's chief executive officer and member of board of directors to become associated with John N. Willys. The board has also accepted the resignations of James E. Kepperly as vice-president and director and B. A. Greene, secretary and purchasing agent. The former is general manager of the Curtiss Aeroplane & Motor Co. of Buffalo. The latter will become affiliated with Dort Motor Co. Lamot Du Pont, vice-president of the E. I. Du Pont de Nemours company, was elected to the presidency to succeed Mountain. S. J. Sohlinger, who has been vice-president and assistant general manager for nearly 2 years was made general manager of the company and elected to the board of directors. F. M. Howard, treasurer, was also elected to the board.

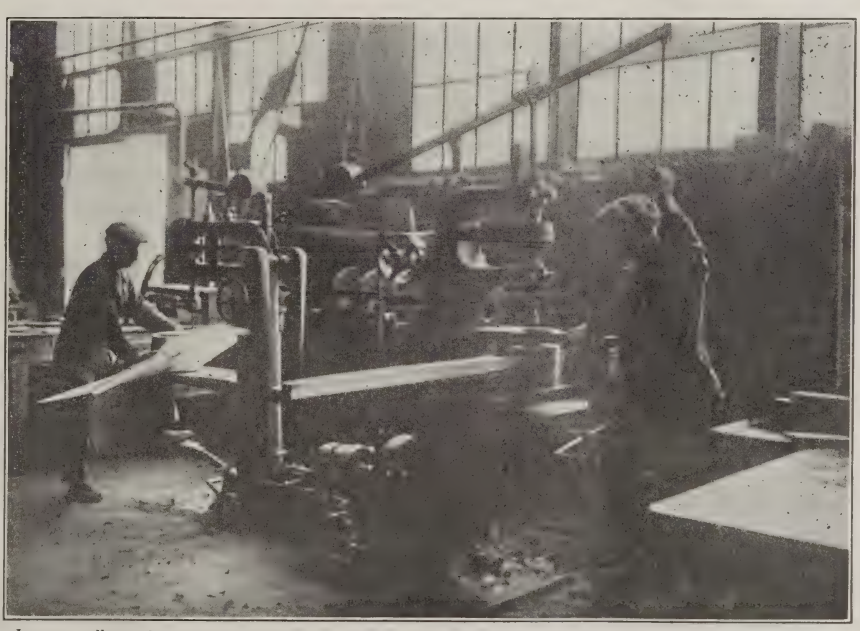
No Aeroplane Show Next Year

New York.—The Manufacturers Aircraft Association has abandoned plans for its annual show during the coming year. The directors last week adopted resolutions against such a show because of the necessity for devoting all time and energy to government requirements

Standard Holds Rally

At 12 o'clock noon, November 1, 1918, a rally was held at the plant of the Standard Aircraft Corporation, Elizabeth, New Jersey, at which rally the 100 per cent Liberty Loan Flag, which has been awarded to the Standard Aircraft Corporation was unfurled.

Mr. H. B. Mingle, President of the Standard Aircraft Corporation, spoke, as did Mr. J. M. Meirick, Publicity Superintendent, who had been directly in charge of the Liberty Loan drive.



In a propeller making plant. The war has demanded so much of manufacturers that existing plants had to be adapted as best they could to war use. Here are shown metal hub flanges being fitted. A divergence of opinion in propeller manufacturing methods centers around the hub! One school bores the hub hole and fits the flange in the nearly finished product. Another school bores the hole in the roughly glued block, and using this hole for the supporting axis, shapes the propeller from the base center

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Frank Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Darneille
August Thiele
Herman E. Fremming
Frank Tower

Aeroplane Mail at 43c. Per Mile

The Post Office Department authorizes the following: The first report of the comparative cost of the operation and maintenance of the Aero Mail Service shows that the aeroplanes used in this service have broken all records for economy of gas consumption.

The total of all operating expenses of nine aeroplanes covering flights aggregating 7,234 miles was $3,682. The total consumption of gas representing 113 hours and 8 minutes of flying was 1,377 gallons, which is $32.50 per hour—something over 50 cents per mile. The total cost of gas was $405 in flying 7,234 miles.

The best performance in flying was made by a Curtiss J-N-4 machine, which flew 26 hours and 40 minutes at a cost of $28.01 an hour, and covered 1,719 miles at a cost of 43½ cents per mile. A plane equipped with an Hispano-Suiza 150-horsepower engine used approximately 8 gallons of gas per hour, and a plane equipped with a 400-horsepower Liberty motor used 17 gallons per hour. This shows 40 per cent. less gas consumed than generally required for aeroplane engines of these sizes.

Kipling's Dream May Be Reality

Kipling's dream of the "Flight of the Night Mail" will be a reality within three years, according to Capt. B. B. Lipsner, in charge of the government's aerial mail service. The idea that mail cannot be rushed from coast to coast, and from the Canadian border to the Gulf of Mexico in giant aeroplanes in all kinds of weather will soon be established, Capt. Lipsner declares.

The excellent service and perfect score maintained in the mail delivery between New York, Philadelphia and Washington during the past month has led Capt. Lipsner to a firm conviction that a nation-wide aerial mail service is not impossible.

It is proposed to have a sunrise to sunset mail service between New York and San Francisco, using the aeroplane equipment of the Army, now in service in France and building in this country, with Chicago as the hub of the gigantic system. Capt. Lipsner also believes that the railways will be eliminated from carrying first-class mail immediately after the war, as the fastest train service is now too slow, in comparison to what aeroplanes have been doing and can do.

Captain Lipsner has been in Chicago to complete plans for the opening of the aerial mail service between New York and Chicago, November 1. Most of the cities along the route to be traversed have already established landing places and hangars, and are eager for the service to get under way.

Flying by night will be a regular thing in the aerial mail service, the plane chief believes, and upon this bases his opinion that a sunrise to sunset mail service between Atlantic and Pacific coast cities is possible.

The plane now being built for service on the short eastern route will be able to fly in all kinds of weather. The present weight carrying limit is 700 pounds, but it is hoped that the new planes will carry nearly five tons of mail. It is proposed to equip the new planes to fly 125 miles an hour. It will cost approximately $50 an hour to operate such a plane.

Aerial Mail Notes

SPAIN

Capt. Herrera, one of the pioneers of the Spanish military air forces, has had a number of interviews with King Alfonso at Madrid on the subject of an aerial postal and passenger service between Spain and United States. The scheme has also been discussed at Cabinet meetings, and it is said that a leading shipping company is willing to finance it.

The plan, it is understood, is to manufacture large airships capable of carrying forty passengers besides the mails. The rate charged for a passenger, if the scheme is carried out, will be $400, and letters will be charged for a the rate of $1 per hundred grams weight (about three and a half ounces). It is estimated the journey would take two days and a half.

AUSTRIA-HUNGARY

It is understood that the aerial mail service between Budapest and Vienna has to come to an end owing to the collapse of the aeroplane at Magyarovar; the two officers were killed and the mail burned. According to the Vienna "Fremdenblatt," the officers whilst conveying mails from Budapest to Vienna were attacked by an eagle, which was killed by the airscrew. One is not very surprised to hear that the aeroplane collapsed under those circumstances.—R. M.

Thanks for Them Kind Words

Regarding the American aero mail service the *London Aeroplane* says:

"During the month of August the aerial mail service between Washington, Philadelphia and New York was conducted without a miss or serious delay of any character. This tends to show how the Americans are working to perfect their aeial mail system.

"Since the inauguration of the United States aerial mail service the American authorities have realized the great possibilities of this new work, and, aided by a sensible Congress who are prepared to supply machines, they bid fair for going to the top of aerial mail affairs unless other countries wake up."

UNITED STATES POST OFFICE AIR MAIL SERVICE

Monthly Report of Operation and Maintenance

SEPTEMBER, 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	PILOTS: Actual time	HANGAR MEN: On plane	HANGAR MEN: Miscellaneous	MECHANICS: On plane	MECHANICS: Shop time	Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST: Gallons of Gasoline	Total time run	Total miles run	Miles run per gal. gas.	Cost per hour	Cost per mile
																	hr. min.				
1	$ 177.34	$ 15.96	$ 23.98	$ 31.52	$ 21.50	$ 47.80	$ 306.10	$ 17.76	$ 3.07	$ 75.88	$ 17.95	$266.32	$ 74.79	$ 78.95	$1158.92	648	39 29	3243	3.00	$29.35	$.3573
2	75.62	18.34	23.98	31.51	21.50	47.80	113.60	20.86	3.07	144.09	17.94	118.04	74.79	78.95	792.18	250	14 39	1254	5.01	54.07	.6317
3	66.85	29.20	23.98	31.51	21.50	47.80	113.60	20.86	3.07	144.09	17.94	118.04	74.79	78.95	792.18	250	14 39	1254	5.01	54.07	.6317
4	114.55	33.46	23.98	31.51	21.50	47.80	215.40	20.86	3.07	113.42	17.94	189.74	74.79	78.95	986.97	376	27 47	2111	5.61	35.52	.4675
5	88.45	23.49	23.98	31.51	21.50	47.80	134.65	19.31	3.07	138.39	17.94	68.38	74.79	78.95	772.21	296	17 22	1306	4.41	44.47	.5912
6	33.00	9.35	15.65	31.51	21.50	47.81	32.25	18.31	3.07	108.54	17.94	195.80	74.78	78.95	688.46	110	4 09	270	2.45	165.89	2.5498
38262	65.11	26.51	23.98	31.51	21.50	47.81	174.45	23.86	3.06	130.41	17.94	8.04	74.78	78.94	727.90	215	22 30	1542	7.17	32.35	.4720
38274	78.83	21.12	23.98	31.51	21.50	47.81	115.40	20.47	3.06	153.61	17.94	12.33	74.78	78.94	701.28	261	14 53	976	3.73	47.12	.7185
38275	41.34	9.40	23.98	31.51	21.50	47.81	59.75	18.01	3.06	69.00	17.94	3.04	74.78	78.94	500.06	137	7 42	623	4.54	64.94	.8026
38278	51.79	15.91	23.98	31.51	21.50	47.81	85.85	17.70	3.06	95.30	17.94	45.27	74.78	78.94	611.34	159	11 05	741	4.66	55.16	.8250
39362	7.50	1.62	15.66	31.51	21.50	47.81	12.30	16.76	3.06	22.00	17.94	.....	74.78	78.94	351.38	25	1 35	90	3.60	221.92	3.9042
39363	7.50	.....	15.66	31.51	21.49	47.81	6.85	16.75	3.06	22.00	17.94	.....	74.78	78.94	344.29	25	.. 53	90	3.60	389.76	3.8254
39364	13.50	1.10	6.77	31.51	21.49	47.81	.....	4.42	3.06	.....	17.94	.....	74.78	78.94	301.32	45	.. ..	.....	.....	.....	.....
39365	44.70	1.10	6.77	31.51	21.49	47.81	13.95	4.41	3.06	111.53	17.94	.....	74.78	78.94	457.99	149	1 48	190	1.27	254.43	2.4104
39367	140.00	.50	6.77	31.51	21.49	47.81	131.80	4.41	3.06	10.05	17.94	.....	74.78	78.94	569.06	500	17 00	1500	3.00	33.47	.3793
Total	$1006.08	$207 06	$283 20	$472 66	$322 46	$717 10	$1560.00	$244 14	$45 86	$1295 14	$269 11	$910.02	$1121 75	$1184 16	$9638 74	3443	201 12	15263	4.43	$47.90	.6315
Cost of N.Y. Chi. route, exploitation	$231.40	$47.62	$65.14	$108.71	$47.17	$164.93	$358.80	$56.15	$10.55	$297.88	$61.89	$209.30	$258.00	$272.36	$2216.91	791	46 31	3510	4.43	$47.66	.6315
Cost of N.Y.-Wash mail route	$774.68	$159.44	$218.06	$363.95	$248.23	$552.17	$1201.20	$187.99	$35.31	$997.26	$207.	$700.72	$863.75	$911.80	$7421.83	2652	154 41	11753	4.43	$47.98	.6315

OTTO PRAEGER, Second Assistant Postmaster General



MILITARY AEROSTATICS



By Lieut. H. K. BLACK, R. F. C., C. F. A.

DURING the past week AERIAL AGE has been asked to say something about the permeability of balloon fabrics. There have been several inquiries to this office about it in the last few weeks, so perhaps a few facts about this subject will be in order just now, particularly as one inquirer wishes to take advantage of the information immediately. It had been intended to go into the subject of permeability in the course of the next few weeks, but in the meantime here are a few facts in advance.

Permeability of Balloon Fabrics

A great many materials have been suggested for rendering fabric gastight; the great majority of balloon envelopes, however, are made from rubber-coated silk or cotton, usually the latter. For the balloon envelope two piles of cloth are used with the gastight rubber film between them. The two plies may be placed parallel to each other or one ply may be placed at an angle of 45 degrees; the biased favric is supposed to offer greater resistance to tearing. Usually from 100 to 130 grams of rubber per square meter are placed between the plies. For protecting the fabric and the gas-retaining rubber film from the action of light, heat, moisture, etc., rubber coatings may be applied on the outside; further protection is sometimes added by coating the inside of the fabric also. Lighter single-ply fabrics are sometimes made for use in ballonets and three-ply fabrics find use in large dirigibles or supply balloons.

Goldbeater's skin finds some application in dirigible balloons of the rigid type. Oiled fabrics of various kinds, as well as fabrics coated with lacquers made from cellulose acetate or nitrate, have been tried. Various coatings have also been applied to rubberized fabrics with a view to rendering them more nearly gastight and increasing their durability. However, none of these has been found entirely successful.

Gas escapes from a balloon envelope through leaks at valves, seams, and imperfections in the fabric, and by passage through the fabric. Hydrogen might pass through the fabric by diffusion through minute holes in a manner similar to the passage of a gas through a porous plate or it might escape by solution in the rubber film with subsequent evaporation from the other side. As a matter of fact, both processes occur simultaneously. The escape of hydrogen through openings in the fabrics is only a case of gas effusion, but the passage of hydrogen through the rubber of the fabric is a very different phenomenon.

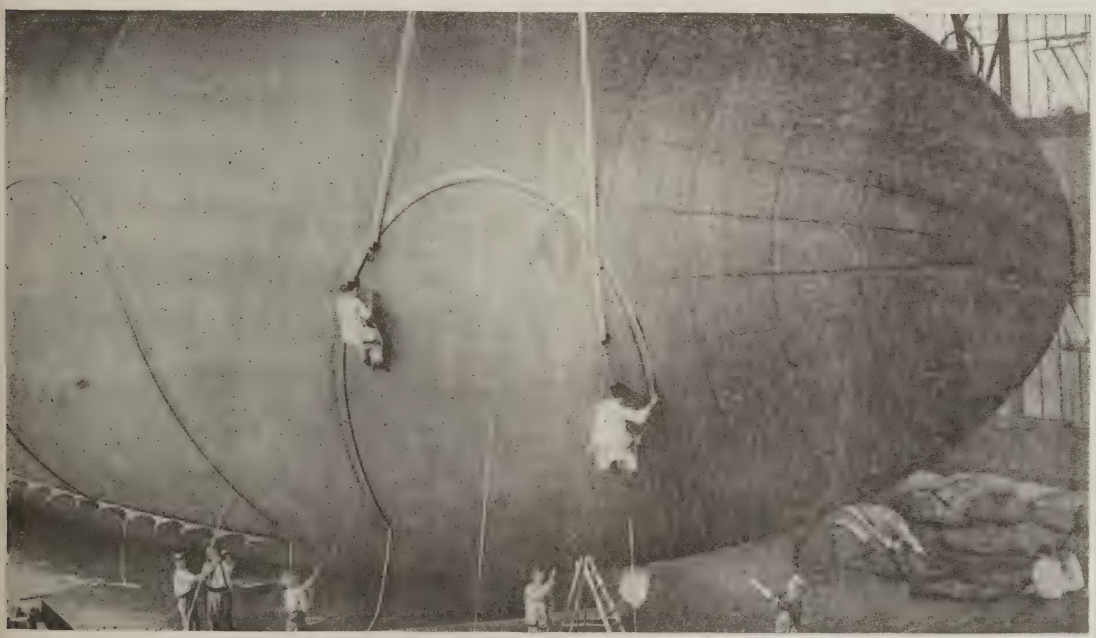
Thomas Graham, in 1866, investigated the flow of gases through rubber films and showed that it was a solution phenomenon and not a diffusion phenomenon. If gases passed through rubber films by diffusion through microscopic holes, their relative rates of escape should be approximately inversely proportional to the square roots of their densities. Graham showed, however, that the rates of penetration of different gases bore no relation to their density. He found the relative rates of penetration of rubber by different gases to be as follows:

Nitrogen	1.0
Methane	2.15
Oxygen	2.56
Hydrogen	5.50
Carbon dioxide	13.58

The rate of change of permeability of rubber films with change of temperature is also much greater than can be accounted for by the diffusion theory. These and other facts have shown that gases penetrate rubber by first dissolving in the rubber.

When a rubber-coated balloon fabric is placed in contact with hydrogen on one side and air on the other, the following process is substantially what occurs. Both the hydrogen and the oxygen and nitrogen of the air dissolve in the rubber film and tend to saturate it up to the limits determined by the temperature and by the partial pressure of each gas. Each gas penetrates the rubber film at its characteristic speed, and when it reaches the opposite side of the rubber film the gas evaporates from its solution in the rubber because the partial pressure of the gas in question is substantially zero. More of each gas is dissolved continuously on the first side of the fabric and a dynamic equilibrium is reached which continues so long as fresh air and fresh hydrogen are available at the two surfaces. In this manner hydrogen passes through the rubber to the air side and air passes through to the hydrogen side.

(To be continued.)



The ground crew of a dirigible making repairs to the envelope while the dirigible is in its hangar. The workmen are slung in cradles from above

POWER CURVE FOR THE AERIAL PROPELLER

By S. E. SLOCUM, Ph. D.

Professor of Applied Mechanics, University of Cincinnati. Member S. A. E.

IN a previous article, entitled "Characteristics of the Aerial Propeller" (AERIAL AGE WEEKLY, August 26th, 1918), the writer derived from experimental data on model and full-size propellers obtained by M. Eiffel and Captain Dorand, a relation expressing propeller thrust in terms of the diameter and speed of the propeller in r.p.m. The characteristic feature of this derivation was that no assumption was made as to the theoretical relation existing between the various quantities involved, but the actual law governing propeller thrust was evolved from the experimental data by the method of Least Squares. The resulting law was as follows:

In metric units,

$$F = N^{2.261}\, D^{4.254} \left[.008542 - .01 \left(\frac{V}{ND} \right)^2 \right],$$

or in English units,

$$F = \frac{N^{2.261}\, D^{4.254}}{50{,}000} \left[6 - 7 \left(\frac{V}{ND} \right)^3 \right],$$

where F = propeller thrust in kg. or lbs.,
N = propeller speed in r.p.m.,
D = propeller diameter in m. or ft.,
V = air velocity in m./sec. or ft./sec.

This particular formula, of course, is conditioned by the particular type of propeller used in the experiments. The method of derivation, however, is perfectly general and affords a much more accurate and reliable basis for the discussion of experimental results on propellers than is possible when it is attempted to make the results conform to a theory which is known to be in error.

In discussing his exerimental results, Eiffel assumed from theoretical considerations that the thrust varied as V^2D^2, or, what amounts to the same thing, as N^2D^4, and also that the power absorbed varied as N^3D^5, but when he came to represent his results graphically, he obtained in each case a series of parallel curves, which means, as he himself notes, that the theoretical assumptions are in error. Since then, however, all discussions of propeller data seem to have followed Eiffel's assumption. The present article shows how far these assumptions may be in error in a particular case.

In what follows, the same experimental data used in the preceding article are retained as a basis for the determination by the method of Least Squares of the power absorbed by the propeller.

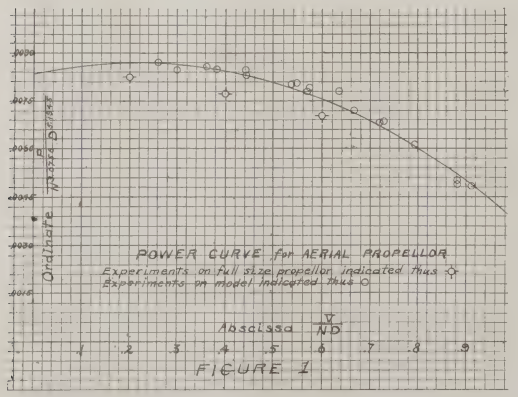


FIGURE 1

The propeller used in these experiments was a Drzewiecki screw, with a constant angle of incidence of 5 degrees, and a width of blade equal to one-sixth the radius. The diameter of the model propeller was .905 m., and of the full-size propeller was 2.715 m.

As in the preceding article, the combination $\frac{V}{ND}$ will be used as abscissa, and the form of the expression for the ordinate developed from the given data.

The experimental data determined by Eiffel and Dorand are given in the left half of the following table. In the right half of the table are certain quantities computed from these data, as explained in what follows:

EXPERIMENTAL DATA Model (Eiffel)			COMPUTED DATA Model (Eiffel)		
Speed N rev. 'sec.	Velocity V m. 'sec.	Brake Power P kgm.'sec	V / N D	P / $N^{3.0756}\, D^{5.4945}$	P / $N^{3.0756}\, D^{5.4945}$
10	0	5.97	0		
15.7	0	23.3	0		
21	0	57.7	0		
26⅔	0	122.0	0		
10	5.22	5.60	.577	.0079027	.007860
15.7	5.44	24.0	.384	.0084584	.008412
21	5.66	58.8	.298	.0084713	.008423
26⅔	6.30	126.0	.262	.0087066	.008657
10	8.00	3.54	.885	.0049956	.004969
15.7	8.10	22.1	.571	.0077888	.007746
21	8.39	57.7	.443	.0083128	.008266
26⅔	8.72	124.0	.362	.0085684	.008519
15.7	10.20	19.3	.719	.0068020	.006765
21	10.35	55.9	.546	.0080535	.008008
26⅔	10.65	122.5	.442	.0084647	.008416
15.7	12.57	14.0	.886	.0049341	.004907
21	12.68	50.0	.668	.0072034	.007163
26⅔	13.00	116.2	.539	.0080294	.007983
21	15.07	42.3	.794	.0060941	.006060
26⅔	15.35	113.0	.637	.0078083	.007763
21	17.32	33.4	.913	.0048119	.004785
26⅔	17.53	99.2	.727	.0068547	.006815
Full Size (Dorand)			Full Size (Dorand)		
9	0	1300	0		
9	4.9	1270	.2	.0082360	.008603
9	9.8	1190	.4	.0077172	.008061
9	14.6	1085	.6	.0070363	.007350

The first step is to determine the relation between the power absorbed and the speed in r.p.m. For this purpose let

P = power absorbed by the propeller in kgm./sec.,

and write the general relation

$$P = XN^kD^m = R\,N^k$$

where X, k and m are unknown quantities to be determined, and

$$R = X\,D^m.$$

Reducing this expression to the linear form by means of logarithms, we have

$$\log P = \log R + k \log N.$$

Substituting in this relation the data from the first four experiments, in which V = O, we obtain the four following observation equations:

$$.775974 = \log R + k$$
$$1.367356 = \log R + 1.195900\ k$$
$$1.761176 = \log R + 1.322219\ k$$
$$2.086360 = \log R + 1.425969\ k$$

These four equations involve two unknown, log R and k. The method of obtaining the most probable value of these two unknowns according to the method of Least Squares consists in reducing the observation equations to a pair of normal equations; the normal equation for log R being obtained by multiplying each observation equation by the cofficient of log R in this equation and adding the results; and similarly, the normal equation for k being obtained by multiplying each observation equation by the cofficient of k in this equation and adding the results. The resulting normal equations are

$$\begin{cases} 1.497716 = \log R + 1.236022\ k \\ 1.560437 = \log R + 1.256415\ k \end{cases}$$

whence

$$\begin{cases} \log R = -2.303806 \\ k = 3.07561 \end{cases}$$

The effect of propeller diameter on power is next considered by comparing corresponding experiments carried out on the model and on the full-size propeller. Since the model is one-third the size of the full-size propeller, its speed in r.p.m. should be three times as great to develop similar characteristics. The following two sets of data are therefore chosen for comparison:

Full-size Propeller	Model
D = 2.715 m.	D = .905 m.
P = 1300 kgm./sec.	P = 122 kgm./sec.
N = 540 r.p.m.	N = 1600 r.p.m.

Writing the general equation in the form

$$\frac{P}{N^k} = R = X\,D^m$$

substituting the above numerical values, and taking the ratio of the two expressions, we have

$$\frac{1300}{122}\left(\frac{1600}{540}\right)^{3.07561} = 3^m$$

whence $m = 5.19455.$

Note that this value of m is obtained from only two experiments and is therefore liable to a large probable error. This is unavoidable at the present stage of the calculations, but when the final results are obtained, a means will be found for checking this value, and it will be found necessary to modify it somewhat.

Since

$$X\,D^m = R,$$

by substituting the values of m and R just obtained, we find

$$X = .008344.$$

For V = O we have, therefore,

$$P = .008344\ N^{3.07561}\ D^{5.19455}$$

Now by plotting the given data it is found that a parabola can be made to conform closely to the power curve. The general relation expressing the power in terms of speed and diameter may accordingly be assumed to have the form

$$\frac{P}{N^{3.07561}\ D^{5.19455}} = .008344 + Y\left(\frac{V}{ND}\right) + Z\left(\frac{V}{ND}\right)^2,$$

where Y and Z are undetermined coefficients.

To find the most probable values of Y and Z, substitute the functional values calculated from the experimental data as tabulated in columns 4 and 5 of the table in the above expression, thus obtaining the following set of 21 observation equations:

$$\begin{aligned}
0 &= +.0004413 + Y\,(.577) + Z\,(.577)^2\\
0 &= -.0001144 + Y\,(.384) + Z\,(.384)^2\\
0 &= -.0001273 + Y\,(.298) + Z\,(.298)^2\\
0 &= -.0003626 + Y\,(.262) + Z\,(.262)^2\\
\\
0 &= +.0033484 + Y\,(.885) + Z\,(.885)^2\\
0 &= +.0005552 + Y\,(.571) + Z\,(.571)^2\\
0 &= +.0000312 + Y\,(.443) + Z\,(.443)^2\\
0 &= -.0002244 + Y\,(.362) + Z\,(.362)^2\\
\\
0 &= +.0015420 + Y\,(.719) + Z\,(.719)^2\\
0 &= +.0002905 + Y\,(.546) + Z\,(.546)^2\\
0 &= -.0001207 + Y\,(.442) + Z\,(.442)^2\\
\\
0 &= +.0034099 + Y\,(.886) + Z\,(.886)^2\\
0 &= +.0011406 + Y\,(.668) + Z\,(.668)^2\\
0 &= +.0003146 + Y\,(.539) + Z\,(.539)^2\\
\\
0 &= +.0022499 + Y\,(.794) + Z\,(.794)^2\\
0 &= +.0005357 + Y\,(.637) + Z\,(.637)^2\\
\\
0 &= +.0035321 + Y\,(.913) + Z\,(.913)^2\\
0 &= +.0014893 + Y\,(.727) + Z\,(.727)^2\\
\\
0 &= +.000108 + Y\,(.2) + Z\,(.2)^2\\
0 &= +.0006268 + Y\,(.4) + Z\,(.4)^2\\
0 &= +.0013077 + Y\,(.6) + Z\,(.6)^2
\end{aligned}$$

From these observation equations form the normal equations for Y and Z in the usual way, according to the method explained above. The resulting normal equations are then as follows:

$$\begin{aligned}
0 &= .0159494590 + 7.564893\ Y + 5.2702055\ Z\\
0 &= .012951103 + 5.2702055\ Y + 3.9077221\ Z
\end{aligned}$$

Solving these simultaneously, the results are

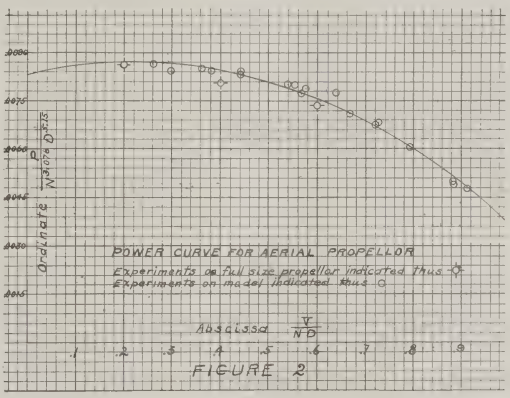
$$\begin{aligned}
Y &= .003319\\
Z &= -.00779045
\end{aligned}$$

and consequently the general relation becomes

$$\frac{P}{N^{3.07561}\ D^{5.19455}} = .008344 + .003319\left(\frac{V}{ND}\right) - .00779\left(\frac{V}{ND}\right)^2$$

Plotting this curve and the experimental data to the same scale, the result is as shown in Figure 1.

Evidently this graph conforms closely to the experiments made on the model, but not so closely to those made on the full size propeller. The reason is that the constant m is based on a single experiment, and an error in the readings for this one experiment will, of course, produce a corresponding error in m. To correct for this error, it is evident that the plotted data for the full-size propeller can be made to approach the graph by decreasing m. As a change in m will produce a change in all the other constants, we will for simplicity take the exponent of N as 3.076, assume a value for m slightly less than 5.19, and repeat the entire process of finding



X, Y and Z. By several repetitions of this process, it is thus found that the most suitable value for m is 5.15, and that the corresponding values of X, Y and Z are

$$\begin{aligned}
X &= .008307\\
Y &= .003647\\
Z &= -.008181
\end{aligned}$$

The modified equation of the power curve in metric units then becomes

$$\frac{P}{N^{3.076}\ D^{5.15}} = .008307 + .003647\left(\frac{V}{ND}\right) - .008181\left(\frac{V}{ND}\right)^2$$

which may be written approximately

$$P = \frac{N^{3.076}\ D^{5.15}}{120}\left[1 + .44\left(\frac{V}{ND}\right) - \left(\frac{V}{ND}\right)^2\right].$$

Plotting this curve and the experimental data to the same scale, the result is now as shown in Figure 2.

Converting this formula into English units, the result is

$$P = \frac{N^{3.076}\ D^{5.15}}{7560}\left[1 + .44\left(\frac{V}{ND}\right) - \left(\frac{V}{ND}\right)^2\right],$$

where P = power in ft. lbs./sec.,
D = propeller diameter in ft.,
V = linear speed in ft./sec.,
N = propeller speed in r.p.m.

The results presented in this article show a considerable deviation from the theoretical assumption that the power varies as $N^3\ D^5$, as well as from the assumption that the thrust varies as $N^2\ D^4$. Furthermore, it is apparent that it is a comparatively simple matter to determine the actual law governing any set of experiments without recourse to any assumptions whatever.

AERIAL PHOTOGRAPHS FROM THE



Aerial photography has been one of the most wonderful developments of the war. Without it the artillery would be sadly restricted in the observation of their fire, the infantry would be at the mercy of concealed machine guns and the general staff would be at a loss of knowledge of the enemy's movements. An aerial photograph reports things which a human eye would

An aerial photograph of Camp Mills, L. I.



Photograph of Vienna, taken by one of the aviators at a height of 750 meters, showing the manifestos scattering over the city. On the left there is shown Am Hof Place, with the new building of the War Department; in the center is the Graben, popular boulevard and promenade; in the corner, on the right, is the St. Etienne Cathedral. (Italian official photo.)

FOUR CORNERS OF THE EARTH



verlook, sees hrough camou- lage and because t is mechanical, it loes away with the ersonal equation, which so often is iable to color re- orts.

The study and eading of aerial photographs is omething which as been brought o a high stage of erfection. To the uninitiated what eems to be a mere umble becomes to he trained reader f photos a regu- ar mine of military nformation.



SPENCER HEATH, PIONEER IN PROPELLER MANUFACTURE

THE business of the American Propeller & Mfg. Co. was organized in the year 1910 in Washington, D. C., by Spencer Heath, who, as president of the company, is still at the head of its activities.

Mr. Heath at that time was a trained and experienced mechanical engineer who had added the profession of law and was then practicing before the United States Patent Office and in the District and Federal Courts. Before taking up law and patent work Mr. Heath had been employed in various engineering capacities by well known Middle West manufacturing companies, including the Elgin National Watch Company, the Crane Company, Western Electric Company, and others. In 1902 he took a position in the Navy Department at Washington. His duties here included the preparation of plans and specifications for almost every kind and variety of engineering work, both under water and on shore, in connection with naval coal depots in all parts of the world. After some four years of the Navy work, Mr. Heath resigned that position to take up the practice of law, for which he had in the meantime prepared, his previous engineering connections leading him mainly into patent practice. Among his clients in this connection was Mr. Christopher J. Lake, Vice President of the Lake Torpedo Boat Company, who retained him regularly for several years in his patent work.

In 1909 Mr. Heath became interested, in a purely scientific way, in the designing of Aeronautical Screw Propellers. Some interesting developments in this led to applications for patents and to the establishment of a very small shop for amateur construction. No money was ever invested in this shop. The first propellers made were turned into cash so promptly that these returns were used to meet bills, etc., for the preliminary expenses. The demand continued until at the end of 1911 the little shop without machinery of any kind showed a surplus of $4,000.00. During 1910 the propeller work was directed only in spare time from the law and patent work and in 1911 Mr. Heath took position as General Manager and Consulting Engineer of the Gyro Motor Company in Washington, which company was owned principally by Mr. Emile Berliner of that city. Mr. Heath gave to the Gyro Motor Company only four hours per day, taking supervision also of Mr. Berliner's patent work generally during that year and until removal to Baltimore in May of the next year. Parallel with these activities the propeller work continued to grow until it became necessary at the end of 1911 to seek a new location for the manufacturing work.

In May of 1912 Mr. Heath transferred his entire propeller activities to the City of Baltimore, where a small shop was equipped with machinery, etc., in a portion of the premises now included in the company's oldest plant, known as Plant No. 1, at the East Hamburg Street location. During the next four or five years the propeller work carried on in Baltimore was largely experimental and developmental. During this time Mr. Heath's work was under the constant patronage and approval of the Aeronautical Branch of the Navy Department and was also supported almost continuously by the corresponding branch of the War Department, both of which were then comparatively small. This official patronage, together with a considerable trade from the exhibition aviators in the early part of the period, and from experimental engineers in all parts of the country, made it possible to continue this development work without interruption at any time. During the latter part of the period there was also a degree of recognition from abroad, leading to various comparatively small orders for propellers from widely scattered parts of the world.

During the pre-war period Mr. Heath's work in propellers was characterized by two leading



principles: first, the unceasing improvement and development of the propellers themselves as regards design, materials and method of manufacture, and, second, an absolute adherence to the principle of service—engineering and advisory service before receiving orders and the highest technical service and promptness in their execution—and the most thoroughgoing follow-up service to insure that no customer should have any possible cause for complaint. Among the valuable developments made by Mr. Heath may be included the original adoption of the so-called constant angle of attack method or independent aerofoil analysis of propeller sections in 1909, important modifications of the constant angle theory, equally early development and perfection of accurately matched and balanced half-laminations for opposing blades in order to preserve running balance and equal deflection under load, the development and practical use in 1912 on the Navy machines of the method of propeller construction in which the blades are formed of a plurality of thin laminations pressed together and twisted into their proper pitch, and the development of a practical and highly efficient type of variable pitch propeller known as the torsion pitch design, of which upwards of ten thousand have been put into successful use within the past few years. In addition to the customary two-bladed and four-bladed propellers, Mr. Heath was the pioneer in his advocacy and development of the three-bladed type, which prior to the war had found great favor with the flying men of both the Army and Navy, being used for the most part in their expert flying, while the two-bladed propellers were used for their instruction work. In addition to the valuable improvements in propeller design and construction above enumerated, Mr. Heath has devoted himself to the designing and building of special manufacturing machinery, all of which has been built for the exclusive use of his own company. This included propeller-shaping machines in which the form of the blade is automatically developed from a master blade or follower pattern; propeller hub facing and boring machines, in which the hubs are sized and machined parallel on both faces and the center hole bored at a single operation; and outlining machines in which the edge contours of the hubs and blades are precisely formed exactly 180 degrees apart for the two-bladed propellers and 120 degrees apart for the three-bladed.

There was also developed a special machine for forming the peculiar hub jointing to which the three-bladed propeller owes its extraordinary hub strength above any other style.

A further line of investigation and development carried on by Mr. Heath relates to the instruments and facilities for designing, for checking of angles, etc. in process of manufacture and other inspection purposes. These consist mainly in a system of standardized instruments conforming to a rational system of designing, checking and inspection which greatly simplifies the work and eliminates the rude method of checking by surface tables, protractors, etc. which were used before this system and these specialized instruments were developed. With the coming of the war, and particularly with the entrance of this country, Mr. Heath's activities have been primarily along the line of developing high speed and quantity production. In carrying this out he has found it necessary repeatedly to enlarge and expand his company's works, the latest addition being factory No. 4, containing 158,000 square feet of floor space, with the latest improved lumber-drying facilities, independent power plants and electrical generating set.

In all matters pertaining to aeronautics in general and propellers in particular, Mr. Heath is an uncomprising optimist. He regards the aeroplane industry as potentially one of the future large industries of the world, and one that will be so recognized within the next very few years. He looks upon the war as only a passing incident in the development of aeronautics and believes that the lasting and substantial features of the business will begin to arise only after the cessation of the war, and the expansion of the airplane to its proper sphere as an industrial and commercial instrument. He looks with equanimity upon the prospective changes after the war and with entire confidence in the future of aeronautics in the era of peace

(*Continued from page* 516)

the Curtiss company in the Hughes' report is connected with the name of Lieutenant Colonel George W. Mixter. Attorney General Gregory in his summary of the Hughes' report says that Lieutenant Colonel Mixter owned only 25 shares of stock with a par value of $2,500 (market value $28 a share) and that the officer testified that he had sold his common stock but did not remember whether he had disposed of the preferred stock in this very small holding. The charge against Lieutenant Colonel Mixter is not a charge against the Curtiss company.

"It must be remembered that the aircraft industry is new. England began the war with less than 200 serviceable aeroplane. A production method, plants themselves, a shop routine, an engineering technique, had to be created, as it were, overnight. It was a tremendous task. In eighteen months the infant aeroplane industry in the United States reached, under all the handicaps revealed by the Hughes' report, a development which the great automobile industry did not attain for seventeen years.

"With no attempt to criticize any other plant in the industry, the Curtiss management feels gratified that the Hughes' report in its measure clears it and its workers of many false charges and loose incriminatory statements so frequently circulated before the Hughes' inquiry began. These stories are shown to be coins of no value. Under reorganized aircraft production system, the Curtiss family has its sleeves rolled up to reach the largest production from any plant in the world. And that will be a Buffalo achievement."

Honor British Flier Who Has Bagged 51 Huns

London.—Announcement that Major Raymond Collishaw, now attached to the naval air service, had just been awarded the bar to the Distinguished Service Order brings out the statement that this brilliant flier has destroyed fifty-one enemy machines.

British Award D. S. O. to American Flier

Washington.—General Pershing informed the War Department on September 23 that Lieut. A. F. Bonnalie of 2,521 Mission Street, San Francisco, an American attached to the Royal Air Force, had received the British Distinguished Service Order for heroism in an air fight August 13, in which he saved another machine from destruction, and later, by great ingenuity, brought his own riddled plane safely within the British lines.

"This officer," said General Pershing's report, "led two other machines on a long photographic reconnoissance. In spite of the presence of numerous enemy aircraft, they were able to take all photographs required, but were attacked by six Fokker biplanes.

"During the combat Lieut. Bonnalie saw that one of his accompanying machines was in difficulty and that an enemy aeroplane was nearly on its tail. He at once broke off combat with the enemy with whom he was engaged and dived to the assistance of the machine in trouble. He drove off the enemy plane, regardless of the bullets which were ripping up his own machine.

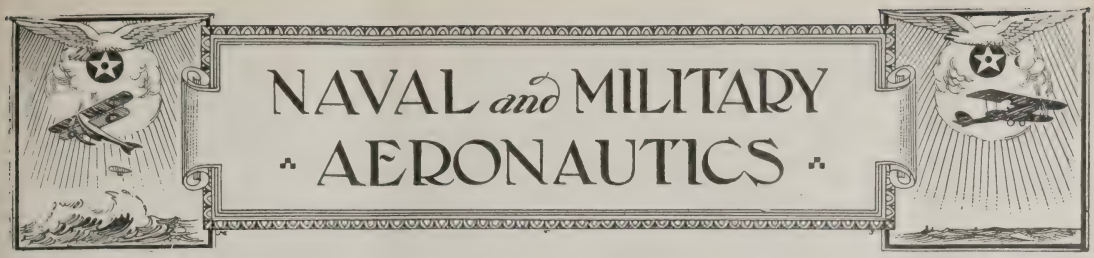
"Eventually, however, his tail planes and his elevator wires were shot away and his machine began to fall in side slips. Lieut. Bonnalie managed to keep his machine facing toward the British lines by means of the rudder control, while his observers and third machine drove off the enemy aircraft which was still attacking.

"In its damaged condition Lieut. Bonnalie's machine was tail-heavy, and he therefore had his observer leave his cockpit and lie out along the cowl in front of the pilot. In this manner he recrossed the British trenches at a low altitude and righted his machine sufficiently to avoid a fatal crash.

"Had it not been for the gallantry of Lieut. Bonnalie, the injured machine to whose assistance he went would have fallen into enemy territory, as its pilot had been wounded and its observer killed. Lieut. Bonnalie's own machine was riddled with bullets, and it was a marvelous performance to bring it safely to the ground."

Godman Field Named

According to an announcement made by Major General Wm. L. Kenly the Aviation Field at the Artillery Brigade Firing Center, located at Camp Knox, Stithton, Kentucky, has been named Godman Field. The field is named in honor of First Lieutenant Louis K. Godman, an Army Corps pilot of the Air Service, who was killed in an aeroplane accident at Camp Jackson, Columbia, South Carolina, September 28, 1918.



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
IMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va
MAC—Report to March Field, Allesandro, Cal
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival
WFO—Report to Wilbur Wright Field, Fairfield, Ohio

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to Aviation Repair depot, Indianapolis, Ind. Speedway.

Note 3—Report to District accounts office, Detroit, Mich.

Note 4—Report to Camp Knox, West Point, Ky.

Note 5—Report to Jacksonville, Fla., Wire DAP.

Note 6—Report to Aviation Gen. Supply depot, Little Rock, Ark.

Note 7—Report to Atlanta, Ga., Wire Chief of Staff.

Note 8—Report to Spruce Production Div., Portland, Ore.

Note 9—Report to Army Balloon school, Arcadia, Cal.

Note 10—Report to School for Radio Mechanics, Pittsburgh, Pa.

Note 11—Report to Dis. Mgr., Aircraft Production, Detroit, Mich. Wire DAP.

Note 12—Report to Newport News, Va., for duty at Camp Hill.

Special Orders Nos. 245—248, Inc.

A

Ahearn, Clarence J.....LHV
Anderson, Albert Edward.....FLA
Armstrong, John Fisher.....FLA
Andrews, Frank M.....JMA
Abbott, Roy W.....ELA
Akins, Charles.....SLA; LHV
Alexander, John A.....EOT
Agnew, Hobart M.....BST
Anderson, Harold.....LHV
Adams, Josiah K.....DMA
Alvey, Paul.....AGC
Amiot, Arthur L.....MAT
Apple, Addison A.....PWM
Ashley, Thomas W.....PWM
Alcorn, Kent A.....PWM
Ashe, Clarence F.....PWM

B

Brown, Harry Dugan.....FLA
Brown, Lincoln G.....CJW
Brown, Frank Kinney.....SLA; CRI
Brown, Raymond Rudolph.....SLA; PMT
Bird, Emerson P.....CJS
Behr, Kenneth P.....CJS
Brannon, Fred Raleigh.....SLA; EOT
Benham, Reid F.....FLA
Brooks, Martin Van Buren.....FLA
Brooks, Frederick Augustus.....FLA; DAP
Brooks, Thomas.....SLA; BFT
Bacon, Paul Oglesby.....SLA; ELA
Batty, Charles Albert.....SLA; TMA
Blind, Charles A.....KST
Browne, Rolla.....PFO
Brecka, Frank V.....SLA
Bishop, Dickinson.....FLA; DMA
Black, Joseph L.....WFO
Burton, James, Jr.....UIU
Beall, Henry I.....CGC
Barbee, Wyatt.....CGC
Barker, Donald V.....AGC
Borre, Peter C.....AGC
Burtt, Harold Ernest.....CPA; PUP
Binford, Morton C.....SLA; CAF
Bach, Hollis S.....CJW
Breece, George Elmer.....LTC
Bridges, Kenneth L.....MAT
Burger, Fairfax C.....AGC
Brewster, Morell K.....AGC
Busch, Harry Nicholus.....SLA; KST
Birdsall, Raymond P.....BST
Batz, John B.....RSD
Brammer, George A.....AGC
Barber, Frank H.....BST
Brandt, Gustavus Schuck.....SLA; CWT
Bailey, James R.....LDT
Booth, Alfred B.....AGC
Boutwell, Leroy A.....GLC
Berg, Arvid Henry.....SLA; AAD
Buckley, James W.....LHV
Buster, Melvin W.....LHV
Brady, Frank L.....LHV
Booker, Francis Pat.....SLA; EOT
Buckingham, Ralph Edgar.....SLA; BFT
Becker, William Randle.....CPA
Blair, Frank W.....RSD
Barb, Martin Bruce.....SLA; CRI
Balderston, Jason A.....AGC
Bible, Frederick R.....PFO
Bixby, R. V.....RSD
Bolsinger, Ray C.....AAD
Boyer, George Powell.....SLA; CRI
Beckett, Ralph E.....CGC
Barber, Clifford L.....GLC
Bishop, Joseph A.....Note 2
Benta, George H.....PWM
Bennett, Thomas E.....PWM
Blair, James J.....PWM
Brock, Harry.....PWM
Bushman, Francis L.....PWM



Major Cushman A. Rice, the well known U. S. Army Air Service officer, who took a large aero unit to England and then to France and participated in the second Marne battle, and was wounded and gassed. The entire unit which Major Rice commanded was cited and distinguished itself in many ways. Major Rice has returned to the United States and although the doctors have given some discouraging reports, it is expected that, thanks to his remarkable constitution, he will fully recuperate. On the left hand side is First Lieutenant Don Hickey

C

Courser, Harry Samuel.....SLA; RWT
Clark, Richard Hills .....SLA; ELA
Carson, Louis Frederick.....SLA; PMT
Munro, Dana G. .....LDT
Chrystic, Edward Prunett.....FLA
Clark, Clifton Wirt.....FLA
Clarkson, Robert Cooke.....FLA
Culp, Alexander Banks.....FLA
Cunningham, William Newton.....FLA
Cameron, Cheever J. .....CAF
Cody, Joseph L. .....CAF
Connell, Otto L. .....CAF
Craig, Robert Madison.....SLA; PMT
Clark, John Martin .....CPA
Cornish, Myron .....SLA; MAC
Chennault, Claire L. .....KST
Cowden, John C. .....MIA
Cordner, Frank N. .....ASM
Carr, Richard Anthony.....LSA; TMA
Clark, Ward R. .....KST
Coulter, Harry Blair.....FLA; DAP
Cox, Artie G. .....PFO
Cutts, George B. .....GLC
Caldwell, Wilbur Chamberlin.....SLA; ABC
Connell, John D. .....LDT
Cullity, Emmet R. .....RSD
Cameron, Mortimer Browne.....SLA; PMT
Calvin, Patrick J. .....MAT
Carlson, Elmer H. .....EOT
Casey, Jack F. .....RSD
Craig, Laureston .....PFO
Clark, Ray H. .....CGC
Carmichael, Frank Linton.....SLA; CFT
Collins, Thomas L. .....TFT
Caldwell, Wilbur C. .....AAD
Callander, Marshall E. .....RSD
Cutting, Aaron B. .....PMT
Campbell, John R. .....GLC
Clark, George Arthur .....LHV
Colliver, Harry F. .....MAC
Canute, Olin J. .....Note 2

D

Davis, John Evan .....FLA
Dean, William Edward .....FLA
DeShields, Charles Burton.....FLA
Downs, Frederick William.....FLA
Dunn, John K. .....RSD
Dupuy, Albert Joseph .....SLA; PMT
Doyle, Patrick J. .....CGC
Douglas, Walter C. .....CGC
Davidson, Lawrence Emmett.....SLA; KST
Driscoll, Egbert C. .....BST
Davis, George H. .....PUP
Dickman, Frederick T. .....IMA
Dean, William Johnson .....LHV



An American Pursuit Aero Squadron in France, with some of the crack American pilots. (Official photo)



A flight of Sopwith "Camels" over a British aerodrome

Dorr, William Gray ..... SLA; ASM
Donahey, John Wellington ..... SLA; BFT
Diamond, William M. ..... AGC
Dean, Alexander ..... FOB
Dumas, Victor M. ..... DMA
Doyle, Benton A. ..... FLA
DuPuy, Fred Kinsey ..... SLA; MAC
Du Fief, John Louis ..... SLA; LHV
Doane, Glendon Bradley ..... SLA; CFT
Disque, Robert Conrad ..... DMA
Deyo, William Barclay ..... CPA; DAP
Dake, Robert E. ..... GLC
Day, Harold Milton ..... SLA; TMA
Donaldson, Harold R. ..... LDT
Doane, John H. ..... LDT
Downs, Wilbur Horatio ..... FLA

E

Ellis, Oliver E. ..... LHV
Edwards, Lewis E. ..... LHV
Engbretson, Francis E. ..... LHV
Ewing, William M. ..... KST
Elsmore, Raymond Thomas ..... SLA; MAC
Erickson, Arthur Xavier ..... SLA; CRI
Elbert, Robert G. ..... DMA
Ells, Myron Boal ..... SLA; PMT
Eckstrom, Lawrence J. ..... CGC
Evans, George P. ..... PFO
Evans, John M. ..... RSD
Ettenger, Edwin L. ..... AAD
Egan, John Franklin ..... SLA; SAG
Early, John McDonough ..... BFT

F

Ford, Charles E. ..... SBI
Foster, James Haflin ..... SLA; CFT
Finney, Olin ..... DAP
Farmer, Leroy, Jr. ..... KST
Freeman, Edward Woolsley ..... CPA
Fensch, Francis E. ..... FLA
Field, James M., Jr. ..... KST
Faulkner, Charles J. ..... PMT
Fogg, Robert S. ..... LDT
Farrell, Roy C. ..... PFO

G

Gallagher, Charles William ..... SLA; AAD
Gibson, Glen T. ..... CGC
Gillett, Melville ..... DMA
Gallup, Burton A. ..... GLC
Grammer, Elijah Sherman ..... MJA; VBW
Guthrie, Sidney Charles ..... SLA; Note 3
Gibson, Robert Clayton ..... SLA; AAD
Gelhaus, Frederick Joseph ..... FLA; DAP
Greist, Raymond Lewis ..... SLA; PMT
Garbutt, John Donald ..... SLA; CAF
Goodman, Richard ..... FRF
Gray, Philander Raymond ..... CPA; DMA
Grady, William Albert ..... SLA; BFT
Glazier, Joseph ..... PFO
Gilman, Arthur Raymond ..... FLA
Goetz, Norman S. ..... FLA
Gregory, Omar B. ..... AGC
Goodrich, Augustus ..... SLA; CFT
Greene, Charles C. ..... CJS
Greene, Frederick W. ..... CGC
Goodwin, Harold C. ..... LHV
Gregory, Joseph Van Clief ..... LDT
Gillett, John S. ..... LDT
Goss, Edgar K. ..... MAT
Greer, John E. ..... AGC
Glidden, Charles J. ..... Note 7
Greene, Stephen H. ..... Note 10

H

Hess, Edwin ..... CGC
Hall, Gus Witherspoon ..... SLA; MAC
Howe, Charles W. ..... BST
Halsted, James Ellinwood ..... FLA
Hunt, John L. ..... AGC
Hall, Loring H. ..... CJW
Harris, William L. ..... GLC
Hall, Caleb Edgar ..... SLA; MAT
Hartman, Harry Bahl ..... CPA
Heinzelmann, Gerald Matthias ..... SLA; SAG
Heine, Henry W. ..... EOT
Hart, Charles W. ..... AGC
Heard, Charles R. ..... AGC
Hosking, Oakley W. ..... AGC
Hileman, David J. ..... PFO
Heaney, John W. ..... CPA
Hunting, Carol S. ..... LDT
Hellman, Isaac Harry ..... SLA; KST
Harper, Floyd K. ..... LHV
Harris, Frank Drake ..... SLA; CRI
Hoffman, Albert L. ..... CPA
Hall, Warren Edward ..... SLA; ELA
Hook, Joseph Stanley ..... SLA; WFO
Haasl, Charles Melvin ..... SLA; BFT
Hall, Norman S. ..... LHV
Hitchcock, Reuben ..... LTC
Higgins, Frank William ..... SLA; SMM
Hausman, William Attlesey ..... SLA; KST
Hamer, Robert S. ..... TFT
Hoffman, Henry A. ..... GLC
Horton, Claude Edward ..... SLA; GLC
Haynes, John C. ..... PFO
Haug, Edward ..... SLA; BFT
Hall, Frank A. ..... DMA
Heebner, Miller B. ..... LHV
Harkins, William H. ..... AGC
Hyde, Gordon E. ..... CJS
Harris, Robert W. ..... CAF
Hall, Theodore E. ..... LDT
Hahnel, William J. ..... MAC

I

Innis, Cecil Robert ..... SLA; BFT
Ison, Nathaniel B. ..... CAF
Ingerham, De Forest Wilber ..... SLA; TMA
Ihrig, Howard K. ..... TFT

J

Johnson, Ross S. ..... CJW
Johnson, Emery B. ..... DJK
Johnson, Arthur Conrad ..... SLA; CRI
Jones, Clifford C. ..... LDT
Jones, James E. ..... LHV
Jones, Charles E., Jr. ..... LHV
Jones, Martin Tilford ..... EOT
Jones, Roy L. ..... TFT
Jaynes, John B. ..... TFT
Josey, Clinton W. ..... KST
Jensen, Ove Frederick ..... SLA; CRI
Just, George A. ..... DMA
Jacobs, William Frederick ..... FLA

K

Kulp, Herbert ..... SLA; BFT
Kelly, John O. ..... CGC
Klootwyk, Jelles ..... SLA; PFO
Keefe, Robert Anthony ..... SLA; PMT
Kamper, Ralph T. ..... LHV
Keller, Reuben W. ..... LDT
Kirkpatrick, Everett L. ..... TFT
Keegan, Leslie Arthur ..... SLA; SAG
Keller, Jacob Ferdinand ..... SLA; PMT
Kelsey, James B. ..... CGC

L

Lane, Charles A. ..... PFO
Lusk, Walter Coles ..... SLA; PMT
Ledbetter, Fred Fay ..... SLA; TMA
Lyon, Howard S. ..... PFO
Lord, Albert C. ..... TMA
Long, Wilfred J. ..... LDT
Leib, William F. ..... MAT
Lindsey, Harold ..... AGC
Lawton, William Wallace ..... MAC
Likins, Charles C. ..... KST
Lyman, Francis J. ..... PFO
Lawler, William E. ..... Note 5

M

Miller, Rudolph N. ..... LHV
Manning, John P. ..... LHV
Munn, John C., Jr. ..... AGC
Mahoney, Lawrence E. ..... AGC
Martin, Charles J. ..... AGC
Martin, Harry J. ..... AGC
Monypenny, William W ..... AGC
Mallory, Louis C. ..... CJS
Miller, Ralph Kerst ..... SLA; RWT
Morgan, William A., Jr. ..... FLA; DMA
Morson, George Edward ..... BFT
Moraga, Eugene W. ..... PMT
Moore, Charles Ransome ..... SLA; RWT
Mooradian, Harry Samuel ..... SLA; BFT
Merriam, Robert C. ..... CGC
Miller, Ralph K. ..... BST
Murphy, Edward J. ..... Note 4
Maxwell, Robert Leland ..... SLA; CFT
Moreland, Andrew ..... SLA; CRI
Murray, Lowell Thomas ..... CPA; VBW
Milburn, Arthur McKenzie ..... PFO
Meng, Paul H. ..... LDT
Miller, Bennie A. ..... AGC
Meyer, Charles L. ..... AGC
Mayott, Charles ..... BST
Macready, John Arthur ..... CPA
Murphy, James M. ..... CGC
Moose, William L., Jr. ..... JMA
Martin, John H. ..... AGC
Matthews, Chauncey Waldo ..... SLA; CFT
Mulvihill, Bernard H. ..... CGC
Mathews, John J. ..... LHV
Moon, Charles Morris ..... FLA
Moen, George M. ..... PMT
Miller, Arthur G. ..... CJW
Maxwell, Allen G. ..... Note 10
Merrill, Andrew J. ..... Note 6

(*Continued on page* 536)

FOREIGN NEWS

BRITISH

In the war in the air last week sixteen enemy machines were destroyed and five driven down out of control. Nineteen British aeroplanes were reported missing. The low toll of machines destroyed was due in part to the prevalence of fog and rain in northern France and Flanders, and in part to the inactivity of the enemy. In addition to other valuable aid to the advancing troops the British airmen dropped heavy cargoes of bombs upon the enemy barge traffic between Bruges and Ghent, and hostile aircraft lined up in the German aerodromes at St. Denis Westrem.

At Somergem a train full of German troops was set on fire, while the horse and motor traffic on the congested roads converging on Ghent was continuously harassed. In the course of a recent raid on the railway junction at Aulnoy, an ammunition train was hit and set on fire. Prisoners add that the whole train blew up in close proximity to a troop train which had just entered the station. The junction was wrecked and 900 casualties are said to have been caused.

At Valenciennes two ammunition trains were hit by British airmen. They burned and exploded furiously for two hours, and all work in that area had to be suspended owing to the shells exploding in different directions. Other prisoners report that in the raid made by a British squadron upon a German aerodrome on the Valenciennes-Frameries road more than thirty aeroplanes were destroyed. One result of a reconnaissance carried out by the royal air force during the week was the indication of a number of new enemy aerodromes, the bulk of them being in the area between Mons and Maubeuge.

Despite the prevalence of thick mists in the south, the Independent Air Force, in the course of the week, made sixteen raids into German territory.

The official statement on the operations of the Independent Air Force, issued October 30th, says: "Tuesday night we attacked the aeroplane works at Mannheim, the furnaces at Burbach, the railways at Thionville and Offenburg, and the aerodrome at Hagenau."

For four months London has enjoyed immunity from hostile air raids and moonlight nights are no longer dreaded by its inhabitants. For many weeks German airmen have had far more urgent business to attend to on the other side of the channel. Much of this is due to the persistent raiding of Rhine towns and the bombing of German aerodromes. These attacks compel the enemy to muster for defense machines which they can very ill spare from the battlefields where allied supremacy in the air becomes increasingly manifest.

The frequent raids on German towns have been fully recorded, but the growing frequency of attacks on German aerodromes have received much less attention. From information obtained from the War Ministry it is learned that in the month of August alone there were thirty-three attacks on German aerodromes, nineteen of which were directed against two of them which had become particularly obnoxious as hives of aerial wasps.

In one daylight raid on an aerodrome a fierce combat lasted over forty minutes as a result of which four German machines were destroyed and three others driven down "out of control." Two British machines were lost. Many of the night raids have been very effective.

The result of these attacks is to cripple the German's aggressive work and their power of retaliation and demoralize their personnel. Their recuperative powers are now at a low ebb.

Fourteen enemy aeroplanes and three enemy balloons were brought down by American aviators with the British forces in the period from August 25th to September 8th, according to a summary of British Royal Air Force communiques.

The Distinguished Service Order was given to First Lieut. A. F. Sonnalie, and special mention was made of the following combat in which American aviators participated:

"First Lieut. H. R. Clay brought down an enemy aeroplane which was attacking an S. E. 5, and then attacked another which was fighting one of his own patrol and brought it down. He was then set on by three enemy aeroplanes and after fighting for three minutes First Lieut. C. Bissell, of the same squadron, came to his assistance and shot down two of the hostile machines and drove another down out of control."

Other Americans mentioned as bringing down enemy aeroplanes were: First Lieutenants, A. S. S. S.—F. A. Dixon, 5538 Forbes Street, Pittsburgh, Pa.; T. D. Moore, 617 Chestnut Street, Kewanee, Ill.; E. W. Springs, Lancaster, Pa.; E. H. Barksdale, Goshen Springs, Miss.; F. E. Kindley, Gravotts, Ark.; C. I. McLean, 776 Madison Avenue, New York City, N. Y.; W. B. Knox, No. 1 West Brown Hall, Princeton University, Princeton, N. J.; F. E. Luff, 3046 Lincoln Boulevard, Cleveland Heights, Ohio; H. L. Blair, 111 West One hundred and eleventh Street, New York City, N. Y.; J. O. Crooch, 6614 Harlan Place, Takoma Park, D. C.

Enemy balloons were brought down by Second Lieutenants I. P. Corse, 2301 First Avenue South, Minneapolis, Minn.; F. E. Luff, 3046 Lincoln Boulevard, Cleveland Heights, Ohio.

In the recent sensational British victories in Palestine British airmen played a great part, and from some of those heroes who faced perils above the deserts beyond the Jordan and in other wild and savage regions, have been obtained particulars that read like wild romances of a kind of fighting far removed from anything which our boys who patrol the skies above the western front have had to face.

One of the men who lately flew under General Allenby across the Egyptian deserts served an apprenticeship in East Africa, where, when compelled to come down by engine trouble, he was promptly attacked by a herd of wild elephants, who resented the arrival of this great new bird in the regions over which they held domain. The pilot slipped away and hid, while the elephants ripped up the machine with their trunks until a comrade aeroplane charged down from the sky, put the tusked monsters to flight and rescued the shivering birdman.

On many occasions aviators in Africa have had to use their machine-guns and automatic pistols against wild beasts, while it is known that some have perished, killed either by denizens of the jungle or hostile tribesmen, or dying of thirst in arid wastes, where their sole chance of life lay in finding a water-hole.

Not long ago an aeroplane set out on a desert reconnaissance for General Allenby's army and failed to return. A rescuing aeroplane went and found evidence of a tragedy. A forced landing had occurred 100 miles within hostile territory, followed by an attack from a band of wandering Bedouins, whom the pilot of the second aeroplane saw on the horizon scurring away as he swooped down.

He hastily descended and ran to the wrecked machine. All the woodwork and wing fabric had been hacked to pieces. An effort had even been made to destroy the engine, but the machine gun had not been carried off, possibly because it had jammed and was therefore regarded as useless. A half-expended drum of cartridges was still in position, and the many cases lying about showed that the pilot and observer had put up a good fight.

Footprints led away from the wreckage. The heavy stumbling footprints of wounded men closely pressed could be distinguished from the more extended lighter footprints of their pursuers. The tracks ended at the base of one of those huge gray boulders with with the desert is studded. Here the pursued had turned at bay.

It will never be known what that last stand cost the savage victors, for the Bedouins always carry off their dead and wounded. But empty automatic clips, and the empty magazine of each revolver, told that these two English boys had exacted a heavy price for their lives. Their bodies lay at the base of the rock, hacked to pieces by the infuriated victors.

German and Turkish emissaries, since the beginning of the war, have incited the wild inhabitants of the desert into attacking disabled machines, which the wild Arabs regard as inventions of the devil driven by demons. The fate of the airman who falls into the hands of wandering tribesmen who have come under Turkish or German influence is a horrible one.

Most sensational results have been achieved by Allenby's flyers, and their work contributed greatly to the crushing victory of September between the Jordan and the sea, but in Mesopotamia and East Africa as well much good work has been done by lads from the green fields of England, who have voluntarily gone forth to face discomforts of which France and Belgium know nothing—heat, sand, mosquitoes, horrible scorpions, wild beasts and wilder men, with the prospect of death by thirst or torture, if mishap occurs. But the work goes on. There are several hundred British aviators ceaselessly patrolling the great wastes of territory in which the minor campaigns of the war are waged.

Early on the morning of October 17th a British airman, flying low over Ostend, perceived civilians wildly signalling him to descend. As he circled in doubt the signals were repeated, and, as there was no sign of Germans anywhere, the pilot made a daring landing in the main street of the city, to be greeted with the information that the enemy had decamped in the night.

FRENCH

The official communication on aerial operation issued November 5 says:

"During the day of November 4 bombing machines dropped more than thirty-eight tons of projectiles and fired 16,000 cartridges on convoys and troop concentrations in the region of Vendresse and Daucourt; 10,250 kilos of projectiles were dropped on the railway stations at Mezieres, Mohon, Lumes, Triage, Sedan, Poix-Terron and Vendresse."

Our troops continued without cessation their pursuit of the enemy during the day of November 7.

Our aeroplanes, working in liaison with our infantry, attacked, bombed and machine gunned enemy columns in retreat, utilizing 15,500 kilos of bombs and 13,000 cartridges.

ITALIAN

On October 17 our aeroplanes made reconnoitering raids on the Friulan and Venetian plains. An enemy balloon was downed over Oderzo. The weather was still very bad. It was raining in the lower valleys and in the plains, and snowing in the mountain zone.

On October 18, notwithstanding the continuous bad weather, our aeroplanes were partially active on the front. Troops being transported were gunned with effective results.

On October 18 and 19 little aerial activity on account of the very bad weather. On the nineteenth our planes were active on the Piave making reconnoitering raids.

On October 21 very little aerial activity on account of the weather. On October 22 our aeroplanes bombed enemy centers of communication and brought down three enemy machines.

On October 23 our aeroplanes bombed military objectives in the region of Fonzaso and Sacile. The weather was still bad along the whole front.

On October 24 Italian bombing squadrons dropped bombs over the enemy camps in the region of Fonzaso and over the large enemy depots in the neighborhood of the station of Sacile.

On October 25 our airships, bombing and pursuit planes were very active on the Brenta, Cismon, Feltre and Fonzaso regions, helping to carry on our big drive against the Austrians. More than ten tons of explosives have been dropped on military centers. Three enemy machines were brought down.

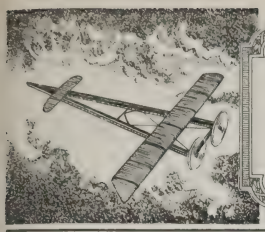
On October 26 squadrons of our aeroplanes operating in following rings, bombed very severely and with splendid results, enemy camps and depots, bombed and destroyed columns of marching troops and dropped altogether more than two tons of bombs on Val Sugana, Val di Cismon, and on the Conca di Arten. Two tons of bombs were dropped during the night by airships over the railway junction. Two enemy machines were brought down by our aviators. In Albania numerous reconnoitering raids were carried on by our aeroplane squadrons.

On October 27, during our big drive across the Piava, the aerial machines participated continuously with extreme daring to the fight. More than fifteen tons of high explosives were dropped on the enemy lines. Enemy troops were gunned from a very low altitude by our machines. Eleven aeroplanes and three balloons were dropped down in the aerial battle. Col. Piccio got his twenty-fourth victory.

In the last week the aviation of the Italian navy made frequent reconnoitering raids along the Albanian coasts and rear stations of the enemy, going farther than Antivari. On October 22 the Italian hydro-aeroplane squadrons bombed the big Lagosta hangar. On the twenty-third, forty-three bombing machines, of which thirteen were Americans, dropped more than three tons of explosives over Pola with very efficient results, destroying many of the big Austrian hangars. Notwithstanding the anti-aircraft, Austrian guns and useless enemy's machines, all our machines came back safely.

Italian Flying Chief Injured on Piave

Milan—Commander Mouzo, chief of staff of the 150th Italian Aerial Division, and one of the best known aviators in Italy's army, was severely wounded in the fighting along the Piave.



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Model Aeroplane Building as a Step to Aeronautic Engineering

THE travel of the center of pressure must be known for all wings sections, and when a designer has a wing under consideration he must know the location of the center of pressure at each different angle of the wing chord when the machine is in flight, and the reasons follow:

We know that an aeroplane is so designed that the center of pressure of the wings must be on a vertical line with the center of gravity of the machine, for the U. S. A. No. 1, at angle of zero this occurs at .530 of the wing chord from the leading edge of the wing, now for a wing with a chord of 48 inches, we locate the C. P. by multiplying 48 by .530 and we get 25.44 inches, which is the distance from the leading edge, to locate the center of pressure. This is for zero angle and the designer would place his wings on the machine so that the leading edge of the wing would be set 25.44 inches ahead of the center of gravity of the machine. But the reader will remember that this is for zero angle only, or for the angle that the designer would set his wings on a fast machine. Now by again referring to the table you will notice that the center of pressure travels forward as the angle increases, and as the pilot must alter the angle of the wings many times in flight, there are times when the C. P. would be in front of the center of gravity, which would be detrimental to the proper working of the machine, as the reader will see that should the C. P. come ahead of the C. G. it would cause the tail of the machine to fall and when climbing the aeroplane would be in danger of stalling. For this reason the designer must figure the C. P. at all angles of the wing and select a point about midway between these two points, for instance, we found the C. P. 25.44 inches from the leading edge at zero angle, and referring to the table we find .274 at 14 degrees figuring it out we get 13.15 inches. This shows a difference 25.44 and 13.15 of 12.29 inches dividing this amount in half we get 6.145 subtracting this from 25.44 we have 19.295 inches, which would be the correct and final location of the C. P.

Resistance of bodies, struts, wires, etc.

Having found out the method of figuring the resistance of wings, we will now turn to the resistance of non-lifting parts as body, struts, wires, wheels, tail, rudder, etc. This resistance is known as parasite resistance and should be figured separate from the wings for checking up, but later we can add the wing and parasite resistance together to figure the performance of the machine.

To figure the resistance of bodies, different methods are employed, some take the maximum cross section of a body and find the resistance of this as if it were a flat plate, then multiplying by a coefficient which is determined by the ratio of the cross section to the length, if the body has a radiator set in the nose of the machine we figure the resistance on the radiator (which is determined from a table given for the resistance of radiators) and the skin friction of the whole surface of the body. Taking it all in all, the only correct method would be to test the model in a wind tunnel, but figures will come close enough for what we wish to know.

For a body where the radiator is set in the nose of the machine, we can figure the resistance on the radiator, then add the skin friction to this and find the total resistance, for instance the coefficient of radiator resistance is .00173, so for a radiator with a frontal area of 4 sq. ft. at 60 M. P. H. we simply multiply .00173 X 4 sq. ft. and this product by the square of 60 or 3,600, which gives us 24.91 lbs. at 60 M. P. H. Now the skin friction must be figured. We find the total surface area of the body or as near to it as possible and multiply it by the coefficient of skin friction which is .03 at 60 M. P. H. Supposing the total surface area of the body to be 300 sq. ft. then the skin resistance would be 300 X .03 or 9 lb. at 60 M. P. H. This added to the radiator resistance gives us 33.91 or roughly 34 lbs., at 60 M. P. H. Now as the body is in line with the propeller, a back wash is constantly working on the body, and as the slippage of the propeller is figured at 25 per cent we can increase the resistance of the body 25 per cent or instead of figuring the square of 60 or 3,600 we add 25 per cent to 3,600 and get 4,500, so we must multiply by 4,500 instead of 3,600.

The opening for the pilot's cockpit causes a disturbance of the air around this section and this also tends to hold the machine back but at a speed of 60 M. P. H. we can neglect it, as it becomes noticeable only at high speeds.

(To be continued)



Small single-seater biplane, powered with an Excelsior motorcycle engine of 15 H.P. The weight of the complete outfit is 225 lbs., measures 15 feet overall and has a spread of 26 feet. This little machine was built at the Chicago Aero Works for Mr. Raymond Carroll, of Oak Park, Illinois



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

No Need for the Color Line

Down South, where the colored population have separate street cars for the whites to ride in, Sam Johnson, a colored porter, got his first glimpse of an aeroplane. The pilot was stunting over the main street of the town and Sam, among others, was watching the performance. He gazed intently for a few minutes, and then with a shake of his head he remarked to the proprietor of the local hotel, "I wanna tell you, Boss, it's going to be a long, long time before there's going to be any great call for Jim Crow cars in that line."

There was a young girl of La Bassee
Whose features were just a bit passee
Her brain-pan, no doubt,
Had something left out,
But, oh, what a wonderful chassis.

New ground officer, just out (to flight sergeant, who is loafing round the canteen): "What are you doing here?"

Flight (who sizes up his man correctly): "Swinging the lead, sir."

N. G. O., J. O. (stumped): "Right-ho, Carry on."

Safety First—and Last

AVIATION—Complete Correspondence Course in Twelve Lessons.

British Correspondence School of Engineering, Maiden Lane, W. C. *Adv. in Aeronautic Weekly.*

Poor Old Gunga Din

(With apologies to Rudyard Kipling)

You may talk of "vin" and "biere"
When you're quartered "over there"
In New York or Abeline or Sleepy Hollow,
But when belts are growing tighter
It's that soda water blighter
That you'd give a dollar ninety-nine to swallow.
In the well-known U. S. A.
Where we used to work and play,
Attending to our pleasures and our "biz,"
Of all the liquid crew,
The finest drink they grew
Was their brimming glass of ice cream soda fizz.
It was fizz, fizz, fizz
Was the brimming glass of ice cream soda fizz.
Gimme strawberry, vanilla
Coffee, peach or *sarsperilla*
Gimme any kind of ice cream soda fizz

Bunch of cloth
Bunch of wire
Bunch of bones
Called a Flier.

Sailing high
Something busts
Bunch falls
Bunch o' Dust.

Altitude
Meaning height
"Boche" plane
Meaning fight.

Good shot
One plane less
'Nother "Boche"
Misses mess.

MUTT AND JEFF--As a Sand-Bag Dropper You Gotta Hand It to Jeff . . . By BUD FISHER

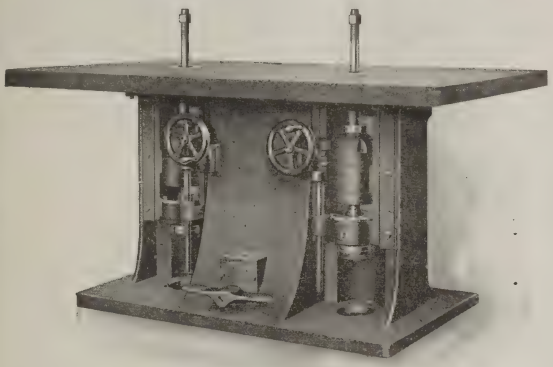
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Courtesy N. Y. World



THIS AEROPLANE STRUTT



Direct Motor Driven
Double Spindle Shaper

Was cut on a

WHITNEY SHAPER

No trick to do it

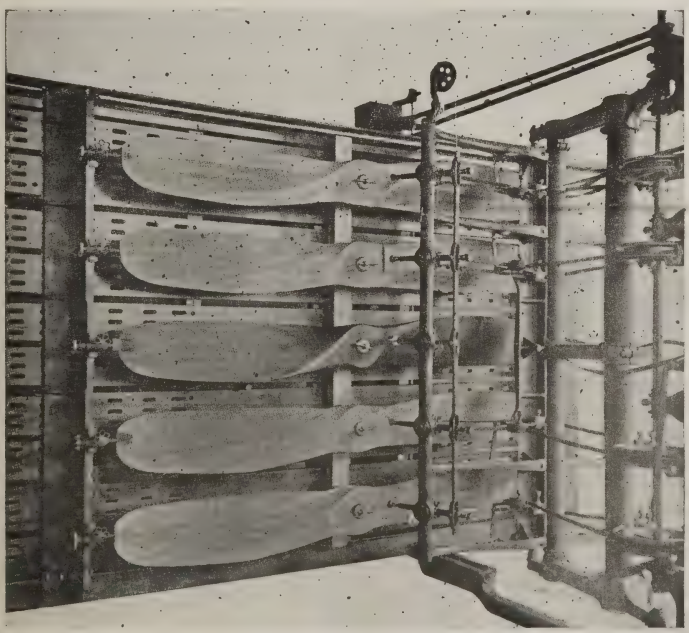
Do you want to know how?

Write

Baxter D. Whitney & Son

Winchendon - - Mass.

The Curtis Dreadnaught Propeller Cutting Machine, Model 55



THIS machine cuts four blades at a time, and cuts closer and more accurate than any other machine in the market.

It finishes the hub the same as all other parts of the blade.

It cuts with the grain of the wood.

It does not require a metal model; just a regular stock blade is sufficient.

It does not bump over the pattern.

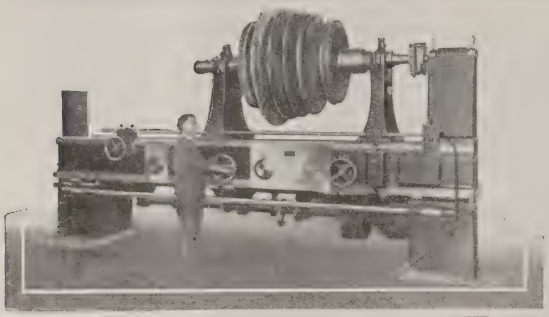
It is manually operated, which gives it the advantage of the human touch required on accurate work.

The hand work required after this machine is from 3½ to 4½ hours on each blade.

It leaves just enough wood for cleaning up.

Curtis Machine Corp.

Jamestown, N. Y.



BALANCING G. E. TURBINE ROTORS

The difficulty of securing and the necessity of having true running balance in turbine rotors has long been a source of worry to mechanics and engineers.

In the past, hours of time and much higher mathematics were required by the cut-and-try method and even then *exact* results could only be approximated.

This illustration shows how the G. E. Company have solved this important and perplexing problem at the Schenectady works. They now use a

CARWEN
Dynamic Balancing Machine
(Sensitive Pattern)

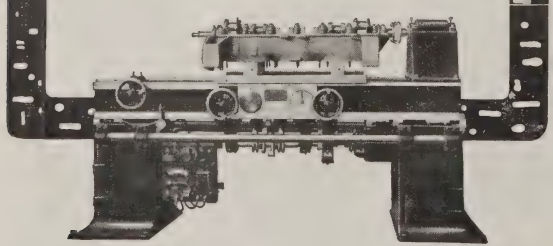
which quickly determines the exact amount of metal to be removed from or added to the rotor to put it in accurate running—not mere static—balance.

Similar results are being obtained by manufacturers of airplane, automobile, truck and other gas engine crankshafts, electric motor armatures or in fact on any machine having rapidly rotating parts that require exactness of running balance.

The cost of purchasing and operating a Carwen is negligible as compared with the gain in output and increased efficiency of your product. Made in sizes for balancing objects weighing from 5 oz. to 15,000 lbs.

Write for booklet that illustrates and describes the principle and operation.

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The *American* Airplane
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More Airmen Win D. S. C.

Washington.—The Commander in Chief, in the name of the President, has awarded the Distinguished Service Cross to the following named officers for the acts of extraordinary heroism described after their names:

Major Carl Spatz, Pilot, Air Service—For extraordinary heroism in action during the St. Mihiel offensive, September 26, 1918. Major Spatz, although he had received orders to go to the United States begged for and received permission to serve with a pursuit squadron at the front. Subordinating himself to men of lower rank, he was attached to a squadron as a pilot and saw conditions and arduous service through the offensive. As he result of his efficient work he was promoted to the position of Flight Commander. Knowing that another attack was to take place in the vicinity of Verdun he remained on duty in order to take part. On the day of the attack west of the Meuse, while with his patrol over enemy lines, a number of enemy aircraft were encountered. In the combat that followed he succeeded in bringing down two enemy planes. In his ardor and enthusiasm he became separated from his patrol while following another enemy far beyond the lines. His gas giving out, he was forced to land, and managed to land within friendly territory. Through these acts he became an inspiration and example to all men with whom he was associated.

First Lieut. Karl G. Payne, Air Service, 20th Aero Squadron—For extraordinary heroism in action near Longuyon, France, September 16, 1918. Starting on a very important daylight bombing mission with five other planes, Lieut. Payne, observer, went on alone when the other five planes were forced to turn back. On crossing the German lines he was attacked by three enemy planes. Using his guns to keep the enemy at bay, he went on, reached his objective and dropped his bombs on the railroad junction, cutting the line. On the way back four more planes joined in the attack, but keeping them at bay with his guns he reached the Allied lines.

First Lieut. Hugh L. Fontaine, 49th Aero Squadron—For extraordinary heroism in action in the region of Hagerville, on September 14. Lieut. Fontaine, together with First Lieut. Hugh Brewster, attacked nine enemy monoplanes, Fokkers, at an altitude of 4,000 meters. He dived into the midst of the enemy formation without consideration for his personal safety, subjecting himself to great danger. By the suddenness and extreme vehemence of his attack, the machines were driven into confusion. Although greatly outnumbered, he and Lieut. Brewster succeeded in shooting down two of the enemy.

First Lieut. Hugh Brewster, 49th Aero Squadron—For extraordinary heroism in action in the region of Hagersville, on September 14. Lieut. Brewster, together with First Lieut. Hugh L. Fontaine, attacked nine enemy planes, Fokkers, at an altitude of 4,000 meters. He dived into the midst of the enemy formation without consideration for his personal safety, subjecting himself to great danger. By the suddenness and extreme vehemence of his attack the machines were driven into confusion. Although greatly outnumbered, he and Lieut. Fontaine succeeded in shooting down two of the enemy.

First Lieut. Clarence C. Kahle, pilot, 99th Aero Squadron—For extraordinary heroism in action near La Chausse, on September 13. Lieut. Kahle and First Lieut. Raymond C. Hill, observer, were directed to take photographs of the old Hindenburg line. They were accompanied by two protecting planes. After they had taken some photographs, the protecting planes were driven off by hostile aircraft, but Lieut. Kahle and his observer continued their mission alone, until, in the vicinity of La Chausse, they were attacked by an enemy formation of nine planes, Lieutenant Kahle put up a gallant fight, in which his observer was shot through the heart and killed. Although pitted against overwhelming odds, Lieut. Kahle, by his pluck, determination, skill and courage, brought the photographs and the plane back to his aerodrome, the enemy keeping up a constant attack upon him back to our lines, riddling the plane with machine-gun bullets.

First Lieut. Raymond C. Hill, deceased, observer, 99th Aero Squadron—For extraordinary heroism in action near La Chausse, on September 13. Lieut. Hill, with First Lieut. Clarence C. Kahle, pilot, was directed to take photographs of the old Hindenburg line. They were accompanied by two protecting planes. After they had taken some photographs the protecting planes were driven off by hostile aircraft, but Lieut. Hill and his pilot continued on their mission alone, until, in the vicinity of La Chausse, they were attacked by an enemy formation of nine planes. Putting up a gallant fight against these overwhelming odds, Lieutenant Hill was shot through the heart and killed; but his pilot, by his pluck, determination, skill, and courage, brought home the photographs and the plane to our lines.

Second Lieut. Paul J. O'Donnell, deceased, Infantry, 96th Aero Squadron—For extraordinary heroism in action near Dunsermeuse, on September 26. His formation was attacked, while flying to bomb Dunsurmeuse, by seven enemy planes. With the first spurt of enemy fire, Lieut. O'Donnell was fatally wounded. With his last strength he opened a deliberate and destructive fire on one of the enemy planes, driving it down out of control.

Second Lieut. Howard G. Rath, observer, 96th Aero Squadron—For extraordinary heroism in action between Rhambley and Xannes, September 13. Lieut. Rath, while acting as leading observer of a flight of three planes, was attacked by fifteen enemy planes. In spite of the fact that his formation was surrounded by an enemy five times as large, he carried out successfully his mission and bombed his objective. In the return running fight, Lieut. Rath and his pilot continued the unequal fight and succeeded in returning to their aerodrome with valuable information.

First Lieut. Cecil G. Sellers, Air Service, 20th Aero Squadron—For extraordinary heroism in action near Longuyon, France, September 16, 1918. Starting on a very important bombing mission with five other planes, Lieut. Sellers, pilot, went on alone when the other five machines were forced to turn back. On crossing the enemy lines he was attacked by three enemy planes, but continued toward his objectives while his observer kept them at bay. In the face of this hostile opposition the objective was reached and their bombs dropped. On the way back four more planes joined in the attack, but fighting them off they reached our lines with valuable information, after a fight lasting thirty-eight minutes.

Fird Lieut. Bradley J. Gaylord, pilot, first day bombardment groups Air Service—for extraordinary heroism in action between Chambley and Xannes, France, September 13, 1918. Lieut. Gaylord, while leading an important mission with two other planes, was attacked by fifteen enemy planes. Nevertheless he and his observer carried out the mission, bombed the objective in a running fight and shot down at least one enemy plane.

First Lieut. Charles R. Dolive, pilot, Air Service, 93rd Aero Squadron—For extraordinary heroism in action near St. Benoit, France, September 12, 1918. Lieut. Dolive, in conjunction with another American pilot, engaged and fought five enemy planes. Outnumbered and fighting against tremendous odds, Lieut. Dolive shot down three enemy planes and outfought the entire enemy formation.

First Lieut. J. Dickinson Este, 13th Aero Squadron, Air Service—For extraordinary heroism in action near Chambley, France, September 13, 1918. Lieut. Este was leading an offensive patrol of five machines when a formation of seven enemy single seaters approached the patrol from above. Although outnumbered and in a very disadvantageous position he did not hesitate to lead his patrol to the attack. Through the

(*Continued on page* 538)



(*Continued from page* 529)

Mc

McCarthy, John Franklin....FLA
McCann, John Henry....FLA; DMA
MacFayden, Rollins....SLA; ABC
McDaniel, Walter F....FLA; KST
McClymond, James D....EOT
McLaughlin, Albert Joseph....FLA
McWilliams, Gerald S....LHV
McKiernman, William....PFO
McAdam, Thomas D....CGC
McReynolds, Edwin R....PFO
McRaith, Joseph G....TFT
MacClain, Albert L....BST
McKinney, Norman....LDT

N

Neff, Harry George....SLA; ELA
Nutting, Harold Wilmot....SLA; ELA
Near, Clifford Leland....SLA; ELA
Norris, Howard D....AGC
Netting, Charles L....AGC
North, John Spring....CGC
Neal, Homer S....CGC

O

Owens, Lee E....LHV
Otstot, Robert E....GLC
Olssen, William E., Jr....PFO
Olson, John Arthur....SLA; AMV
O'Neill, John F....PMT
O'Toole, Hubert M....CGC
Obenauer, Victor J....PMT
O'Sullivan, William J....PMT

P

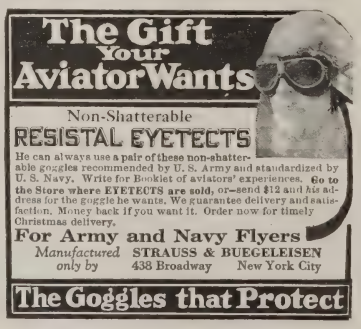
Peace, Harley Moore....SLA; CFT
Patrick, Albert I....KST
Price, Albert A....AGC
Pritchard, Ernest W....EOT
Porter, Harry B....SRC
Phelan, Joseph P....PWM
Proper, James Howard....SLA; ELA
Parsons, Claude P....LDT
Pickett, Roy W....AGC
Patton, Glenn A....RWT
Pratt, George Woltage....RWT
Perrin, William J....BST
Paul, Clarence L....RSD
Pyne, Herbert R....GLC
Peters, Walter L....KST
Phetteplace, Charles G....RSD
Patterson, George Beatty....CPA
Porter, Harry B....LHV
Phillips, Charles T....AGC
Pollock, Robert E....CPA
Pfeil, Paul F....TFT

R

Rice, David Edgar....CPA; PUP
Rennie, George Joseph....SLA; ELA
Rooney, Albert W....TMA
Rouse, Charles L....TMA
Robertson, Thomas Caffey....SLA; CAF
Reynolds, Harry I....CRI
Russell, Arthur Charles....SLA; ELA
Raymore, Henry B....RSD
Robertson, Thomas C....RSD
Robertson, William B....AGC
Robinson, Richard Taylor, Jr....SLA; BST
Randall, Rex R....PFO
Reynolds, John Dain....SLA; CWT
Robie, Frederick....PFO
Russell, Cyril Guy....SLA; EOT
Roberts, Isaac W....CPA
Rouse, Hallock....RWT
Rambo, Ross C....CJW
Rogers, George W....AGC
Riddle, Harry E....PMT
Rose, Waldo H....AGC
Reed, Harold A....PFO
Randall, Joseph F....CSC
Robertson, Paul....CPA; Note 11

S

Sutphen, Edward A....AGC
Stewart, Guy....AGC
Spearman, Roy J....LDT
Stevens, Winthrop P....LDT
Sturges, Carl Brooks....BST
Seymour, Cylde E....PFO



Stinson, Edward Anderson....FLA; RSD
Smith, Harold Lewis....SLA; WFO
Sharp, Bayard....SLA; MAT
Smith, Ralph Keely....SLA; PMT
Spaight, Daniel Raymond....SLA; SAG
Stinchcomb, Orville C....AGC
Scovell, Harold B....RSD
Sparrow, Carroll M....CPA
Stevens, Walter Harold....SLA; MAC
Smith, Donald Jerome....SLA; KST
Sievert, Will Clifton....SLA; BFT
Schmid, Edgar Charles....SLA; BFT
Stauver, Frank L....LHV
Steele, Harry Wilson, Jr....LHV
Simpson, John A....LHV
Sheldon, Herbert L....LHV
Stewart, Bertram Murray....SLA; BFT
Schneeberger, Philip....ABC
Switzer, Lewis....SLA; MAT
Sanford, Frank W....PWM
Silverman, Silas P....PWM
Stewart, Hal W....PWM
Scherck, George....PWM
Sly, Nelson A....PWM
Swift, Arthur D....PWM
Severson, Earl Martin....SLA; ELA
Stanton, Donald Tennyson....SLA; CUI
Schermerhorn, Maurice Thompson....SLA; BFT
Smith, Philip D....FLA; MIA
Schairer, Edward O....CPA
Swan, Walter S....TFT
Stockard, Lester N....KST
Sonntag, Arthur Henry....SLA; GLC
Scharfschwerdt, Otto....SLA; EOT
Smith, Edward Simpson....SLA; CFT
Stanton, Edgar....UIU
Smith, William H....TFT
Smith, Clarence....TFT
Schumann, Raymond....SLA; Note 8
Stinchfield, Paul M....PFO
Shaw, Harold E....BST
Smith, Maynard L....AGC
Sheppard, Robert Zook....MAC
Shriver, Herschel L....MAC
Smith, Donald J....PFO
Stickell, Grayson M....PFO
Schwarz, Walter August....CPA; VBW
Simms, John Asa....SLA; CRI
Sattler, Augustus E....KST
Stebbins, Willis I....KST
Sherwood, Carey....TMA
Sanborn, James E....AGC
Seeley, Charles Frederick....FLA; HHN
Sargeant, Edward James....SLA; KST
Smith, Curtis W....RSD
Scott, Elmo C....TMA

(*Continued on page* 538)

Thomas

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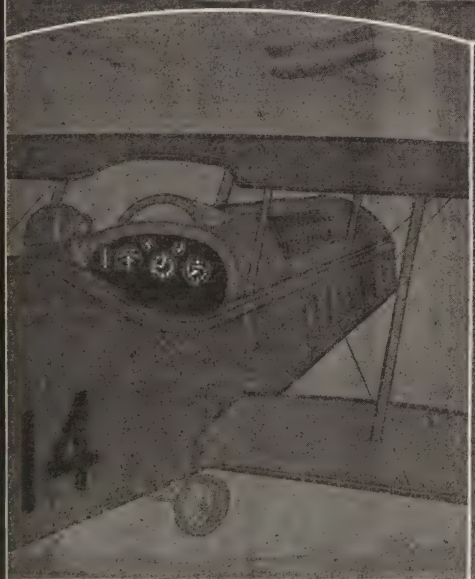
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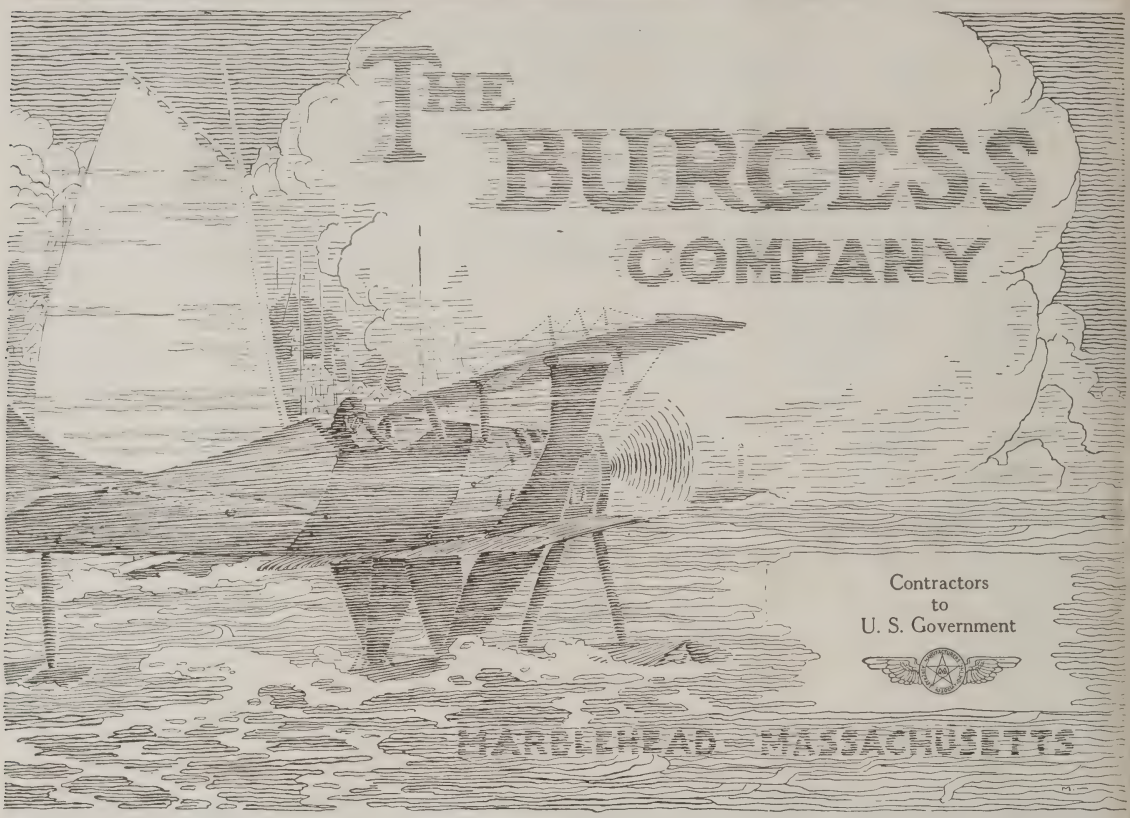
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(Continued from page 536)

Sigler, Ernest R. ..... TMA
Shaw, Harold H. ..... TMA
Spencer, Haven H. ..... ELA
Shaw, George W. ..... AGC
Spaight, Daniel R. ..... PFO
Schuch, Leland S. ..... CGC

T

Taylor, John R. ..... RSD
Tunis, Edwin V. ..... RSD
Thompson, Homer T. ..... BST
Tucker, Albert J. ..... Note 9
Tate, Bertram Brown ..... SLA; CFT
Thomas, Don W. ..... Note 6
Thomas, Charles E. ..... LDT
Thorne, William B. ..... PWM
Todd, Clarence W. ..... PWM
Tebb, Gordon E. ..... ASM
Treman, Robert E. ..... Note 12
Taylor, George D. ..... PFO
Titus, Charles B. ..... PFO

W

White, Albert Ralph ..... SLA; KST
Wilson, Frank G. ..... AGC
Woodward, Alvah Gray ..... SLA; BFT
Ward, Charles P. ..... PWM
Welty, James A. ..... PWM
Wilber, Jerry F. ..... PWM
Woody, Kenyon ..... PWM
Waterworth, Harold A. ..... PWM
Wiedersum, Roy ..... PWM
Woodbury, Philip J. ..... PWM
Witt, Keith Lamar ..... SLA; PMT
Wicker, John J., Jr. ..... Note 12
Watters, John ..... EOT
Wolfangle, George H. ..... EOT
Walser, Arthur ..... AMV
White, Clyde Walker ..... SLA; ABC
Wiggins, Grafton ..... GLC
Wiber, Harold C. ..... GLC
Whitehead, Eugene C. ..... GLC
Wood, Benton Wood ..... FLA; VBW
Watson, Henry L. ..... CRI, WDM; Note 1
Wilson, Lee E. ..... KST
William, Richard E. ..... CGC
Whitting, Frank Rice ..... SLA; ELA
Wells, William Calvin ..... SLA; CFT
White, George L. ..... PFO
Whitehouse, William E. ..... MAT
Wales, William C. ..... LHV
Wilson, Vincent L. ..... LHV
Walker, Charles L. ..... AGC
Wilson, Frank G. ..... AGC

(Continued from page 535)

combat which followed Lieut. Este fought with the greatest bravery, in spite of the fact that he was himself attacked by two enemy planes, which fired at him at pointblank range from the rear and above. By his skill and courage he was able to keep his formation together, and they succeeded in shooting down three of the enemy planes, of which Lieut. Este himself destroyed one and drove down another out of control.

Lieut. Wilbert W. White, Air Service—While protecting three observation planes, Lieut. White was attacked by three Halberstadt fighters. He led them away from the observation planes, which were permitted to carry on their work unmolested.

Returning home he dived through a cloud to attack an enemy balloon, bringing it down in flames.

Two Fokker scouts attacked him. He attacked the first head on, shooting until it went down into a vertical dive out of control. Pulling up sharply, he fired a long burst at the second as it went over him, putting it to immediate flight.

Lieut. William Clarkson Potter, also decorated, was with a daylight bombing mission on Dunsur-Meuse which was attacked by a force of enemy planes three times its number. He saw that the observer's guns on the leading machine were inactive. He flew in close to the leader, so as to protect him from the rear. This position he held under ever increasing enemy attack, and in face of the fact that his leader continued on into Germany.

The conditions became more desperate, still Lieut. Potter hung on until his leader was finally able to make a turn about to the Allied lines. On landing it was found that the observer had been killed and had fallen and jammed the controls, making a turn impossible.

Second Lieut. Arthur R. Brooks, Air Service—For extraordinary heroism in action over Marsla-Tour on September 14. Lieut. Brooks, when his patrol was attacked by twelve enemy Fokkers over Mars-la-Tour, eight miles within the enemy lines, alone fought bravely and relentlessly with eight of them, pursuing the fight from 5,000 meters to within a few meters of the ground, and though his right rudder control was out and his plane riddled with bullets, he destroyed two Fokkers, one falling out of control and the other bursting into flames.

First Lieut. Edward V. Rickenbacker, Air Service, 94th Aero Squadron—For the following act of extraordinary heroism. The Bronze Oak Leaf is awarded to be worn on the Distinguished Service Cross awarded October 16. On September 14, in the region of Villecy, he attacked four Fokker enemy planes at an altitude of 3,000 meters. After a sharp and hot action, he succeeded in shooting one down in flames and dispersing the other three. For the following act of extraordinary heroism a Bronze Oak Leaf is awarded to be worn on the Distinguished Service Cross awarded October 16. On September 15, 1918, in the region of Bois de Waville, he encountered six enemy planes, which were in the act of attacking four Spads, which were below them. Undeterred by their superior numbers, he unhesitatingly attacked them and succeeded in shooting one down in flames and completely breaking the formation of the others.

Aviators Break Flight Records

October has witnessed the smashing of all American aviation precedents. A 4,000-mile flight from the Gulf of Mexico to the Great Lakes and return was made by an army officer from Ellington Field, Houston, Tex. Three other Ellington Field aviators made the first successful flight from Texas to Washington, landing in this city last week. Three seaplanes, following the Atlantic coastline, have completed a wonderful flight from Philadelphia to Pensacola, Fla.

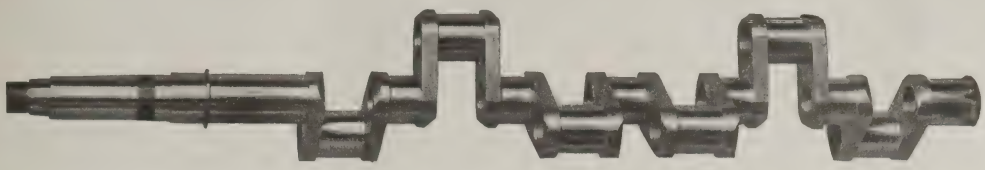
The 4,000-mile flight from Ellington Field to Mt. Clemens, Mich., and return, was made in nine days by Lieut. John E. Davis without mechanician and without changing plane or motor. The actual flying time was sixty-four hours, an average of 62.5 miles per hour over the entire distance.

Lieut. Davis followed the same course as the three officers who came to Washington, as far as Dayton, Ohio.

The three naval planes left Philadelphia at 9:30 o'clock and proceeded southward, following the seacoast and Chesapeake bay. Stops were made at several of the naval stations along the coast, and Pensacola was reached in less than a week. The trip was made without accident of any sort. This flight marks a new record in the history of naval aviation.

Peterson Promoted to Major

We have referred on several occasions to the excellent work being done by D. McK. Peterson, a young Lehigh graduate, and it gives us pleasure this week to record that he has recently been promoted to his majority in the Air Service and has been placed in command of his squadron of aeroplanes.



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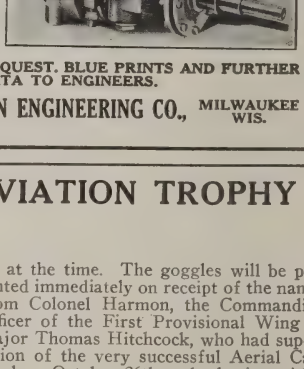
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COMPETITION FOR AERO CLUB ARMY AVIATION TROPHY MAY SOON START

THE Aero Club of America officials have written to Major-General William L. Kenly, the Director of Military Aeronautics, asking that the military aviators be permitted to compete for the three trophies and $1,500 of U. S. Liberty Bond prizes offered by the Club under the Samuel H. Valentine Will, for the development of aviation.

The Aero Club of America offered these trophies and prizes early in October and the first competition for the trophy offered to the First Provisional Wing and for the $100 U. S. Liberty Bond, took place on October 26th during the Aerial Carnival at Belmont Park.

A few days later Mr. Alan R. Hawley, President of the Aero Club of America, received the following letter from Major-General William L. Kenly:

"My dear Mr. Hawley:

"After careful consideration of your letter of October 21st, herewith returned, it is not believed advisable that this project be carried out during the continuance of the present war.

"The attitude of the Aero Club in endeavoring to promote efficiency by stimulating competition is, of course, admirable, and upon completion of the war, propositions of this kind will undoubtedly be very valuable to the Air Service.

"I would recommend that no action be taken on this at present.

"Very truly yours,
"(Signed) W. L. KENLY,
"Major General, U. S. A.
"D. M. A."

Under the offer of the Aero Club of America, each of the four trophies is to cost $1,000, and with each trophy will be given five $100 Liberty Bonds, making five prizes of $100 each to go with each trophy. The idea in giving these Liberty Bond prizes was that while under the rules of the competition, a station or squadron would have to win the trophy three times in succession to get permanent possession of it, the winning station or squadron would get a $100 Liberty Bond prize, immediately upon winning the contest. It is left to the Military, Naval and Marine Corps authorities to decide whether the $100 Liberty Bond prize shall go to the Squadrons, or to the Stations, or the individuals competing.

It is hoped that now that the armistice has been signed, the War Department will grant permission to the military aviators all over the country to compete for these trophies and prizes.

The Aero Club of America has also written to Major General Kenly asking permission to grant the $100 Liberty Bond prize to Sergeant Coombs, who won the race around the Statue of Liberty on October 26th, before the Club was notified by Major General Kenly not to hold competitions for these trophies.

The Aero Club of America has also written to the military authorities who had charge of the aerial carnival asking them for the names of the military aviators who participated in the Aerial Carnival so that a pair of goggles can be presented to each, as the Club had offered to do at the time. The goggles will be presented immediately on receipt of the names from Colonel Harmon, the Commanding Officer of the First Provisional Wing or Major Thomas Hitchcock, who had supervision of the very successful Aerial Carnival on October 26th and who is entitled to great credit for the way in which the whole affair was handled.

Famous French Ace Missing

Paris.—Sub-Lieut. Boyau, one of the famous French aces, is reported to have been missing since September 28. He is credited with thirty-two aerial victories.

Sub-Lieut. Boyau began to figure in the reports of exploits of the French aviators early in the present year. By the month of June his record of aerial victories had reached a total of fourteen. It jumped rapidly during late June and July, until on August 1 it was reported as twenty-nine. Particular mention was made of three victories he scored in late July, each of which was won in not more than ten minutes.

American Official

Washington.—General Pershing has cabled the following:

On October 31 French bombing units attached to the 1st Army successfully raided Mezieres and Poix-Terron and dropped nearly twelve tons of explosives on the important railway in that region. On November 1 our aviators dropped three tons of bombs on the roads and dumps in the vicinity of Tailly, Barricourt and Villers-devant-Dun, and machine gunned enemy troops and convoys. In the course of the day seven enemy aeroplanes were shot down. All our machines returned.

An American aerial patrol on November 1 encountered seven German machines in the region northwest of Verdun. Lieutenants Howard Smith of Hudson Falls, N. Y., and Richard Aldworth of San Antonio, Texas, each brought down an aeroplane. The other German machines escaped.

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AERIAL AGE WEEKLY

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Vol. 8, No. 11 NOVEMBER 25, 1918 10 CENTS A COPY



Berlin, the German capital, through which the Allied armies may march soon, as photographed from the air

STABILIZING THE AERONAUTIC INDUSTRY

NATIONAL AERIAL DERBY PROPOSED BY AERO CLUB OF AMERICA

UBLISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
bscription: Domestic, $4; Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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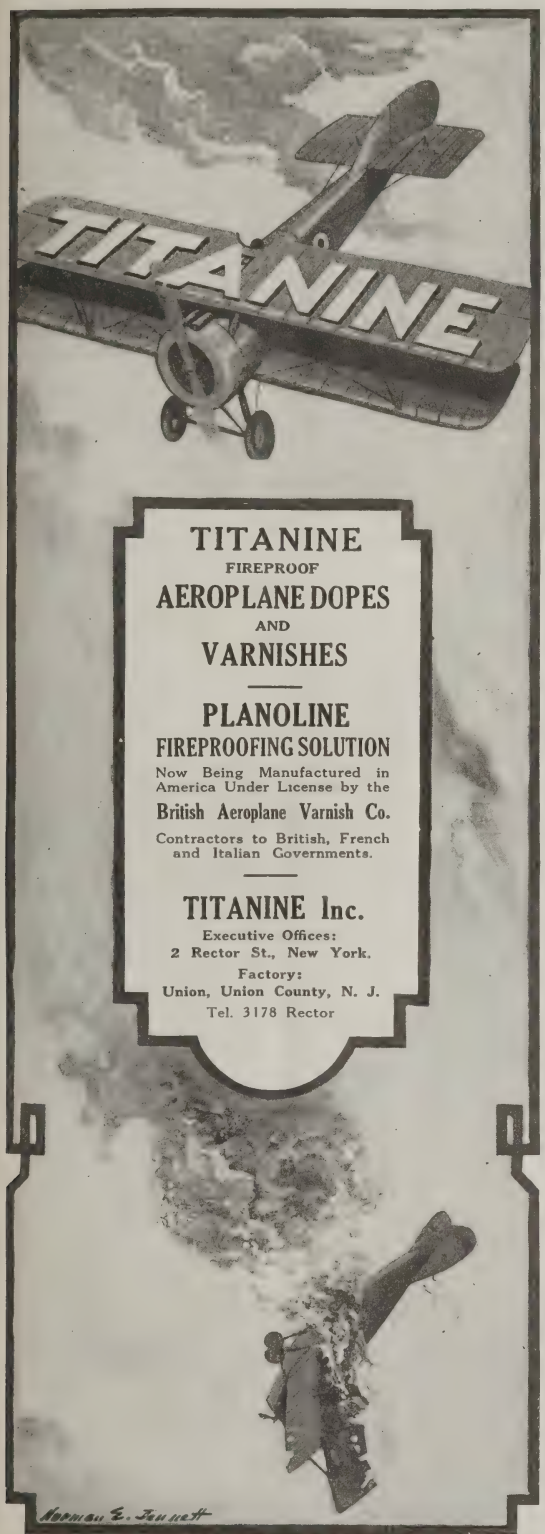
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AERIAL AGE WEEKLY

VOL. VIII NOVEMBER 25, 1918 No. 11

TABLE OF CONTENTS

PAGE

Stabilizing the Aeronautic Industry. 557
National Aerial Derby Proposed... 558
$50,000 Transatlantic Flight Renewed 558
News of the Week..... 559
One Hundred and Forty-nine Aeroplanes Fly in Largest Formation in America 561
The "Langley" at Erie, Pa..... 561
The Aircraft Trade Review..... 562
U. S. Aerial Mail 563
The Working Processes of Internal Combustion Engines 564
The Hughes Aircraft Report (continued) 565
Review of German Aeroplanes.... 570
Splitdorf and the Magneto Situation 574
Fred S. Duesenberg, Pioneer High Duty Engine Builder 575
Military Aerostatics 576
Naval and Military Aeronautics... 577
Foreign News 580
Elementary Aeronautics and Model Notes 581
Aeronitis 582

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879



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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Nov. 25, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, NOVEMBER 25, 1918. NO. 11

STABILIZING THE AERONAUTIC INDUSTRY

By HENRY WOODHOUSE

"MAY I urge AERIAL AGE to print an editorial in the immediate future on what can be done to stabilize the aeronautic industry? AERIAL AGE'S foresight in urging aerial preparedness three years before the war brought the first large appropriations and prepared the American aeronautic industry to some extent for the war. During the past year AERIAL AGE had the foresight to begin to plan for the employment of aircraft for peace, thereby educating the country and the aeronautic movement in that important subject and preparing them, in a measure, for the change of conditions that would follow the declaration of peace.

"We have no doubt that AERIAL AGE can be equally effective in clearing up the present confusion and stabilizing the Aeronautic Industry."

This request from a leading aircraft manufacturer summarizes similar requests and the subject of numerous interviews between aircraft manufacturers and the editors of AERIAL AGE during the past two weeks.

What the Government Can Do to Stabilize the Aeronautic Industry

Nothing is more important at this time than to stabilize the aeronautic industry and it is necessary to do so quickly, before aeronautic talent and trained aviators, and skilled labor, look elsewhere for positions.

The Government should be the main factor in stabilizing the aeronautic industry, at least for the next six months, while the plans for the employment of aircraft for special purposes are put into effect.

As Mr. Alan R. Hawley, the President of the Aero Club of America, recently stated to the press, the Hughes' Report shows that the aircraft program was barely large enough to supply the aeroplanes needed to keep our aviators equipped until such time as order is established in Germany, Austria, and Russia. To cancel orders at this time means jeopardizing national safety because the United States was so utterly unprepared that what there is being manufactured at present represents all there is in aeronautic equipment, and that is barely sufficient to equip our aviators until order has been established in Europe.

The Government has cancelled a number of orders for aircraft already. It is hoped that there will be no further cancellations. The program should be continued until such time as the situation in Europe is positively settled.

In the meantime, the aeroplanes could be used for carrying mail. There are thousands of trained aviators in this country ready to take up mail carrying, and the Post Office has received so many requests from all over the country for the extension of the Aerial Mail Service, that several thousand aeroplanes and military aviators could be used for this purpose.

The Revenue Cutter Service and the Life Saving Service need aeroplanes, and could use any number of seaplanes that the Navy may be able to spare.

The Forestry Service can use land aeroplanes to detect fires, and there are a number of other Government Bureaus that can use aeroplanes to speed up the work of their inspectors.

Coast Defenses Still Without Aircraft

As was pointed out in the expert articles by John Hays Hammond, Jr., appearing in the November number of "Flying", our Coast Defenses are still without aircraft. The big guns which protect our coast are still without aerial eyes. Steps should be taken immediately to supply them.

Demand for Aircraft for Civil Purposes Will Support the Aeronautic Industry Six Months Hence

Provided the Government supports the aeronautic industry for six months, the future of the aeronautic industry is as bright as the future of any other industry.

Aeroplanes will be used for pleasure purposes, business trips, and as carriers of express, before many months have gone by.

As we have pointed out repeatedly, a large number of the night and day letters being sent now by telegraph, can be sent to a great advantage and economic saving, as Aerial Mail letters. The Post Office is about to put into effect an Aerial Mail line between New York and Chicago, which will make it possible to deliver night and day letters between the two cities in from seven to eight hours. The sender will be able to send a letter written in his own office, in the same time that it would take to send it by telegraph, and the cost will only be sixteen cents, instead of several dollars for a night or day letter of the same length. The economic saving is so tremendous that the Aerial Mail will be patronized extensively for business and general purposes.

Soon after peace is declared, we may expect thousands of people to purchase aeroplanes, to use them as they use automobiles, for pleasure and travel.

A great many of the two thousand members of the Aero Club of America and the five thousand members of the Aerial League of America have already expressed their intention to acquire aeroplanes as soon as the Government requirements permit manufacturers to deliver aeroplanes for pleasure and travel.

In the near future we may expect to see aeroplanes on the market ranging in price from $1,500 for a one passenger, low-powered aeroplane, to $25,000 for a large ten passenger air yacht. Between these two classes there will be the aerial limousine, and the equivalent of the pleasure cars, ranging in price from $3,000 to $10,000. The aerial limousine, or six passenger air yacht, or the one-ton aerial truck, equipped with Liberty motors will probably cost between $8,000 and $10,000.

Aero Club and Aerial League of America Have Extensive Programs

The proverbial foresight and progressiveness of the Aero Club of America and the Aerial League of America is once more emphasized by the fact that sudden peace finds them as ready as they were when war was declared, and with substantial plans and tangible assets.

Co-operating closely with the Post Office, these organizations have popularized the aerial mail service and created the demands which exists for the extension of the aerial mail service. They have also planned for the general use of aircraft for sport, travel, exploration, passenger and express

carrying, Revenue Cutter Service, Life Saving Service, detection of forest fires, and other purposes, in the United States and possessions, Canada and South and Central America.

The plans are ready and clearly defined. They must now be put into effect.

Seventeen National and International Aeronautic Trophies and Prizes

Seventeen national and international aeronautic trophies and prizes to open for competition are listed in the Aero Blue Book (being published by the Century Company, New York,) as follows:

The Gordon Bennett Aviation Trophy; The Gordon Bennett Balloon Trophy; The Michelin Trophy; The International Marine Aviation Trophy; The American Annual Aerial Derby; The Pan American Aviation Trophy; The $50,000 Transatlantic Flight Prize; The Curtiss Marine Flying Trophy; The Annual National Elimination Aviation Contest; The Annual National Elimination Balloon Contest; The Mackay (Military) Aviation Trophy; The Valentine Trophies of the Aero Club of America; The Collier Trophy; The Pulitzer Trophy.

The competition for these trophies, which is to be arranged by the Aero Club of America in the United States, will do much to popularize the aeronautic sport and aeronautics in general.

The Club has already taken steps to arrange for contests.

NATIONAL AERIAL DERBY PROPOSED BY AERO CLUB OF AMERICA

A NATION-WIDE Aerial Derby, in which all the very best Allied aviators will participate, is proposed by the Contest Committee of the Aero Club of America, to be held next July fourth, in connection with proposed World Peace Celebration to be held in the United States.

This World Peace Celebration was proposed by resolution in the House of Representatives, yesterday, by Congressman Fess, and provides for an appropriation of $500,000. The resolution provides for making July 4th, 1919, "A day of World Celebration to commemorate, in the City of Washington, D. C., the ending of the War, the abandonment of the principle of absolutism in government and the adoption of the principle of constitutional Democracy, established upon the will of the sovereign people."

To make the aviation feature of the celebration country-wide, the Contest Committee of the Aero Club of America proposes that one of the aviation events shall be an Aerial Rally, in which aviators will fly to Washington from practically all of the important American cities, each bringing to the Capitol, and to the Allied representatives assembled at the Capitol, messages and trophies from their respective States and Cities.

The States and Cities would be asked to enter aeroplanes in this Rally, which would officially represent each State or City. As each State has given hundreds of aviators to the Army, Navy and Marine Corps, the Contest Committee feels sure that each State and City will be able to select native aviators to pilot the aeroplanes to the Capitol on this occasion.

The Rally will be a contest under rules to be evolved by the Contest Committee of the Aero Club of America, and the prizes would be awarded to the winners under a system of points, which will give due credit for the distance and weight carried by each of the competitors no matter what distance they may fly from.

The important international feature in this competition will be the International Aviation Trophy. This trophy, which was competed for each year up to the time of the World War, is now in France, and the Contest Committee of the Aero Club of America is communicating with the Aero Club of France and the International Aeronautic Federation, proposing that the competition for the trophy be held in Washington on July 4th, 1919, at the time of the Celebration.

The competition for this trophy would bring to the United States the most famous Allied Aces, and the fastest and best Allied aeroplanes to compete against the American Aces and American aeroplanes.

The Aero Club of America has been advised by many of the Allied Aces of their desire to come to the United States, and it is felt that the American public will certainly welcome the opportunity to pay homage to the brave Knights of the Air who did so much towards achieving victory over Germany.

This event would bring to the United States the greatest aerial rally ever held in the world, and the American public would see in the air on July 4th, 1919, more famous Aces than ever were in the air on one day, even during the Great War.

This gives in brief an outline of what can be done to stabilize the aeronautic industry.

$50,000 TRANSATLANTIC FLIGHT PRIZE RENEWED

THE Aero Club of America has received a cablegram from the Royal Aero Club of Great Britain, reading as follows:

"Daily Mail Cross-Atlantic Flight for $50,000.00 Prize is now open under regulations previously issued."

Mr. Alan R. Hawley, the Chairman of the Contest Committee of the Aero Club of America in making this announcement, issued the following statement:

"There are a number of American aeroplanes under construction for the purpose of crossing the Atlantic in different ways, and we expect that a number of entries for this prize will be made in the near future with the Aero Club of America which represents the Royal Aero Club of Great Britain in the United States.

"The flight with forty passengers made by a British Handley-Page a few days ago and the knowledge that we have of large Caproni aeroplanes which are almost ready to take the air, necessitates haste on the part of Americans who wish to compete for the Transatlantic Prize."

The $50,000 Prize is to be awarded to the aviator who first crosses the Atlantic in an aeroplane in flight from any point in the "United States, Canada or Newfoundland, to any point in Great Britain or Ireland in seventy-two consecutive hours. The flight may be made either way across the Atlantic."

The competition is open to persons of any nationality holding an aviator's certificate, which is issued under the rules of the International Aeronautic Federation by the Aero Club of America in the United States and by the Royal Aero Club of Great Britain in Great Britain. Only one aircraft may be used for each attempt to fly across the Atlantic. It may be repaired en route and will be so marked before starting that it can be identified upon reaching the other side. Any intermediate stops may be made only on the water.

The start and finish may be made from land or water, but at the finish the competitor must cross the coast line in flight.

Considering the development of the aeronautic art during the last three years, the flight is by no means a difficult one. All the problems in the way of success have been solved and the flight may be expected to be made in the very near future.

Looping Record

The Aero Club of America has just received a telegram from Lieutenants Dudley B. Mayer, Maurice A. Sharp and Joe Borden, certifying that Lieutenant William T. Campbell, Officer in Charge of Flying at Love Field, Dallas, Texas, made one hundred and fifty-one consecutive loops with a Curtiss aeroplane. This is the highest record which we know of any one having made up to date since Pegaud made the first loop and proved it to be possible to fly upside down.

We have heard of a record of one hundred and forty-four loops having been made and Lieutenant Carl Batts held the previous record of one hundred and thirty-six consecutive loops, which is also a very recent record.

At the Panama-Pacific Exposition in San Francisco it was considered marvellous when Art Smith made twenty-three consecutive loops in his old type Curtiss pusher machine.



THE NEWS OF THE WEEK



Captain Bartlett Planning Flight Across North Pole

Capt. Robert A. Bartlett is making plans to fly in an aeroplane across the North Pole. He believes he can do it with ease, plant the American flag there and continue his flight on into Asia. He will start on his air trip from Etah, Greenland, and after reaching the pole will fly to Cape Cheluskin, Asia.

Captain Bartlett and some other members of the Aero Club of America look upon the fact as certain of accomplishment. The Captain is now an officer in the United States Army, and if he is not mustered out by July he will obtain an indefinite leave, for it is then that he expects to make the flight. He was with Admiral Peary on his famous dash for the pole, and he is conversant with conditions in the Arctic regions.

In the most matter of fact way he explained to a reporter for *The Sun* recently how he expects to reach the pole. All of his plans are made except that of the aeroplane to be used.

"We could take off in the plane from Etah and fly to the pole, which is 700 miles distant, land there for a very brief survey and observation, plant the American flag on the spot our scientific instruments indicate as the pole, ascend again and continue for another 700 miles and land in Cape Cheluskin," he said. "It would mean a broken flight of 1,400 miles. Gasoline is the only consideration. If I can get a speedy engine with broad planes for the rarefied atmosphere I can make the trip as surely as you will make the trip to your office in the subway."

"How are you going to adjust your carbureter to this intense cold and rare atmosphere?" he was asked.

"I won't adjust it. It isn't necessary. After we leave Etah the air will be cold and probably rare if we fly high, but as we near the pole it will become warmer."

"You know that flowers bloom at the pole, wilt and die and fall in the water, float south and encounter the ice and are frozen in. We often find flowers from the pole frozen in. It is a well-known fact that the ground around the pole and the pole itself is covered with vegetable growth. And, by the way, it is as level as Mineola field. We won't have any trouble landing there." "How high will you have to fly?"

"A thousand feet, maybe more. It depends upon atmospheric conditions and the chemical action of salt water; maybe we'll have to get up a bit after all, but it will not affect the machine."

"How long will it take?"

"Roughly estimating, the first flight will not take more than six hours before we reach the pole. We will stay there long enough to be sure that it is the pole as recorded by the instruments and compass, take a survey of surroundings and note the conditions of the terrain, atmosphere growth and other things that will be extremely interesting to science.

"Then we will crawl into the old bus and fly away to Cape Cheluskin. This, as the trip to the pole, will be a continuous flight and we'll land all safe and sound there. It will be an easy matter to make our way back to the United States.

"It will take a season to make the trip. We will fit out the expedition and go by ship to Etah. It is a simple matter to assemble the plane and tune her up for the flight. Then we'll take off and garner glory for America in America's progressive way, reaching the pole by air," he concluded decisively.

Captain Bartlett will have any number of planes to select from and many of them are now under consideration. Bernard Sanders, of the club's legal committee, is assisting Captain Bartlett in making arrangements.

Gianni Caproni, the famous Italian aviator, has under consideration the construction of an 18,000 horse-power plane which will be capable of carrying a considerable number of passengers. Planes of 5,000 horse-power also are being designed.

Ryan Tells Secret of Aeroplane Radio Phone

One of the secrets of the war was released November 15th by John D. Ryan, Director of Aircraft Production. He said that American pilots fighting in France were directed by their squadron commanders, who talked into the transmitter of a wireless telephone. But the fact that radio communication has been perfected by Americans so that no motor, no propeller, is too loud to drown out the human voice that vibrates through the ether into the ear of the aeroplane pilot is not quite as much of a secret as Mr. Ryan supposes.

The man who perfected this device, who adapted the wireless telephone to the aeroplane and gave the Americans a wonderful advantage over the puzzled German aviators, is Col. Clarence C. Culver, U.S.A., now stationed in Washington. He has been working on it for ten years. As long ago as February 7, 1917, AERIAL AGE printed a report from San Diego, Cal., that Culver, then a captain, had supervised a successful test of radiotelephonic communication between a military plane in flight and a land station.

In making his announcement regarding the use of the wireless telephone on the western front up to the moment the armistice was signed, Mr. Ryan said:

"There are some details concerning it which we cannot discuss yet, but the radio devices worked out during months of experiment went into actual service some weeks ago. I have myself, standing on the ground, given orders to a squadron flying in the air and watched them manœuvre accordingly. The transmission of the voice is clear enough to be heard distinctly through the sound of the aeroplane motor. It is in every way satisfactory."

Mr. Ryan said he could not discuss the distances over which the radio telephone has worked but they are known to be a matter of several miles. It was said in Washington that the Germans got some inkling of what the Americans were doing just before hostilities ceased.

Colonel Culver, when a lieutenant, was an observer of the great aviation meet at Belmont Park in 1910. He was one of the first to appreciate the possibilities of radio conversation from plane to plane and from ground to plane. He went to work on the problem. He and E. J. Simon, a radio engineer of New York, jointly directed the test held in San Diego a year and nine months ago.

Tests Prove a Success

A newspaper despatch, published on the following day, said:

"Flying at an altitude of 800 feet in a tractor biplane piloted by Capt. Herbert Dargue, Captain Culver succeeded in transmitting several verbal messages a distance of approximately three miles. Captain Culver's voice came floating out of the blue sky as clear and distinct as though he were only a few feet from the receiving room.

"Within the next ten days Captain Culver and Mr. Simon expect to have little difficulty in engaging in extended conversations while flying in two distinct aeroplanes many miles apart. The War Department has set aside two Martin military tractors for radio telephone experimentation."

The fifty-three aeroplanes which performed simultaneous evolutions as the closing spectacle of the army meet at Belmont Park, October 26, were directed from the ground by wireless telephone. Only a few of the spectators knew this. Most of them supposed the pilots were "stunting" in obedience to signalling motions of the leading planes, as had been the training custom.

Our Flyers Down 473 in Two Months

In the period from Sept. 12 to 11 o'clock on the morning of Nov. 11, American aviators claim they brought down 473 German machines. Of this number 353 have been confirmed officially. Day bombing groups from the time they began operations dropped a total of 123 tons of bombs within the German lines.

Bombing operations were begun in August by the 96th Squadron, which in five flying days dropped twenty tons of bombs. The first day bombardment group began work in September, the group including the 96th, the 20th and 11th Squadrons. The 166th Squadron joined the group in November.

Except for Sunday and one or two other days the American aviators had unfavorable flying weather during the week previous to the signing of the armistice.

Many spectacular flights were planned for 11 o'clock Monday and just before that hour, but a heavy mist on the entire front prevented all but a few planes from venturing forth.

Lieut. Hitchcock, Boy Air Hero, Home

Eighteen-year-old Lieut. Thomas Hitchcock, Jr., who wears the French War Cross for air victories, and who escaped from Germany into Switzerland after he had been shot down and captured, arrived in New York on Nov. 14th on the U. S. transport Plattsburg.

His father, Major Thomas Hitchcock, executive officer of the flying field in Mineola, and his mother came in from their home at Westbury to welcome him.

"Little Tommy," rejected by the United States Air Service because of his youth—he was only sixteen then—joined the Lafayette Escadrille. He was wounded and captured in a fight with three German planes on March 6 last. On Aug. 28 he arrived in Switzerland, having walked 100 miles in eight consecutive nights.

700 Mile Non-Stop Flight to Yonkers

Claim to a new aeroplane record was advanced November 8 by Major M. J. Boots and Lieut Elmer J. Spencer, United States Army aviators, who on November 7 completed a non-stop flight from Mount Clemens, Mich., to Yonkers, in four hours and fifty minutes.

The officers, flying a two seated Haviland aeroplane equipped with a 400 horse power Liberty motor, ascended at Selfridge Field near Mount Clemens at 11:40 A.M. Until they were in the air they had no notion of attempting a long journey, but shortly after their ascent finding weather conditions ideal and their motor running perfectly they decided to attempt to reach Mineola without coming down.

Flying east by north until they were over Ottawa they then hauled their course and proceeded in a general southerly direction, flying across the Adirondack region and down the Hudson Valley as far as Yonkers. They were obliged to land at Yonkers because their supply of fuel was running low. Their landing was made at 4:30 in the afternon and ended a flight which they estimate to have been not quite 700 miles in length.

They landed in a field on Seminary avenue in Yonkers owned by Gideon H. Peck, whose house, close by, was filled with guests helping him celebrate his seventy-fifth birthday and Thursday's premature peace report. The aviators were literally dragged into the house by the enthusiastic merrymakers, who tried to induce them to join the party and accept the hospitality of the house over night.



Lieut. Jack Rutherford, U. S. Navy Air Service, Mrs. Rutherford and their charming little family

Rinehart Sets New Dual Passenger Mark

Dayton, O.—By attaining a height of 22,400 feet while carrying Milton Baumann, an employe of the Dayton-Wright Aeroplane Company as observer, Howard M. Rinehart, chief pilot for that company, broke the altitude record with a passenger during a flight from South Field, Moraine City, on November 2. The fact that Mr. Rinehart had established the new record came to light a week after the remarkable feat was performed, from an outside source. Had not a newspaper man questioned Rinehart concerning his achievement, it probably would never have become publicly known.

The record was established during a flight being made by Rinehart and Baumann on a piece of testing work, the nature of which is kept secret. The test required certain performance from a De Haviland 4 aeroplane, driven by a Liberty motor. The day was perfect for altitude flying, and after attaining a height of 21,500 feet, a pinnacle reached many times before by Rinehart, he decided to continue climbing. This he did until the record height of 22,400 feet had been reached.

Upon landing, the instruments on the machine which Rinehart had driven to the dizzy height were tested by government instruments at McCook field. It was then that it was found that the register named above was correct.

In spite of that fact that a new record had been established, Rinehart has refused to make official claim to the distinction through the medium of the Aero Club of America, the one American organization empowered to confer it. The fact that the feat had been performed, however, reached New York, and queries were sent to this city concerning it.

Rinehart and Baumann found a temperature of approximately 15 degrees below zero while at their greatest height. They maintained the maximum altitude for about 30 minutes. From their position, Dayton, Springfield, Eaton and Greenville were closely within sight.

With the establishment of a new altitude record by a pilot carrying a passenger, both the dual and single-passenger altitude records have been made in Dayton within the last few months. It was only a short time ago that Captain Schroeder attained a height of 28,900 feet without a passenger, thus establishing a record for a single-passenger altitude attempt. Rinehart said that it was because of the difference between the single passenger record and the double that he had not taken the pains to claim official recognition of his record.

Rinehart is one of the foremost civilian fliers in America. He has been piloting aeroplanes for the last six years, and was for a time chief flier with the Villa forces in Mexico. He resides in this city.—*Dayton Sunday News.*

Prairie Aerodromes in Canada

An air control station is to be established at Winnipeg within the next few weeks.

It is proposed that similar stations shall be established at Fort William or Port Arthur, Regina, Moose Jaw, and other points between there and the Pacific Coast. The Board in charge of the publicity work for the "Victory Loan," propose to stimulate enthusiasm throughout the Dominion by exhibition aeroplane flights, during which airmen will drop literature advertising the loan.

Count Jacques de Lesseps Decorated

Most of the early pioneers of flying are now past active participation in the war and have to confine their efforts to keeping up the supply of aircraft. It is all the more gratifying, therefore, to hear that Comte Jacques de Lesseps, who was the second aviator to fly across the Channel, has just been awarded the Cross of the Legion of Honour for bombing work and for six long reconnaissances involving a good deal of low flying. He has been four times mentioned in Orders.

Charting Air Lanes

WASHINGTON.—Charting air lanes over the United States has been begun by the army. These charts are mosaics made with stereopticon cameras, showing such land marks as waterways, railroads, cities, and mountains for pilots to follow.

From Kelly Field instructors and members of their classes work with the aid of aeroplanes carrying cameras and motor trucks carrying photographic material and supplies and a portable darkroom for developing plates and films. Such an outfit is usually set up in some town in the district to be photographed, which has a landing field adjacent. The men employed in the work are rationed from this camp, and the developing and printing of the films and plates delivered by the aeroplanes are all done here. As fast as one district is finished the outfit moves on to the next.

Douglas Campbell Comes to New York

The American ace, Capt. Douglas Campbell, who has seven enemy planes to his credit, has left Bolling Field to report at New York.

Largest Seaplane Flies Over Washington

The largest seaplane in the United States, the *U. S. S. Nancy I*, flew over Washington on the afternoon of Nov. 8 enroute to Hampton Roads. It carried fifteen officers. This mammoth seaplane flew from a coast patrol station near New York on Nov. 7 and stopped at the Anacostia naval aviation station on Friday morning.

The *Nancy I* has a wing stretch of a hundred and twenty-six feet, and is propelled by three twelve cylindered liberty motors. The pilot has his seat and engine controls between the lower and upper wings. Above the top wing, in the center of the plane is the observer post. Below the lower wing seats for four are fixed, and below that the boat part of the plane has a capacity for a number of observers.

Several officers witnessed the start of the plane on the Potomac from a navy launch. Admiral Taylor of the Bureau of Construction and Repair, Admiral Griffin of the Steam Engineering Bureau and Captain Steele, director of Naval Aeronautics, inspected the plane before the start for Hampton Road.

The plane has a fuel capacity of 300 gallons of gasolene and is used on coast patrol duty, requiring much flying with little opportunity for replenishing gas reserve.

Stops Admissions to Officers' Camps

The War Department has issued orders discontinuing the acceptance of applicants for the central officers' training camps and stopping the organization of any new classes. This order will stop all admissions to the camps, it is understood. There are now about 100,000 men in training.

The November classes will be discontinued and a decision is expected soon as to whether present classes shall be continued to graduation.

None of the additional training camps for officers that had been planned will be established. This includes the Camp Fremont, Cal., camp, to which many District men were to have gone.

For Bonus to Soldiers

A bill granting one month's furlough with full pay to all officers and enlisted men in each branch of the service who have served in the present war has been introduced by Senator Trammel of Florida.

Under its provisions, the furlough would be granted as nearly as possible so as to conclude the term of service, and in effect the bill would bring about the granting of a bonus amounting to one month's pay to each man.

Smithsonian Institution War Collection of the U. S. National Museum

Washington, D. C.—The U. S. National Museum is now assembling and has recently begun the installation of a collection of material relating to the present war which will form one of the most important ever shown in the Museum. The object of the collection is to preserve and exhibit for the benefit of the public a series of objects graphically illustrating the military and naval activities of all of the countries engaged in the war—the United States, its Allies, and the enemy—and will in addition to the military and naval features, include foods and other economic specimens. The immense value of such a museum collection when once assembled cannot be over estimated either from the popular or scientific point of view. It will not only form a fitting and serviceable supplement to the written and printed records relating to the history of the war, but it will also constitute a most notable memorial to the patriotic forces represented by the individuals who have contributed to the preservation of civilization and democracy in the present great crisis.

The collection will have in the aeronautic department Air Service Equipment, including aeroplanes and other accessories of this most important branch of the military war activities. Perhaps the most important single objects already installed in the collection are a number of aeroplanes showing the types of the machines of this character used during the present war. Of these, two machines have been installed in the south hall of the Museum building. One is a Voisin plane of 1917 model used in the French Army for bombing at night, the other a Caudron plane of 1917 model used in the French Army for photographing and reconnoitering. Both of these were purchased by the United States Government from France last year and at that time were regarded as the latest types. An up-to-date U. S. Army training plane has just been added to this portion of the collection.

The collection contains also a distinguishing flag of the Zeppelin L-49 captured at Bourbonne les Bains, France, October 17, 1917, and a fragment of the gas bag and outer envelope of the Zeppelin.



Photo of Rio de Janeiro taken from one of the Brazilian naval seaplanes

ONE HUNDRED AND FORTY-NINE AEROPLANES FLY IN LARGEST FORMATION IN AMERICA

Cadet A. R. Metcalfe

Waco, Texas.—One hundred and forty-nine aeroplanes in formation flight, the largest formation ever known to take the air this side of the big show, was the rare treat presented to the citizens of Waco on November 2 in celebration of the opening of the annual Cotton Palace Exposition in connection with which is appearing the U. S. and Allied Governments Official War Exhibit.

That such an immense undertaking could be staged without a single ship being forced to descend, without the least sign of mishap or trouble with engines or ships, reflects the highest credit upon the flyers who participated and equally upon the officers of Rich Field under whose auspices this remarkable event was staged.

Through the good offices of Major John A. Whitesides, commanding officer of Rich Field, it was arranged for ships and flyers from every flying field in Texas to participate. First Lieut. Maurice A. Sharp, officer in charge of flying, arranged the details of this great flying pageant, and much credit is due him for its success.

A sight, rare even to experienced flying men, was presented when promptly at 9 A.M. the entire number of ships entered—one hundred and forty-nine in number—drew into position on the field, props flashing in the sun, engines throbbing to be off, all arranged in fourteen perfect ranks of "company front" from nine to thirteen ships in each row. Each row of ships comprised a unit or squadron, and the fourteen units in file made up as great and impressive a formation as was ever witnessed.

The first unit, composed of nine Rich Field ships, was led by First Lieut. M. T. Chamberlain, Asst. Officer in Charge of Flying, followed by First Lieut. H. G. Andrews, Second Lieuts. D. W. Crump, E. H. Miller and E. E. Glenn and Civilian Instructors J. P. McGrath, G. E. (Buck) Weaver, A. W. Claverie, and Dan E. Davidson.

The five succeeding units of the formation were likewise composed of Rich Field ships with Rich Field pilots and were led respectively by Lieutenants M. D. Mann, M. G. Kregle, J. O. Nelson, E. E. Hughes, George O. Berg.

Brooks Field at San Antone was represented by a crack squadron of flyers led by Captain McCready, Officer in Charge of Flying at Brooks.

Carruthers field at Fort Worth sent down a contingent of flyers who well deserved the praise they received for the excellence of their formation work. A number of Cadets, well along in their training, piloted some of the Carruthers machines. Lieut. Ayers of Carruthers was in charge of this group.

The squadron from Taliaferro Field was led by Major Macauley; that from Barron Field by Lieut. Burton, and those from Kelley Field by Lieut. Dorsey. Love Field at Dallas sent 13 ships under the leadership of Captain Wooten.

A number of pilots assigned to the Second Provisional Wing, stationed at Ream Field near Houston, came up in a squadron, and a number of Ellington Field ships entered also.

The ease and precision with which the formation was got under way is counted as an especially noteworthy feature in view of the large number of ships which were to be marshalled into position and started off within so short a time. The arrangement of the ships by unit squadrons in the fourteen rows for the take-off solved this problem.

At the signal to start, the centre ship of the first line, Lieut. Chamberlain piloting, took off, followed at three second intervals by the succeeding pairs of ships comprising this unit. The thirteen remaining ranks took off in turn in the same manner and without the slightest confusion, until within a space of five minutes there could be seen winging away to windward a total of 149 planes, each in proper place and each holding position without the slightest difficulty. At 1000 feet altitude, the leading unit swung off to the east followed by a stream of orderly "V's," gaining altitude and encircling the city, flying directly over the downtown section and across the Exposition Grounds where 60,000 people were craning their necks in an effort to encompass in a single glance the length and breadth of the spectacle above.

Upon the breaking up of the formation there followed a perfect galaxy of stunt flying directly over the city, during which every conceivable trick known to stunt flying was staged. Lieut. Chamberlain's No. 1 Unit staged a flying circus all its own. At the break-up signal, the nine ships in the "V" drew up abreast of the leader into a perfect line whereupon the nine ships looped simultaneously. This clever feat was followed by individual stunting over the very roof-tops of the business section which afforded more thrills to Waco in five minutes than it is credited with having experienced in the last five years. One nervy pilot spiralled down below the sixth story of Waco's one and only skyscraper, the Amicable Building of 20 stories.

"Buck" Weaver and Walter Claverie, Civilian Instructors at Rich Field, furnished additional

(*Continued on page* 585)

THE "LANGLEY" at Erie, Pa.



THE Handley Page bombing machine "Langley", built by the Standard Aircraft Corporation, did its part in helping the recent Liberty Loan Drive by flying from Mineola, L. I., to Utila, Buffalo, N. Y., Erie, Pa., and Dayton, Ohio.

The plane was driven by two Liberty Motors and piloted by Captain E. B. Waller of the British Royal Air Force. The other members of the crew were Lieutenant G. Beck of the United States Air Service, "Doc" Allen, Chief of the Flying Instruction, U.S.A. R. M. Brown, Liberty Motor expert; A. Berndt of the British Air Board, Sergeant McAfee, U. S. Air Mechanic, and L. Milani, mechanic.

After distributing Liberty Loan Literature in Utica the big bomber flew to Buffalo and circled over the city dropping more Liberty Loan circulars. Without landing the Aeroplane continued on to Erie where it was received on Friday afternoon by the officers and employees of the Erie Specialty Company which made most of the 4000 odd nuts and bolts in the construction of the aircraft.

The Fliers spent the night in Erie and early on Saturday proceeded to Dayton, Ohio, where they were received with great enthusiasm.

The "Langley" was described in AERIAL AGE at the time of its launching in Elizabeth, N. J., in July 6. It measures 100 feet from wing tip to wing tip and the body is 65 feet long. Two Liberty Motors of 400 h.p. The gas tank holds 400 gallons and the oil tank has a capacity of twenty gallons. The "Langley" weighs 9,000 pounds and carried two tons of useful load.

Mr. W. C. Adams, plant manager of the Erie Specialty Company engineered the entertaining of the fliers at Erie. The Erie Board of Commerce and the Erie Exposition Association also assisted in the entertaining.



The crew of the American-built Handley-Page biplane "Langley"

The AIRCRAFT TRADE REVIEW

N. E. J.

Aeroplane Testing Fields Transferred to Division of Military Aeronautics

By an agreement between the two divisions of the Air Service, the acceptance parks or testing fields located at Dayton, Ohio; Detroit, Mich.; Buffalo, N. Y.; and Elizabeth, N. J., have been transferred from the jurisdiction of the Bureau of Aircraft Production to the Division of Military Aeronautics, and the method of testing the finished product is now undergoining a complete change.

3,878 Libertys in October

Washington.—Three thousand eight hundred and seventy-eight Liberty engines were produced in October as compared with 2,378 in September, an increase of 1,500. This increased production was made despite influenza, which threatened to hamper the output of the various factories. The quota set for September was 2,500 engines and the actual number shipped was 2,378. The quota set for October was 3,000. The competition among the various factories has now become a race with each concern showing keen interest.

To Make Propeller Material

Hayward, Wis.—The American Veneer Co. has been organized at Hayward, Wis., with a capital stock of $100,000, and will erect and equip a new plant for the manufacture of aeroplane veneers, propeller material, gun stocks and similar hardwood products for military and naval purposes. George C. Glover, head of the Willow River Lumber Co., Hayward, is president and general manager of the new concern.

Personal Pars

A. H. Doolittle, formerly sales and advertising manager of the Zenith Carbureter Co., Detroit, has joined the publication division, service department, Bureau of Aircraft, in Detroit.

Archibald Black, recently aeronautical engineer of the L-W-F Engineering Co., College Point, N. Y., has become aeronautical engineer with the Bureau of Construction and Repair, Navy Department, Washington, D. C., and began his duties there October 21, 1918.

Glenn Martin Develops 180-M.P.H. Bombing Plane

Washington.—A bombing plane designed by Glenn Martin which is said to have developed a speed of 180 m.p.h., is receiving the attention of both the Senate Military Affairs Committee and the Bureau of Aircraft Production. This plane was mentioned in conference between the members of the War Department and the committee. There have been rumors here that there was a new high-powered plane designed, and that it would supersede the Handley-Page and Caproni in our program. Although the report of a new plane has been confirmed in the acknowledgment that Mr. Martin has designed one, nothing definite can be learned at this time regarding its superiority over the Caproni or Handley-Page.

Adopt Specifications for Gasoline

Washingfon.—Following conferences between the Specifications Commission of the Allies and the American Committee on Standardization of Petroleum Products, standard specifications for motor and aviation gasoline have been adopted.

Under these specifications aviation gasoline has a far higher end point than commercial grades of fuel; motor gasoline, which is for the use of motor transport vehicles, is slightly different from the commercial grade. Ordinary commercial gasoline has an end point of approximately 450 deg. Fahr. Under the new specifications aviation gasoline has an end point of 347 deg. Fahr. for domestic purposes and 257 deg. Fahr. for the fighting grade, and motor gasoline of 420 deg. Fahr.



Mr. L. G. Randall, Superintendent of Plainfield Plant of the Standard Aircraft Corp.

Following are the specifications as adopted by the Commitee on Standardization of Petroleum Specifications:

Specifications for Aviation Gasoline

1. *COLOR:*—The color shall be water white. *Test*—Inspection of a column in a standard 4-ounce oil-sample bottle.

2. *FOREIGN MATTER:*—The gasoline shall be free from Acid, undissolved Water and Suspended Mater.

Acid Test: The residue remaining in the flask after distillation is completed is shaken thoroughly with 1 cc. of distilled water. The aqueous extract must not be colored red on addition of a few drops of methylorange solution. *Water and Suspended Matter* would be in evidence in the test for color.

3. *DOCTOR TEST:*—The gasoline shall yield a negative doctor test.

Directions for making doctor test on gasoline:

(A) *Preparation of reagents:*—Sodium Plumbite or "doctor solution": Dissolve approximately 125 grams of Sodium Hydroxide (NaOH) in a liter of distilled water. Add 60 to 70 grams of litharge (PbG) and shake vigorously for 15 to 30 minutes, or let stand with occasional shaking for at least a day. Allow to settle and decant or siphon off the clear liquid. Filtration through a mat of asbestos may be employed if the solution does not settle clear. The solution should be kept in a bottle tightly stoppered with a cork.

Sulphur: Obtain pure flowers of sulphur.

(B) *Making of Test:*—Shake vigorously together two volumes of gasoline and one volume of the "doctor solution" (10 cc. of gasoline and 5 cc. of "doctor solution" in an ordinary test tube; or proportional quantities in a 4-ounce oil-sample bottle may conveniently be used). After shaking for about 15 seconds, a small pinch of flowers of sulphur should be added and the tube again shaken for 15 seconds and allowed to settle. The quantity of sulphur used should be such that practically all of the sulphur floats on the surface separating the gasoline from the "doctor solution."

(C) *Interpretation of Results:*—If the gasoline is discolored, or if the sulphur film is so dark that its yellow color is noticeably masked, the test shall be reported as Positive and the gasoline condemned as "sour." If the liquid remains unchanged in color and if the sulphur film is bright yellow or only slightly discolored with gray or flecked with black the test shall be reported Negative and the gasoline considered "sweet."

4. *CORROSION AND GUMMING TEST:*—The gasoline when subjected to the corrosion test shall show no gray or black corrosion and no weighable amount of gum.

Directions for Making Test:—The apparatus used in this test consists of a freshly-polished hemispherical dish of spun copper, approximately 3½ in. in diameter.

Fill this dish to within ⅜ in. of the top with the gasoline to be examined and place the dish upon a steam bath. Leave the dish on the steam bath until all volatile portions have disappeared.

If the gasoline contains any dissolved elementary sulphur, the bottom of the dish will be colored gray or black.

If the gasoline contains undesirable gum-forming constituents, there will be a weighable amount of gum deposited on the dish.

Acid residues will show as gum in this test.

Interpretation of Results:—CORROSIONS: It is specified that no gray or black deposit shall be formed. This wording is intended to admit gasolines that have so small a quantity of sulphur that the deposit is peacock colored.

GUM: It is specified that there shall be no weighable amount of gum. The intention is to refuse admittance to gasolines that show an amount that can be readily weighed in this style of dish.

The distillation method and apparatus shall conform to those outlined and described in Bureau of Mines Technical Paper No. 166, entitled "Motor Gasoline, Properties, Laboratory Methods of Testing and Practical Specifications."

Volatility and Distillation Range—Export Trade

When 5 per cent of the samples has been recovered in the graduated receiver the thermometer shall not read more than 149 degrees Fahr. or less than 122 degrees Fahr.

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 203 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 257 degrees Fahr.

When 96 per cent has been recovered in the received the thermometer shall not read more than 302 degrees Fahr. and the end point shall not exceed this temperature by more than 27 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The Distillation Loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

Volatility and Distillation Range—Fighting Grade

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 158 degrees Fahr. or less than 140 degrees Fahr.



The Italians have been flying large machines from snow for the past three years. This shows a Caproni biplane in winter surroundings

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division

AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Frank Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Darneille
August Thiele
Herman E. Fremming
Frank Tower

Ready for New York-Chicago Aero Mail Service

Chicago.—Capt. B. B. Lipsner, Superintendent of Aerial Mail Service, received a telegram from Otto Praeger, Second Assistant Postmaster General, on November 18 requesting him to have all hangars, oil tanks and other equipment in readiness the first week in December for the regular aero mail service between Chicago and New York. The telegram said an aeroplane will reach Chicago about December 5 to make a trial flight.

AERIAL MAIL OPERATION FOR THE MONTH OF OCTOBER 1918.

Date 1918	Miles flown	Hrs. of Flying		Mail Carried		Percent of Performance	Arrival	
		hrs.	min.	A.	O.		Wash.	N. Y.
Oct.	1.	2.		3.		4.	5.	
1	436	5	04	34	593	100 %	2.38	2.23
2	436	6	14	32½	602	100 %	4.28	2.00
3	436	5	39	35½	578	100 %	3.21	2.25
4	436	6	01	30½	609	100 %	3.51	2.38
5	436	5	59	30	590	100 %	4.13	2.05
7	436	5	50	29½	489	100 %	2.21	3.28
8	436	5	36	34½	574	100 %	2.44	3.00
9	436	5	30	33½	562	100 %	2.49	2.33
10	654	8	19	33	886	100 %	2.43	2.35
11	654	9	46	34	852	100 %	4.20	2.12
12	436	6	53	28¾	564½	100 %	5.15	2.03
14	436	5	46	45½	601	100 %	3.03	2.40
15	466	6	22	30½	608	100 %	3.28	3.30
16	436	6	26	27½	243	100 %	3.49	2.57
17	436	6	16	32½	600	100 %	4.07	2.12
18	520	6	35	31	770	100 %	2.45	3.12
19	436	5	29	34½	574	100 %	2.43	3.45
21	436	5	58	35	518	100 %	3.47	3.05
22	436	5	51	35	556½	100 %	3.15	3.15
23	436	5	22	40	507	100 %	3.33	2.56
24	436	5	59	33	499	100 %	4.12	2.25
25	436	5	39	30½	526	100 %	3.26	2.10
26	436	5	50	33	522½	100 %	3.34	4.05
28	436	5	29	38	593	100 %	3.43	2.08
29	436	5	48	53½	598	100 %	4.13	2.23
30	281	2	04	35½	713	50 %	*	2.35
31	436	5	50	49	520	100 %	4.00	2.04
Ttl.	12,167	161	35	939¾	15,848½			

*Forced landing. Mail sent in by train.

Note: Number of hours dead flying for the month, 10 hours, 36 minutes.

Explanation of Tabulation;

1. **Miles flown;**
   Leg from Washington to Philadelphia..128 miles
   Leg from Philadelphia to New York.... 90 miles
   Miles flown for the day, whether one, two, three or four legs of the trip have been made.
   The aim is to get exactly the number of miles flown in connection with the mail service each day. Therefore, mileage of partial trips should be indicated.
2. **Hours of flying;** To include the actual hours and minutes machine is in the air with mail.
3. **Mail carried;** In this column, under A., give pounds of aeroplane mail; and under O., give pounds of ordinary mail.
4. **Percent of Performance;** Round trip Washington-New York consists of four legs, each leg valued at 20% if completed by aeroplane and not by train before close of day.

PERFORMANCE OF AVIATORS DURING THE MONTH OF OCTOBER. 1918.

Total possible number of flights	108
Total possible mileage	11,772
Total perfect (uninterrupted) flights made	105
Total interrupted flights made	2
Total flights defaulted on account of weather	0

Pilot	Perfect Flights		Forced Landings		Total Flights	
	No.	Miles	Interrupted Flights	Uncompleted Flights	No.	Miles
Dana C. DeHart	30	3270	0	0	30	3270
Maurice A. Newton	25	2744	1	1	27	2897
Robert F. Shank	26	2834	0	0	26	2834
Max Miller	24	2616	0	0	24	2616
Total	105	11,336	1	1	107	11,617

5,000 H. P. Planes May Carry Mail Across Atlantic Ocean

By Frederick M. Kerby
N. E. A. Staff Correspondent

New York.

Fifty million dollars' worth of aerial mail and 25,000,000 worth of parcel post business is awaiting the time when the plans already made by the Postoffice Department are fully carried out and the aeroplanes and pilots that the war is producing are at the disposal of the postal authorities for mail-carrying.

However startling such an estimate may seem, this is actually a conservative business calculation.

Henry Woodhouse, a governor of the Aero Club of America, has made a study of the possibilities of mail-carrying by aeroplane.

"Aircraft capable of lifting fifteen tons, with a speed of 100 miles an hour, are now in actual production," he said. "The first of the American-built Caproni planes, equipped with four Liberty motors and developing 1,750 horsepower, has just been successfully tested. This giant plane has a total lifting capacity of 40,000 pounds, or 20 tons. The super-Handley-Page or the Caproni could easily carry fifty bags, or more than a ton of mail. This means 100,000 letters. Judging the future development of aircraft by what has taken place in the last two years, we may look for the building of a 5,000 horsepower aeroplane, possibly within a year.

Four Hundred Miles a Day by Postplane

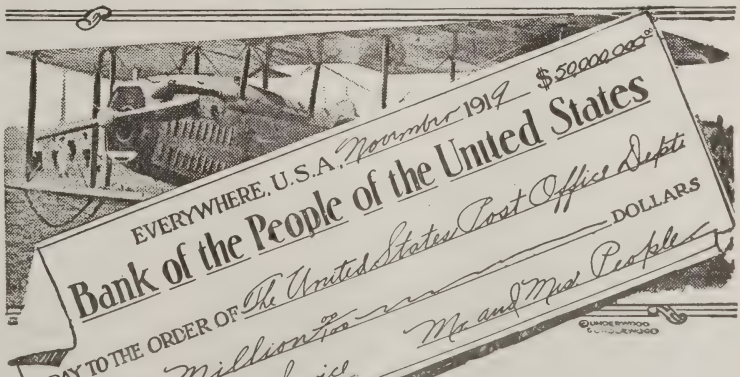
"If the people of the various cities along the eight great airways already proposed insist on it, at least a dozen additional aerial mail lines can be established within twelve months," Woodhouse continued. "This can be done by utilizing only machines not needed by the army or navy. That means it will be possible to send by postplane at least 50,000,000 of the 100,000,000 day and night letters, and at least 25,000,000 of the 50,000,000 special delivery letters that are sent each year in the United States.

Postoffice officials estimate that the average cost of telegraphic day and night letters now going over the wires is close to $1 each. Special delivery letters average about 13 cents apiece.

"This makes a total of more than fifty million dollars' worth of potential aerial mail business that is simply waiting for the establishment of aerial mail routes which can easily be established within the next twelve months.

"Four hundred miles is the distance over which postplane day mail is most effective. Aerial mail letters are effective over any distance, since, with proper stations, light signals and guides for night postplane flying, the air mail can be carried more than 1,000 miles between the hours of 6 P. M. and 8 A. M.

(*Continued on page* 583)



A check which, in line with modern development, should be honored this year

THE WORKING PROCESS OF INTERNAL COMBUSTION ENGINES

By E. H. SHERBONDY

DURING the past fifteen years the commercial development of the internal combustion engine has come forward from a place of questionable utility to a necessity of the first rank in the public mind, and has undergone a process of remarkable improvement from a mechanical viewpoint. Perhaps no other invention has brought the meaning of the word "efficiency" into so much prominence, in this industrial era, than has the internal combustion engine.

Through the forty years prior to the commercial development of the internal combustion engine, inventors devised many new fundamental schemes for heat engines, only a few of which were destined, however, to an important commercial development. A brief historical review allows us to compare the important inventions in this field and permits us to show how the efficiency of the internal combustion engine has been increased in the sixty years past.

In spite of the remarkable mechanical development shown in the construction of gas and oil motors and particularly those for use in the propulsion of *vehicles where specific output* is a matter of greatest concern investigation of the physical and thermo-dynamic problems encountered have been few. Aeroplanes, motor cars, motor boats, in which the horsepower per pound of weight required is of prime importance as well as is the fuel consumption efficiency.

The future development in this field, however, calls for an increasing amount of technical information concerning the working process (*heat-work conversion process*) of internal combustion motors.

Lenoir Engine First

Fig. 1 shows the Lenoir engine to have been the first double acting two-stroke engine. Lenoir failed to realize success with his engine owing to its low efficiency as contrasted with the steam engine of that day. The actual working efficiency was 4% of the heat energy supplied, and this low efficiency is attributable to the small expansion ratio (no compression, small expansion), and also because the amount of heat transmitted to the walls was relatively large, due to the long time the cylinder walls were exposed to the burning and expanding gas and the enormous superficial area of the combustion chamber.

THE LENOIR ENGINE
DOUBLE ACTING TWO STROKE.

Fig. 1 A

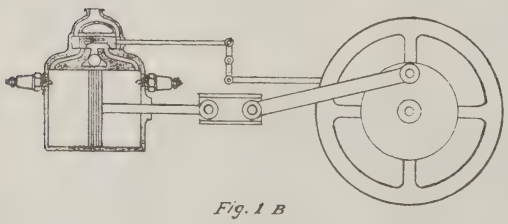
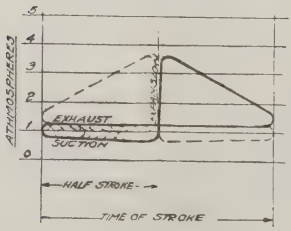


Fig. 1 B



In 1873 Julius Hock of Vienna produced the first petrol (gasoline) engine operating on the Lenoir cycle.

About the time of the appearance of the Lenoir gas engine M. Beau de Rochas patented a gas engine based on the following postulates:

1st. The largest volume of gas with the smallest possible enclosing surface.

2nd. The highest possible speed of the working piston.

3rd. The greatest possible expansion ratio.

4th. The maximum pressure at the beginning of the working stroke.

It was not, however, until 1876 that the Beau de Rochas cycle was approximated in a working engine by Dr. N. A. Otto, of Cologne, Germany, who founded The Gasmotorenfabrik Deutz, Cologne, and it was to Otto's inventive and practical work that we owe the remarkable development of the internal combustion engine as we have it today, since all the cycles of operation in use utilize at least the essentials of Otto's 1876 gas engine.

We will now proceed to a discussion of Otto's gas engine. In Fig. II the piston strokes and theoretical corresponding gas pressure are indicated graphically by the lines and curves AB, BC, CDE and EF. In the first piston stroke from A to B we have a horizontal line practically, representing admission at atmospheric pressure; from B to C the pressure rises from 1 atmosphere to 5, 6, 7, 8 or 9 atmosphere, as the case may be, which pressure is said to be the compression pressure. At the end of this second stroke ignition is applied to the combustible mixture and the pressure rises rapidly, almost instantaneously from C to D, all of the mixture having burned, expansion follows during third stroke from D to E. At E the exhaust is opened and scavenging of the burned gases continues to F during fourth stroke at substantially atmospheric pressure.

In Fig. III we unite the curves of gas pressure to form the theoretical indicator diagram. Fig. IV also shows the indicator plotted above the corresponding piston motion diagram.

In designating the theoretical diagrams shown in Figs. II, III, and IV we have assumed that:

1st. Admission of the change takes place at atmospheric pressure and scavenging (exhaust) takes place without back pressure.

2nd. Combustion is instantaneous, at constant volume and no heat is lost during the process of ignition.

3rd. Combustion is complete and perfect.

4th. Expansion is complete and adiabatic.

In reality each of these hypothesis are without foundation and the discussion to this point is only an approximation of the natural process undergone during the cycle of operation.

1st. Admission and exhaust involve back pressure, caused by the frictional resistance to the movement of gases through the port and valves, and further important heat interchanges take place between the combustion chamber, cylinder walls and the gaseous contents.

2nd. Ignition of the combustible mixture does not take place instantaneously, but in certain period of time, varying from 1/10 of a second to 1/300 second, during which period the piston is in motion and the volume varying. Also heat is lost to the walls of the combustion chamber (which are at low temperature).

3rd. Combustion is not completed ordinarily during the rise of pressure following ignition, and continues during a portion of the expansion.

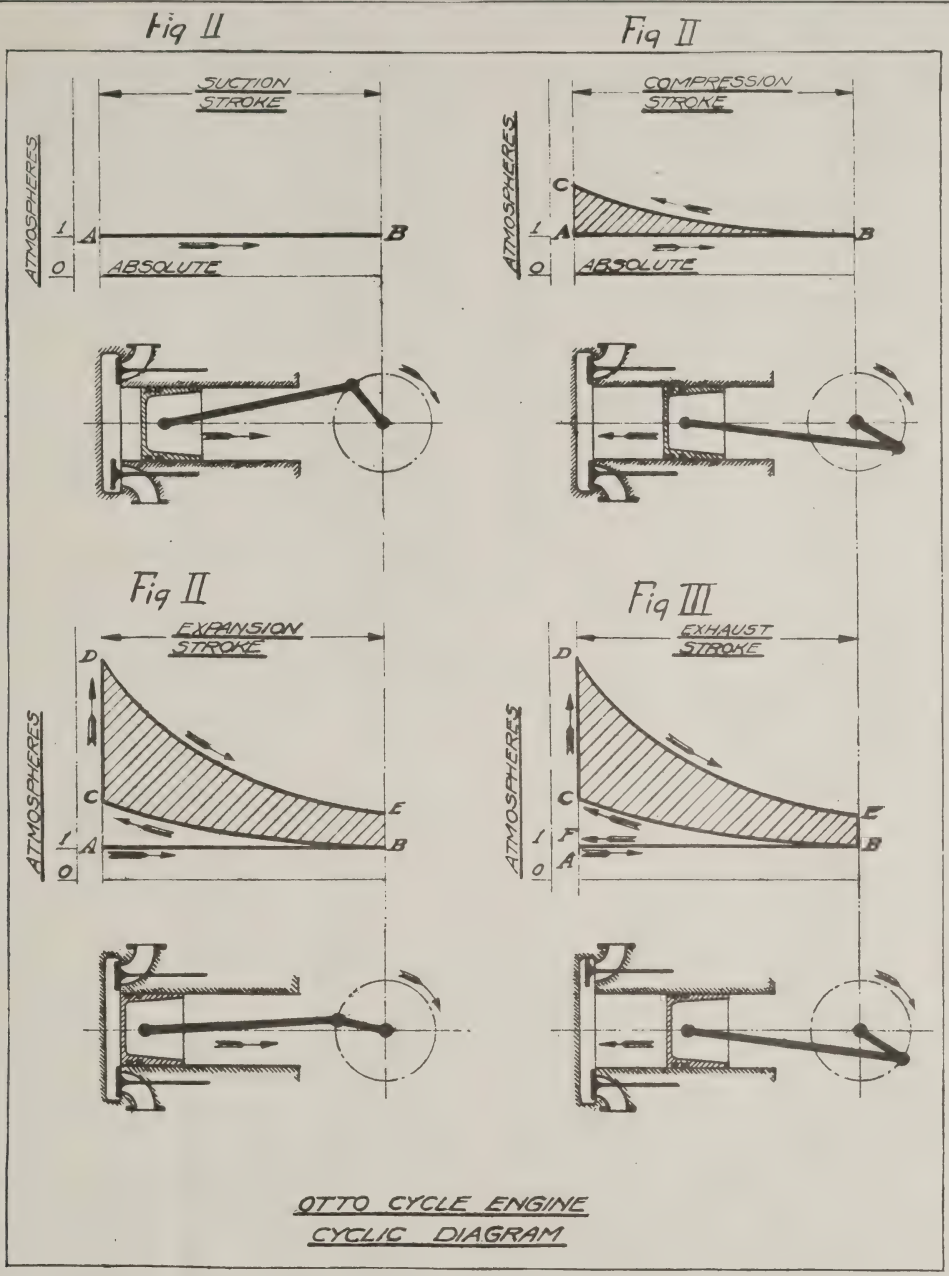
4th. Expansion is incomplete and can not be adiabatic since heat is lost to the cylinder walls.

As has been seen the working cycle of Otto's engine is distributed over four portions of time and has been called half acting, or is said to be of the four stroke cycle type.

It may be remarked that Otto's engine is a compression pump during the first and second phases, it sucks in and compresses the mixture; it is only during the third and fourth phases that it is a driving engine and conducts a real working process. The two processes can be separated suction and compression undertaken in a special cylinder, a compression pump, and during the compression the mixture can be forced into the second cylinder (power cylinder) in which combustion, expansion and scavenging occur.

This latter method of operation was developed by Clerk, Körting, Witting and Hüs, von Occhelhaüser and Junkers and is known as the two-stroke cycle. Of this method of functioning Gülchner says, "It is certain that the two-stroke cycle of work must serve as the basis for future progress in internal combustion motors, and to the exclusion of all other cycles."

This view at first championed by only a few engineers and constructors is rapidly finding favor among gas and oil engine builders, where the problems of size, weight, and first cost make it imperative that material be put to its best use.



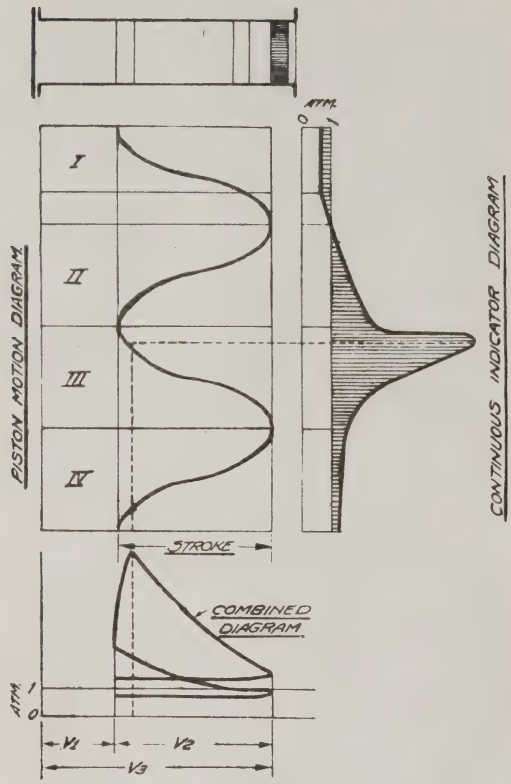
Daimler and Fernand Forest

Together with Otto and Langen, Gottlieb Daimler, founded the Gasmotorenfabrik Deutz at Cologne, Germany, in 1872. Ten years later he separated from the Deutz Company, retiring to Cannstadt, Germany, where he conceived and developed motors operating at the then considered frightful speeds of 500-800 r.p.m. First conceived of for use in small boats, Daimler's motor was later applied to two-wheeled vehicles in 1886, later on tricars, and finally four-wheeled carriages. Daimler was first to see and take advantge of the possibilities of high crank shaft speeds, and his brilliant and indefatigable efforts resulted in the foundation of the motor vehicle industry. Daimler's remarkable mechanical improvements resulted in improved functioning and increased specific output, however, his work was of mechanical rather than thermodynamic character.

Fernand Forest

Working independently and with prodigious energy, Fernand Forest, Paris, France, designed and built a great many motors of the four-stroke cycle type. Commencing in 1881 with a single cylinder gas engine, he proceeded to the development of gasoline engines with opposed pistons in 1885, a four-cylinder vertical block motor in 1889, two six-cylinder motors between 1889-1891 and a four-cylinder vertical motor, utilizing mechanically operated poppet valves, enclosed crank chamber, copper water jackets, magneto ignition. In each of these featural developments Forest appears to have been first, his work, however, was almost unknown and he died without attaining financial success, although his motors were the prototype of our modern vehicle motors. Recognition for Forest's inventive genius was secured in 1910, by the combined efforts

Fig. IV



of Marquis De Dion, Arch Deacon Georges Gallice, Paul Faure, H. Dunnod and Chas. Faroux, all of Paris, France.

Diesel's Heat Motor

In 1893 Rudolph Diesel, Berlin, edited an article, "The Theory and Construction of a Rational Heat Motor," in which as a result of special thermodynamic inquiry he developed a mode of working and construction which later received the highest consideration in technical quarters and while his actual working engine developed between 1897-1900 did not realize all of his proposals, it did mark an important step in the development of heat engines, so that today upward of 200 manufacturing companies are building engines operating on the Diesel cycle.

The working process may be carried out in the two-stroke or four-stroke cycle and is as follows:

(a) During the admission stroke atmospheric air only is admitted to the working cylinder, and is then compressed (in actual working engines) to from 30 to 50 atmospheres. The compression space now contains pure atmospheric air of high pressure and temperature which has been produced in a purely mechanical way (compression). Into this space, fuel under great excess of pressure is introduced and Diesel from the first thought of utilizing solid fuel (coal dust), liquid fuel (petroleum, naptha, alcohol), or gaseous fuel (compressed illuminating gas).

(b) Ignition of the fuel is insured by the high temperature of the air at the end of compression. The temperature of ignition has a particular value for each fuel under given conditions, and is lower, the higher the pressure at which the fuel is introduced. Petroleum behaves particularly well in the Diesel Motor and small quantities may be used to start the ignition of heavy tar residues, etc.

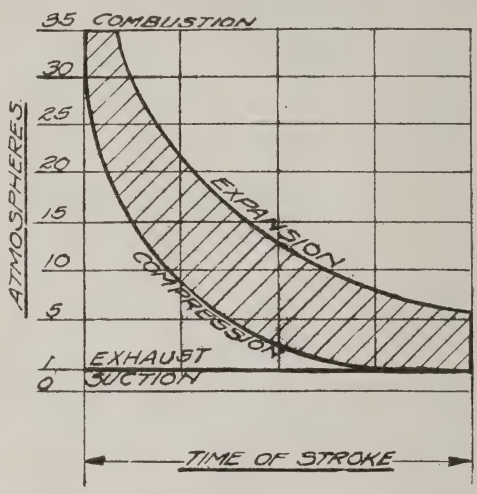
(c) Combustion begins immediately after ignition, *the temperature of combustion* is a consequence of the chemical occurrences connected with combustion and depends on the quantity of air present, which *Dicsel uses in great excess* in opposition to the hitherto customary view that in ordinary combustion, the air supply should be but a little more than is just needed for combustion.

(d) The blowing of the fuel into the compression space, already filled with dense air of high temperature occurs during the first portion of the outstroke of the piston, and the rate of fuel supply is regulated so as to maintain constant pressure (approximate) during the period of injection at the close of combustion expansion occurs and was assumed to be adiabatic (which, however, is not the case). Scavenging in the same manner as the gas engine now completes the cycle of operation.

In the first operative Diesel engine tested by Schröter an indicated thermal efficiency of 26% was secured and a brake thermal efficiency (effective work efficiency) of 20%. These efficiencies were far superior to any others attained in heat motors (1897) but have since been very markedly improved (1918).

Fig. V shows the indicaator diagram of Diesel's motor as contrasted with the gas or gasoline engine. Diagrams 1 and

Fig. V A
THEORETICAL DIESEL ENGINE



2 are the theoretical and actual indicators respectively for the Diesel constant pressure engine. Diagrams 3 and 4 are the theoretical and actual indicators of Otto's constant volume gas engine.

While the historical development of the internal combustion engine has been frequently discussed, it is, however, not without interest to review the development following Schlöttler's comparison (*See Die Gas Machine* 1909). The diagram (6) clearly shows at a glance the increase in efficiencies recorded. The years are drawn as abscissae and the efficiencies, based on gas consumption per effective horsepower are drawn as ordinates.

The diagram begins with Lenoir's engine, having an effective work efficiency of 4%. In 1867 the free piston Otto engine was produced, the working indicator diagram of which is shown in Fig. 7. Admission of the combustible mixture take place during the first portion of the outstroke of the piston, ignition and combustion then take place as in Lenoir's engine. This corresponds to late ignition in the modern four-stroke cycle engine, and as is well known is very unfavorable from a point of heat efficiency (since the speed at this point is relatively high the mixture ignites slowly, tending to fail altogether), owing to incomplete combustion and the enormous superficial area of the mixture volume.

Riedler states in published tests that, owing to late ignition the indicated efficiency may drop 50%. The reason lies in the extremely complicated occurrences during combustion. These will be discussed later on in our studies.

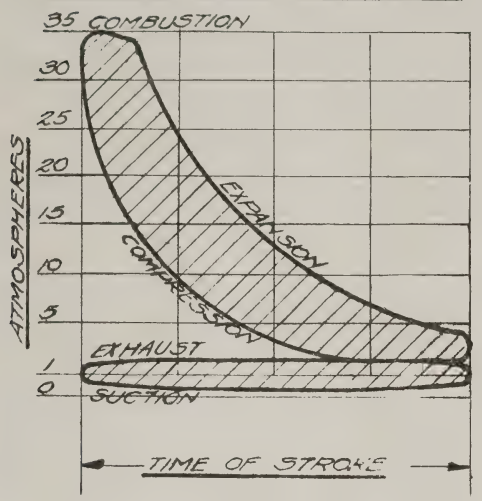
From this point of view the Otto free piston engine possesses no advantage thermo-dynamically, although the expansion ratio is greater, and continue to below atmosphere.

The expansion ratio is approximately equal to

$$E = \left(\frac{Pi}{P2}\right)^{\frac{1}{1.37}} = \text{about } 3.$$

Fig. V B

ACTUAL DIESEL ENGINE



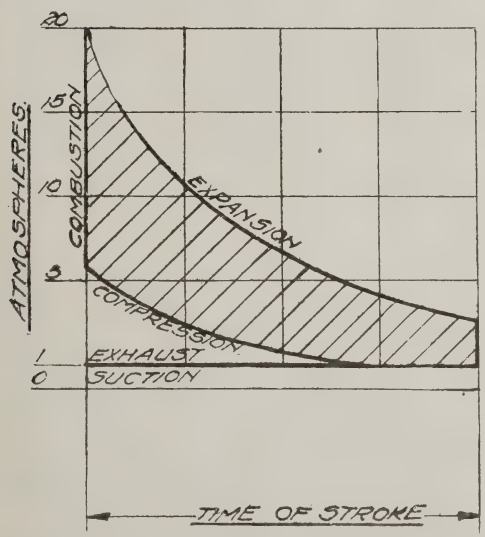
From the end of expansion the piston must impart to the exhaust gases exactly the same amount of energy which they give to the piston during expansion below atmospheric.

Otto's 1867 free piston engine attained about 15% efficiency following with his four-stroke cycle engine, 1876-1878, with about 12% effective.

The next step of importance was Diesel's heat engine of 1897, with 26% effective work efficiency.

Fig. 6 A

THEORETICAL GAS ENGINE (OTTO)



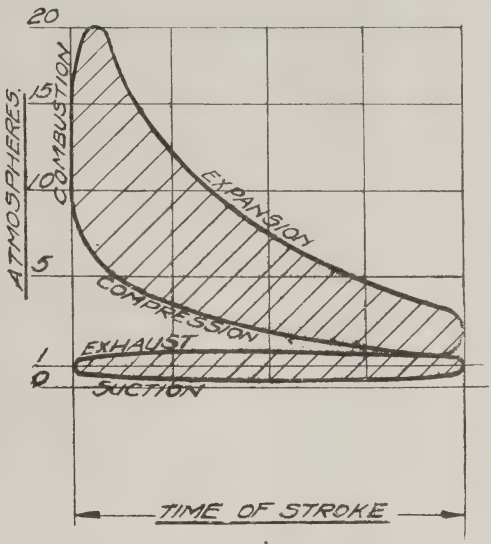
The four-stroke cycle gas engine has been increased in efficiency from 12% in 1878 to 15-19% in 1888 (London Exhibition), operating on illuminating gas. Between 1888-1905 the efficiency was raised to 20-24%. By 1916 we are able to record the extraordinary high efficiency of 34.16% of total heat supplied converted into useful work.

This last result was secured in test by Schröter, Meyer and Dr. Koobor a Gueldner gas engine.

As an interesting contrast it may be said that the *two*-stroke

Fig. 6 B

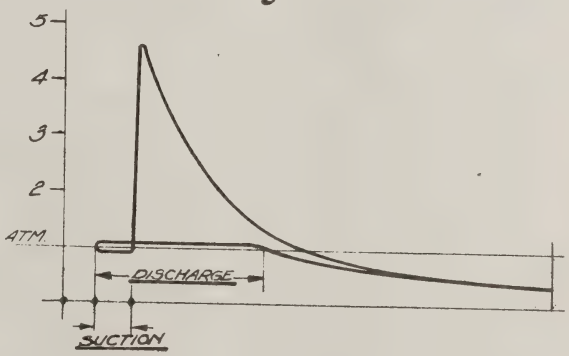
ACTUAL GAS ENGINE (OTTO)



cycle gas engine has shown equally good results as constructed by Von Occhelhauser and Junkers, with the added remarkable result of 3 times the specific power per unit piston displacement.

The Diesel engine has been constructed in increasing sizes each year, both two- and four-stroke cycle and its efficiency has been increased from 26% (1897) to 37-39% (1918) of total heat supply converted into useful work. At present the United States Government have under construction at Brook-

Fig. 8



OTTO DIAGRAM

FREE PISTON ENGINE

lyn Navy Yard two six-cylinder, two-stroke cycle Diesel engines of 2,500 b.h.p. each for use in submarine tenders.

It is a matter of interest in the comparison to determine the product of the area of the combustion chamber per horsepower, multiplied by the combined times of combustion and expansion. This figure gives an approximation of the amount of heat lost to the walls relative to the amount of heat supplied:

O = area of combustion chamber in M^2 or $(ft)^2$.

H. P. = Horsepower.

Taking the data of Lenoir's engine:

Diameter of cylinder = 160$^m/_m$ (6$^3/_{16}$ inches).
Stroke = 300$^m/_m$ (11$^4/_8$ inches).
B.h.p. = 1.
Speed = 81 r.p.m.
Displacement = 6 litres (366 cubic inches).

The area of the combustion space at the end of expansion 19.2 sq. m. and the ratio:

$$\frac{O}{H.P.} = 19.2 \text{ sq. in.}$$

The time of expansion was 0.185 sec.

$$\frac{O}{H.P.} \times t = 19.2 \times 0.185 = 3.55.$$

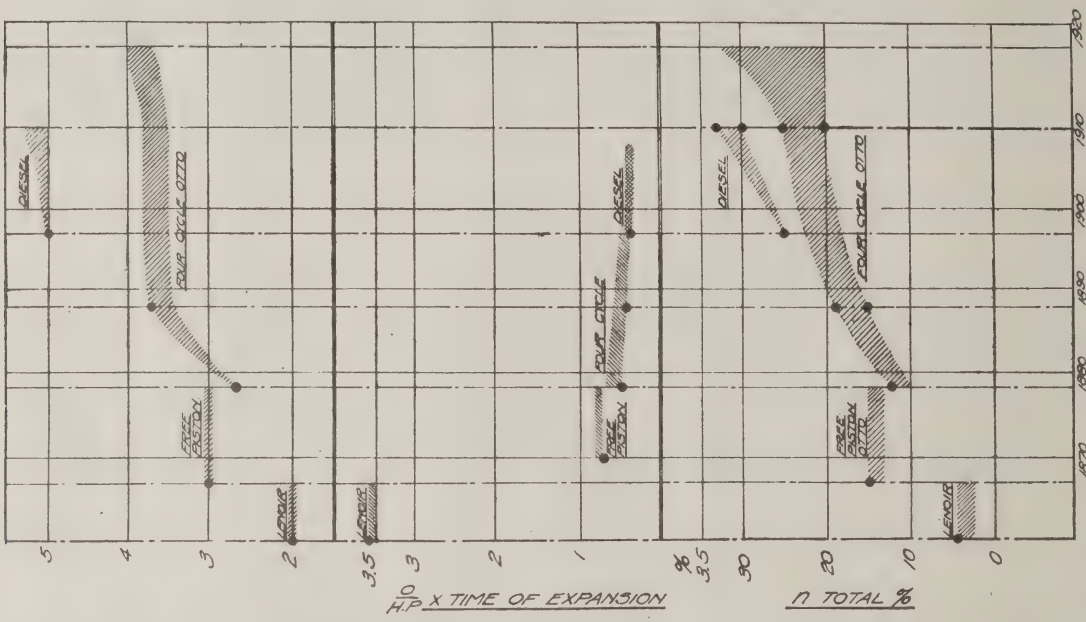
The expansion ratio was E = 2.

It is to be observed that increased efficiencies have accompanied increased compression pressures, greater expansion ratios and shorter times of expansion. Of extreme importance are the increases in piston speeds which have obtained during the last fifteen years, as by this means marked improvement in specific capacity, economy, etc., have been obtained. We shall discuss this important subject later on in the technical investigation of the working process of internal combustion engines.

The examination of the physical occurrences, now demands the study of the nature of the fuel utilized, the real process of combustion and of the experimental data on hand concerning it.

Because of the real interest in the Diesel heat motor we shall contrast its development as a constant pressure engine from time to time with the Otto or Clerk constant volume engines.

Fig. 7



CURVES SHOWING HISTORICAL DEVELOPMENT

η, E, O/H.P. X TIME

THE HUGHES AIRCRAFT REPORT

(*Continued from last week*)

FIFTH—SELECTION OF CONTRACTORS AND DISTRIBUTION OF WORK

Selection of Contractors

For engines to be used in training planes, there were orders (to June 30, 1918) for 7,950 OX-5s distributed among the Curtiss Aeroplane and Motor Corporation, the Willys-Morrow and Willys-Overland companies. Orders for the Hall-Scott engines (2,250) were placed with the Nordyke & Marmon Company and the Hall-Scott Motor Company. The General Vehicle Company received an order for 111 Gnome engines (100 H. P.), and the unfilled portio n of this order was taken over by the Aeronautical Engine Company, which also received certain additional orders for engines of the same type, when the latter corporation was organized to conduct operations at the plant of the General Vehicle Company after its purchase by the Government. The Union Switch & Signal Company had orders for 2,500 LeRhone engines (80 H. P.). The orders for the Hispano-Suiza engines placed with the Wright-Martin Aircraft Corporation have already been sufficiently detailed (*ante*, p. 96). In addition, orders for 450 of the Lawrence engine (28 H. P.) were placed with the Excelsior Motor Manufacturing Company, and an order for 2,000 Bugattis was given to the Duesenberg Motor Corporation.

In the Summer and Fall of 1917 contracts were entered into for the manufacture of 22,500 Liberty motors, as follows:

August 31, 1917, Lincoln Motor Company	6,000
September 4, 1917, Packard Motor Car Company	6,000
September 7, 1917, Nordyke & Marmon Company	3,000
September 11, 1917, Trego Motor Corporation	500
November 22, 1917, Ford Motor Company	5,000
December 11, 1917, General Motor Corporation	2,000
Total	22,500

The contract with the Trego Motor Corporation was subsequently cancelled,* only one engine being delivered.

* It is understood that it has been taken over by the Ordnance Department, for tanks. It is cancelled so far as its relation to aircraft is concerned.

For the production of elementary training planes of the type known as the JN4-D, reliance was placed chiefly upon the Curtiss Aeroplane and Motor Corporation which had already made planes for the British Government. Substantial orders were also given to the Springfield Aircraft Company and the Canadian Aeroplane Company, Limited (of Toronto). A number of small orders were placed from time to time with various concerns. The total orders to June 30, 1918, were for 3,975 of the JN4-D type.

The orders for the Standard-J training planes were distributed among the Dayton Wright Aeroplane Company, the Fisher Body Corporation and the Standard corporations (Standard Aero Corporation and Standard Aircraft Corporation). The total orders were for 1,600 of this type.

For advanced training planes, there were orders given to the Curtiss Aeroplane and Motor Corporation (to June 20, 1918), for 919 JN4-H and 479 JN6-H; to the Thomas Morse Aircraft Corporation (for 100

S4-B and 400 S4-C); and to the Breese Aircraft Corporation (for 300 Penguins).

With respect to both elementary and advanced training planes there were also various orders for spare parts.

In service planes, the production of the DeHaviland-4s was pivoted upon the work of the Dayton Wright Aeroplane Company in connection with the designing of the plane for American production, as hereafter explained. There were contracts for 8,500 of the DH-4s as follows:

Dayton Wright Aeroplane Company	4,000
Fisher Body Corporation	4,000
Standard Aircraft Corporation	500
Total	8,500

The contract for the Bristol Fighters (2,000) was given to the Curtiss Aeroplane and Motor Corporation.

In view of the exigency, it was inevitable that the responsible officials of the Signal Corps entrusted with the duty of aircraft production should exercise a broad authority, virtually unhampered by restrictions, in the selection of contractors. The Aircraft Board, in which the responsible Army officers sat as members, afforded a useful opportunity for the comparison of views, but not a legal, and only to a limited extent a practical, check. There have been numerous complaints from individuals and corporations who sought contracts unsuccessfully. The extent to which activities were centered at Dayton, the profitable contract promptly given to Colonel Deeds' former business associates, and the preference of a small group of manufacturers in the allotment of the large contracts, created a feeling of distrust which finds frequent expression in the record of this inquiry.

There could be no well founded objection to a well-directed effort to standardize products for production in large quantities under conditions favoring the most economical and efficient work. So far as orders for production of planes in small quantities and various spare parts are concerned, to give an adequate statement of the facts with respect to the companies who received, or which asked and were refused, contracts would require a great variety of detail which it is impracticable to set forth. It does not appear that in the award of these contracts there was adherence to any clearly-defined principle. It is sufficient to say that in many instances the parties complaining have no ground for their complaints, save that others in no better situation obtained what the complainants were denied. For while offers or requests of some manufacturers went unheeded because of alleged lack of proper facilities or of assured financial ability, in other cases contracts were made with parties equally destitute of adequate resources. Among those whose facilities were apparently adequate, some were taken and others were left.

But aside from any question of discrimination between manufacturers, it is obvious that the exigency demanded that important and needed sources of supply should not be neglected, and in this connection, without attempting to make a comprehensive statement of other available resources, the case of the Singer Manufacturing Company deserves special attention.

Singer Manufacturing Company

While this Company had no experience in the building of aeroplanes, it had perhaps the largest plant in the country for cabinet work, and one of the largest veneer plants, and its facilities available for the processes demanded in aircraft production were hardly excelled in the country. As Colonel Waldon testifies, "There was every reason why they should be successful in aeroplane manufacture." The officers of the Company were not seeking contracts but they offered its facilities to the Government and these were not utilized. As early as July 14, 1917, Mr. Waldon of the Aircraft Production Board requested an interview with the vice-president of the Singer Sewing Machine Company, and this was had. Later, representatives of the Singer Company visited the plants of the Curtiss Company, the Dayton Wright Company and the Canadian Aeroplanes, Ltd., of Toronto, and an interview was then had with Mr. Deeds and Mr. Waldon, on August 14. Up to that time, the manufacture by the Singer Company of 3,000 training planes had been under consideration, but it was then suggested that it should build 1,000 service planes of the DeH-4 type. Before undertaking this work, the representatives of the Singer Company desired to examine the sample DeH-4 at the plant of the Dayton Wright Aeroplane Co. The letter of introduction to that company, however, revealed the fact that the whole proposition was still very indefinite. The letter (August 15, 1917) stated:

"We are asking the Singer Sewing Machine Co. to conduct such investigations as is possible while we are making up our minds as to the part of our program they are to fulfill. When they were here yesterday we suggested that they should help in the DH-4 production. This is not definitely settled, and they may be given some other part of the program, but we would like to have them given the privilege of an opportunity to study the details of the DH-4, inasmuch as it represents the latest type of barge war machine from abroad."

On receiving this letter, the Vice-President of the Singer Company telegraphed Mr. Waldon that it was so indefinite that the trip would be postponed until it was decided whether it was desired that they should undertake the building of the DeH-4. To this Mr. Waldon replied, under date of August 16, as follows:

"We are promptly in receipt of your telegram about the indefiniteness of our letter of August 15th. Since your visit we have received a cablegram which indicates that there will be a very important change in our program, in all probability causing us to change the type of machine you would build. This was the reason I stated in my answer that it was not definitely settled that you would build the DH-4. It will be in your hands, however, whether you go to Dayton and look over the DH-4 as a sample of an up-to-date war machine. The one we have in mind now that we would ask your assistance upon would be quite a little larger than this."

On August 17, Mr. Waldon telegraphed "change in program will probably make it necessary to assign a type other than DH-4." On August 20, the Singer Company informed Mr. Waldon that they had decided to postpone their trip to Dayton "until it is more definitely settled what you wish us to do for you." In a postscript to this letter it was stated that the Singer Company had been requested by the British Government to duplicate their order from that Government for certain aeroplane parts (universal joints), and they asked whether there was any objection to their undertaking this additional work. An answer was received on August 23, that this was entirely satisfactory. This additional work for the British Government required the services of perhaps 100 persons, and left the Singer Company quite free to undertake the making of planes for the Government, but no further word was received and no order was given to the Singer Company. In the light of the correspondence, no explanation has been given of the failure to enlist its important resources for the purpose of aircraft production.

Engel Aircraft Company, of Niles, Ohio

In view of the former connection of Mr. Harry E. Baker, the brother of the Secretary of War, with the Engel Aircraft Company, the facts with respect to its organization and its contracts with the Government should be set forth.

The Company was organized about August, 1917, under the laws of Ohio. Mr. Harry E. Baker testifies that it was originally intended to have a capital stock of $3,000,000 (preferred $1,000,000 and common $2,000,000), but this was subsequently reduced to $1,500,000 (preferred $500,000 and common $1,000,000). Mr. Harry E. Baker, of Cleveland, was President and general manager. His associates in the organization of the Company were Mr. Engel, Vice-President and production manager, and Mr. Patterson, Secretary and Treasurer.

Mr. Baker had taken an option in the Spring of 1917 for the plant at Niles, Ohio, formerly owned by the Engel Aeroplane & Motor Co., and this was taken over by the new Company, which, in effect, issued its preferred stock therefor, at a cost of about $225,000. The remainder of the preferred stock was sold for cash. The preferred stock was entitled to seven per cent. cumulative dividends and, as Mr. Baker states, was to be retired at par before the common stock participated in earnings. The common stock was issued to Mr. Baker and his associates for services in promotion. As an officer of the company, Mr. Baker received a salary at the rate of $7,000 a year.

On October 9, 1917, the Aircraft Board recommended that an order be placed with the Engel Aircraft Company for spare parts for 100 JN4-D training planes, at the aggregate price of $80,827.80. At the meeting of the Aircraft Board on October 19, 1917 it was recited that the Equipment Division had recommended that a larger order be placed with the Engel Company, and the Board thereupon rescinded its resolution of October 9, and recommended that an order be placed with the Engel Company for spare parts for 700 JN4-D aeroplanes at a total cost of $585,077.50. Following this contract for 700 sets, Mr. Baker states that there were further orders from the Government during his connection with the Company for 200 sets of spares for JN4-Ds, 200 sets of spares for JN4-Hs, and another order of 100 sets of spares for JN4-Ds, the aggregate orders being for 1,200 sets of spares at a price of about $1,000,000. Mr. Baker testifies that he ceased his connection with the Engel Company on January 21, 1918.

The Secretary of War testifies that either before or after our entry into the War his brother (Harry E. Baker) asked him whether there was any reason why he should not go into the manufacture of a certain flying boat for the Navy, in association with one Engel. The Secretary told him that he knew of no reason why he should not. Later his brother informed the Secretary casually that they were going to make aeroplanes, and asked if the Secretary objected. The Secretary replied that he had no right to object, but did not wish to be consulted about it; that he had nothing to do with it. Later, the Secretary discovered that the Engel Aircraft Company, of which his brother was president, had a contract with the Government, which was not a competitive contract, but one which had been given upon an inspection of the facilities of the aircraft company. The Secretary sent for General Squier and asked for the facts. The Secretary regarded the situation as intolerable and directed that the contract should be cancelled. Thereupon it was immediately cancelled by telegraph and arrangements were made, through Mr. Eugene Meyer, Jr., (acting for the Secretary) for the separation of Mr. Harry E. Baker from the Company. The Secretary thought it was just that his brother should be paid on the basis of the value of any services he had rendered, but that his complete separation from the Company was necessary before a contract should be regarded as possible.

Mr. Harry E. Baker testifies that, in January last, he was informed by telephone that all of the contracts of the Engel Company had been cancelled: that he immediately went to Washington and had an interview with Assistant Secretary of War Crowell, who told him that his association with the aircraft business was embarrassing to the Secretary of War, and that he should retire from it. He said that he had no desire to furnish cause for embarrassment, and accordingly, after an interview with Mr. Meyer, he turned back to the Treasurer of the Company all of the stock that he had in his name and resigned as President and general manager. Mr. Baker testifies that the Company paid him nothing for his stock. In addition to the payments of salary which, according to his testimony, he had received for two months at the rate of $7,000 a year, Mr. Baker says that he was paid on his retirement the sum of $15,000 in consideration of the services that he had rendered.

Being assured that the separation of his brother from the Company had been effected, the Secretary notified General Squier that the capacity and merits of the Company were the only matters to be considered. All the contracts were immediately reinstated on the same terms. Subsequently an additional order was given to the Engel Company for 500 sets of spares for DeHaviland-4s, at an estimated cost of $2,275,000.

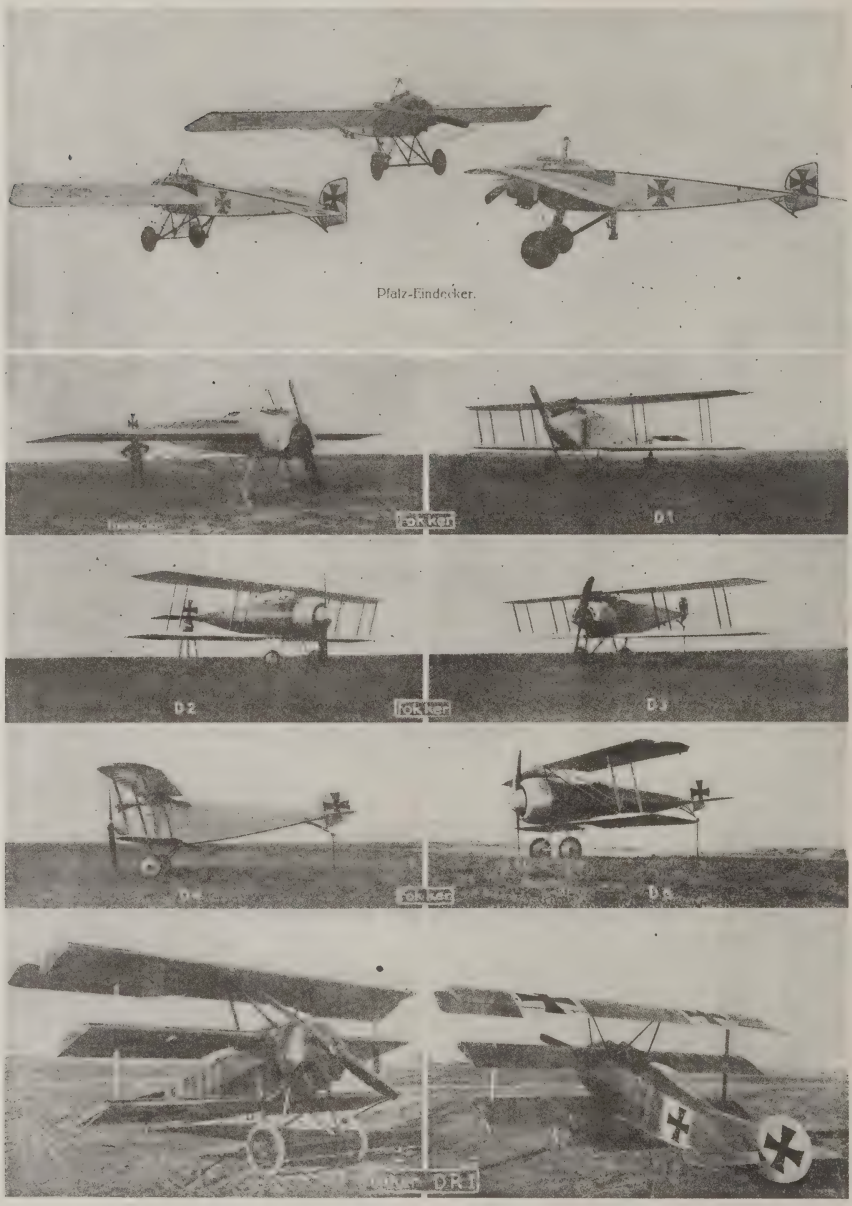
Distribution of Work

Quite as important as the selection of contractors and the development of adequate sources of supply, was the distribution of work so as to insure prompt and efficient production. Each type of plane requires special preparation and the demands of varied sorts of work may easily be mutually restrictive and demoralizing. A conspicuous instance of this is furnished in the case of the Standard Aircraft Corporation. This Company with its predecessor (the Standard Aero Corporation) had the unusual features of being a manufacturing corporation under the direction of two lawyers, Harry Bowers Mingle and Max J. Finklestein, of the firm of Mingle and Finklestein, of New York City. It is unnecessary to review the financial history of the two Standard corporations, with their plants at Elizabeth and Plainfield, New Jersey. It is sufficient for the present purpose to say that from the time of the organization of the Standard Aircraft Corporation in November, 1917, it has been the operating company, except that recently the Standard Aero Corporation has been availed of, and it has taken the plant at Plainfield for the purpose of handling fixed-price orders, the cost-plus contracts being in course of performance at the large plant at Elizabeth. Both these corporations are controlled by Mitsui & Company, a leading Japanese firm, which holds all the preferred stock and a majority of the common stock of each Company. The orders which have been given by our Government to one or the other of these Standard companies exhibit an extraordinary range of types embracing training planes of the Standard-J type, six machines and spares of the JR-1B type for the Post Office, advanced training planes of the M-Defense type, four Capronis, the assembly of Handley-Page planes, five hundred DeHaviland-4s, as well as flying boats for the Navy and various orders for small parts. The effect was to put in this plant almost every variety of aeroplane work, a proceeding which has no justification from a production standpoint. Mr. Charles H. Day, the chief engineer of the standard companies, whose ability is generally recognized, frankly admits the serious disadvantage of this multiplicity of orders. He says:

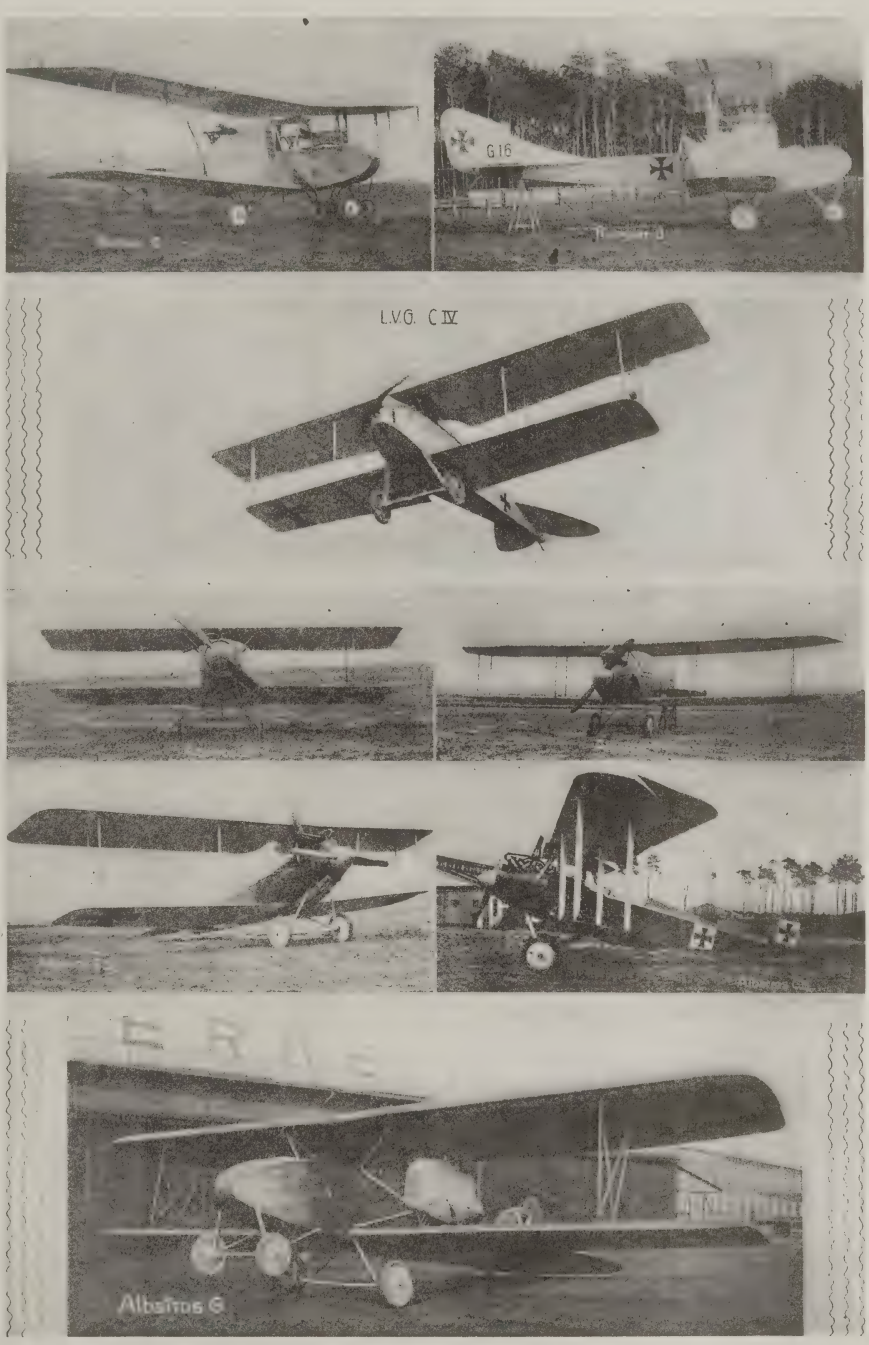
(*Continued on page 575*)

REVIEW OF GERMAN AEROPLANES, SHOWING EVIDENCE THAT THE GERMANS COPIED FRENCH AND BRITISH AEROPLANES THROUGHOUT THE PERIOD OF THE WAR

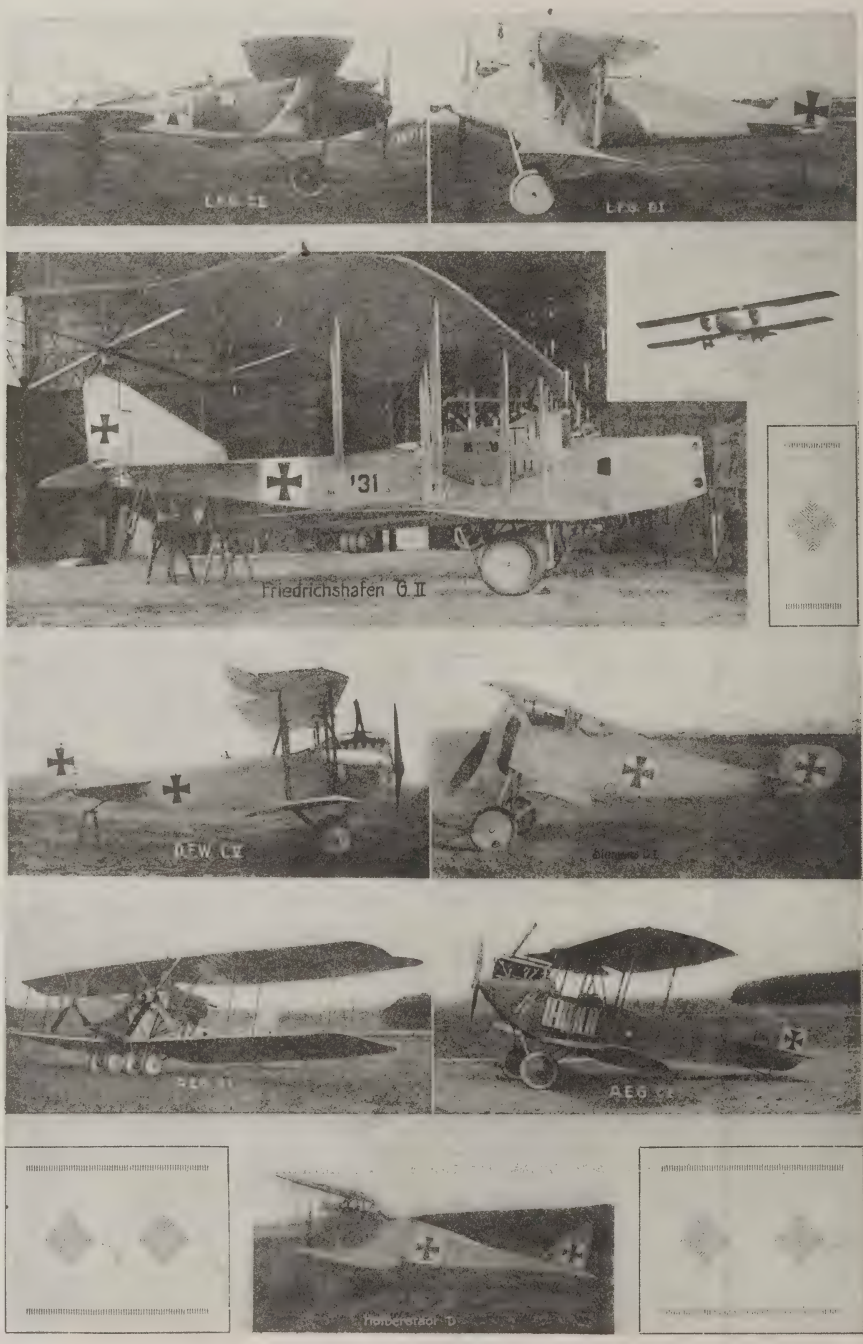
The Fokker monoplane was built on the Morane-Saulnier design; the Fokker biplanes were built on the Sopwith and Nieuport designs; the triplane on the Sopwith design. Aerial Age published the designs of most of the machines shown herewith and of the larger model.



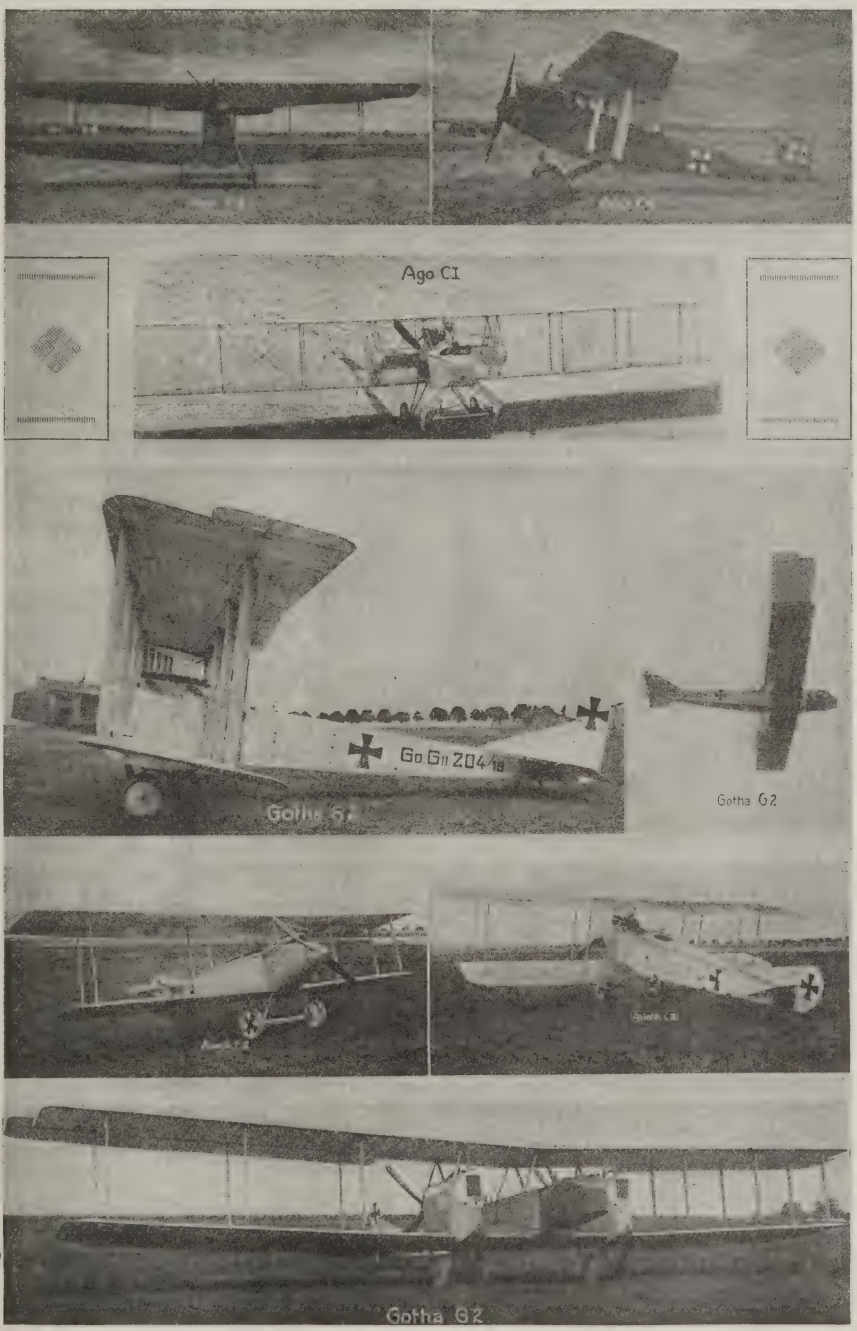
These photos show the German Rumplers, the L. V. G. and the Albatros, single and double motors



The L. F. G. were the only German machines with original features, but they stole the "wireless" features of later models from Curtiss



The Gothas, the Aviatiks and the Ago are shown herewith. The designs of the four-motor Zeppelin type German bomber were published in a recent number



SPLITDORF AND THE MAGNETO SITUATION

THE Federal Trade Commission having granted Splitdorf Electrical Company of Newark, N. J., a license under certain Bosch patents, various conflicting notices have appeared in the press concerning the matter.

With a view to obtaining a correct statement concerning the mater, C. W. Curtiss, General Manager of the Splitdorf Electrical Company, was interviewed and made the following statement:

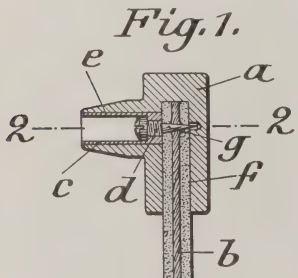
"It is true that Splitdorf Electrical Company has been granted a license by the Federal Trade Commission to use two United States patents owned by Robert Bosch of Stuttgart, Germany. I do not believe these patents have been used to any extent by the Bosch Magneto Company of Springfield, Mass.

"Splitdorf Electrical Company was ordered to make use of these patents by the Secretary of War at the direction of the President of the United States in connection with magnetos for war aeroplane purposes. The patents do not relate in the remotest degree to the principle of construction embodied in the Dixie magneto, which is made under numerous United States and foreign patents owned or operated under by the Splitdorf Electrical Company only.

"The Bosch patents in question relate merely to details, standard practice abroad, which the Government authorities wanted for the following reasons:

"Patent 1030817 relates to a binding post for connecting electric cables. This is a detail of construction commonly used abroad and with which European aviators and mechanics are familiar. Naturally by incorporating this detail in the Dixie magneto, cables on foreign magnetos would then readily interchange with the American product, and probably for this reason Splitdorf Electrical Company was instructed to use this patent. There are many other ways of attaching a cable to a magneto and some of them covered by Splitdorf patent applications pending may even be preferable to the one shown in the patent, but as this was already being used abroad, it was adopted as standard here. The accompanying figure taken from this patent shows the Bosch type of

Fig. 1.

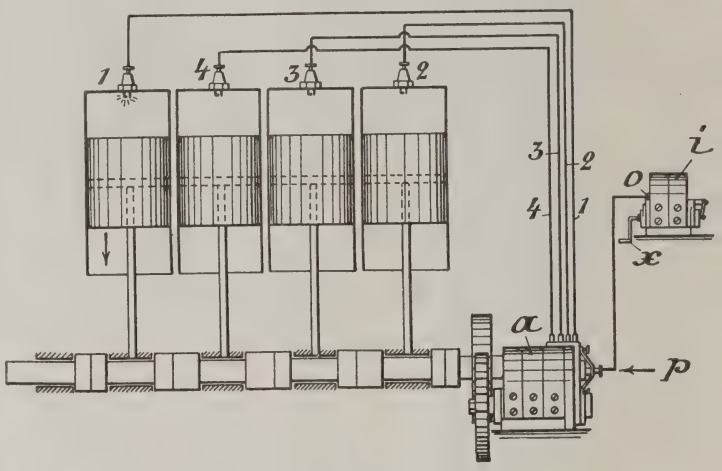


binding post employing a pointed screw piercing the conductor and securing it in place in the insulated brush holder or distributor.

"Patent 1014824 relates to an ignition system, wherein a high tension starting magneto is connected to the main magneto in such a way that the starting magneto may be operated by hand in order to furnish a starting spark. The accompanying figure from patent 1014824 shows this arrangement.

"The main magneto 'A' is connected to

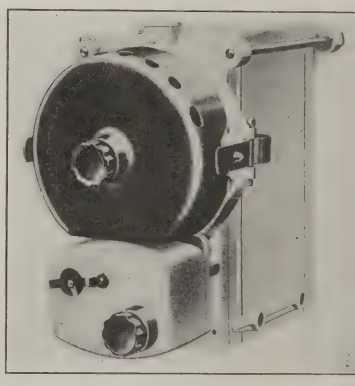
Fig. 1.



the spark plugs in the usual manner. From the distributor of the main magneto a cable 'P' is connected to the starting magneto 'I' and when the latter is rotated by means of the crank 'X' high tension current will flow into the distributor of the main magneto where it is distributed by means of an auxiliary brush located behind the usual moving brush of the distributor, thereby being connected to whatever cylinder is under compression, and in no way relating to or interfering with the functioning of the main magneto. As soon as the engine has started, the service magneto 'A' operates in the usual manner, the hand starting magneto 'I' being stopped. This arrangement of using a hand starting magneto is standard on many foreign aeroplane engines, and it was desired to have the American practice conform for the sake of uniformity. There are several other ways of accomplishing the same results, and this patent is not vitally essential to American needs, although its use is desirable for the reason stated.

"An improved method is shown in U. S. patent 1260995, property of the Splitdorf Electrical Company, by which method the high tension wiring to the starting magneto is eliminated and the arrangement simplified as compared to the Bosch patent. Splitdorf Electrical Company has manufactured several hundred thousand magnetos for the Allies since the beginning of the war, and its product is now 100% essential. The Dixie magneto has been standardized and is being produced in great quantities to meet the present emergency, the Splitdorf Electrical Company now being the largest manufacturer of magnetos in this country.

"In addition to furnishing magnetos direct from their own factory for war purposes, the Splitdorf Electrical Company has arranged to permit the Bosch Magneto Company of Springfield, Mass., and the Ericsson Manufacturing Company of Buffalo, N. Y., manufacturers of the Berling Magneto, to make for war purposes only, and only for the duration of the war, certain Dixie magnetos under the Splitdorf Dixie patents; therefore three sources of supply for the Dixie magneto are available. In addition the Splitdorf Company will furnish the necessary drawings and engineering information so that the product of all three factories will be standard, uniform and interchangeable.



"The standardized Dixie magneto enables one magneto to be used for 4, 6, 8, 12, and 16-cylinder engines, and 8 and 12, 45 degree cylinders, with a total of only 16 extra pieces to make up any one of the necessary assemblies. This arrangement, devised and developed under the direction of the Splitdorf Company's Engineer, Carl T. Mason, eliminates the necessity of having several types of magnetos and hundreds of repair parts therefore at the supply depots, and marks not only a distinct advance in the art, but is a notable example of an all American contribution to winning the war."

FRED S. DUESENBERG, PIONEER HIGH DUTY ENGINE BUILDER

SEVENTEEN years ago, in a tiny garage and repair shop in Rockford, Iowa, was born the idea which has reached maturity in the Duesenberg marine motor of today. Here it was that Fred S. Duesenberg built the first gasoline motor, a clumsy little motor-cycle engine which was exhibited at the first Chicago show. Even in these formative days the motor gave promise of a budding genius in design which has been fully realized.

Catching a glimpse of the tremendous future of the automobile industry, Fred S. Duesenberg organized the Mason Motor Co., of Des Moines, Iowa, and spent a few years bringing out what was in those days, a first class machine. But this kind of thing didn't keep Fred S busy enough, so in 1910 he branched out into the automobile racing game, as it seemed to offer the greatest field for the development of ideas and rapid and severe trial of their value. The first four-cylinder Duesenberg engine was built mostly in the basement of the Duesenberg home and took over a year to complete. However, it was a real motor and embodied improvements which have endured the rigors of many racing campaigns without a reason for any important change. This original motor was still propelling a car with a truck body on it at 50 miles an hour through the outlying districts of Chicago this summer. Fred Duesenberg entered his first car in Indianapolis Race of 1912 and was scoffed at for doing so, as his motor capacity was only 230 cubic inches as against the 450 cubic inches of the other cars. However, he got 78 m.p.h. out of the car in that race and eventually forced the abandonment of the 231 cubic inch class races.

The success of the Duesenberg racing motor since then has been so outstanding that practically everybody knows the principal details. It is probably safe to say that at least 70 per cent of all cars on the dirt and board tracks today in America are Duesenberg equipped.

Development of the gasoline motor for marine purposes has gone hand in hand with its perfecting in the automobile field and when a prominent Chicago sportsman determined to do a seemingly impossible thing—produce a sixty-mile boat—it was natural for him to turn to Fred Duesenberg to produce the power plant for him. The problem was a tough one, but five months from the day the motor was first put on paper the engines were turning over in Disturber IV, the fastest 40-foot hydroplane yet developed in this country.



Fred S. Duesenberg

That was the start of the Duesenberg marine engine. Soon after the successful results obtained in the Disturber the old Loew-Victor Engine Co., of Chicago, made a deal with Fred Duesenberg to become their chief engineer. He designed for them a six-cylinder and an eight-cylinder 6¾ inch by 7¾-inch marine engine. He also designed a four-cylinder aeroplane engine, a six-cylinder aeroplane engine and a series of automobile motors.

In January, 1917, the Duesenberg Motors Corporation was formed, taking over the old Loew-Victor Engine Company and in the fall of 1917 they moved into the big modern factory at Elizabeth, N. J. The Loew-Victor plant in Chicago and the temporary Duesenberg factory at Edgewater, N. J., were brought together in this new factory at Elizabeth, and subsequently, in order to obtain sufficient facilities to execute large Government contracts for aeroplane motors, the Duesenberg Motors Corporation purchased the plant of the F. I. A. T. Automobile Company, of Poughkeepsie, N. Y., which was also moved into the new factory at Elizabeth, which had been doubled in size by the construction of an additional unit.

In February, 1918, ground was broken for a separate factory unit solely for testing and laboratory purposes and in May this building was completed and is said to be the largest permanent gasoline engine test house in existence.

Thus from comparative obscurity Mr. Duesenberg through sheer mechanical ability has risen to be one of the leading figures in the automotive industry today.

(*Continued from page* 569)

"There is a natural amount of confusion in having a multiplicity of those parts. . . . The engineering personnel is limited by the number of different machines you have to produce, and the executive force is limited by the same amount. The physical layout of the factory itself is very seriously affected. . . . We have on the HS boat job, made entirely our own drawings. It was out of the question to work to the drawings which were supplied us and we therefore redrew the entire job. That occupied a great amount of time of the drafting room and the engineering departments of the Standard Aircraft. Then a great amount of drawing has been necessary on the DeHaviland-4, it being impossible to get VanDyke drawings from the Signal Corps, and we have attempted to draw up a great deal of that machine, and we have redrawn in its entirety the Handley Page machine. That involves the engineering department and the drafting department and the bill of materials department, sometimes known as the specification department, which is one of the most important we have, inasmuch as under the present regulations we are not allowed to purchase material except we bill the material. The approvals officer will not approve the materials except on the basis of a bill of materials supplied, and making the bills of materials and completing the drawings on all these different machines has been extremely difficult.

"Q. Have you had in your drawing department the HS boats for the Navy, that is the seaplane, the Handley-Page planes and the DeHaviland planes, all being worked out at the same time? A. Yes, sir."

On the same point, Mr. Day again testified:

"The order for the DeHaviland-4s is a very small order comparatively. . . . If we were to turn over our plant entirely into building the 500 DeHaviland-4s and had a go-ahead on 500 DeHaviland-4s, it would not last very long. We expected early in this year and were preparing to take over a large order for Capronis. That was before we had the DeHaviland machines, and it was supposedly to be a thousand Capronis. That was a fair sized order, and we expected we would have that alone and nothing else. But that was withdrawn, and the order for 700 sets of spare parts for the Bristol and 1,500 sets of spare parts for the DeHaviland-9 was given us, and that was a pretty fair sized order. That in itself would have been difficult for some length of time, but both of those orders were recalled. The interference, so far as spare parts of machines is concerned, would have been less than the interference caused by two orders for complete machines. It has been impossible for us to obtain a large enough continued order to actually know what we were going to do and to prepare for doing it."

Criticisms upon the management of the corporation do not excuse such a state of affairs. If a manufacturing corporation is to be entrusted with work, it is manifest that it should be given the work it can handle efficiently; and if its efficiency is distrusted, there is still less reason for embarrassing it with confusing orders. On the other hand, if it is deemed capable of successful production it should have a suitable opportunity to develop it. The effect of placing such an assortment of orders, coupled with the difficulties besetting production in this new industry, has not only interfered with production, but has promoted waste, made it exceedingly difficult to maintain proper cost accounts, and has confused responsibility for delays.

Other illustrations of a poor distribution of work might easily be given; the result of it is that one part of the Government's program has stood in the way of another.



MILITARY AEROSTATICS



HOW it feels to be in a run-away Caquot observation balloon, torn from its winch by a wind storm and blown 9,000 feet over the Cascade Mountains, is told by Lieutenant H. C. Hahlbeck, an observer attached to the Army Balloon School at Arcadia, California. The observer stuck to his balloon until hope of saving it was gone and then made a parachute jump to safety. While it was not necessary that there be a passenger in the basket, on the afternoon of his adventure he had ascended as additional ballast in the balloon for some experimental work and had not adjusted his parachute harness and carried only four bags of sand ballast.

In the official report of the incident Lieutenant Hahlbeck stated that when the cable broke he was riding 2,500 feet in the air, and while he noticed a storm brewing in the distant mountains, he did not report it to the crew at the winch below until gusts at 30 to 40 miles an hour were jerking the balloon and causing it to roll so that the basket at times was at an angle of 45 degrees or more from the perpendicular.

In his report Lieutenant Hahlbeck described what happened as follows:

"I telephoned down, describing the wind force, and directed that the balloon be hauled down. I also asked that as many men as could be found be assembled, as I figured there would be trouble in handling the balloon on the ground. The wind became rapidly worse on my descent. At 500 feet elevation the balloon was in the teeth of the gale. I saw by the pitching and rolling that I was in trouble and started to adjust my parachute harness immediately, but it was slow work on account of the behavior of the basket.

"The balloon in the meantime was being maneuvered by the crew below west, past the guard house over the main road past the K. of C. hall, north over the road past the rigging tent and then east past the rigging tent, the winch stopping on the main road in front of the balloon hangar on the west side of the road; wind blowing forty to fifty miles per hour in southwest direction. There the winch started to haul down, but the balloon pitched considerably, each time straightening up with a jerk and putting a severe strain on the winch cable. When about one hundred feet from the ground a severe gust of wind hit the nose of the balloon, causing it to pitch much heavier than previously and straightened up and snapping the cable just above the sheave wheel.

"The balloon, being free, ascended rapidly to about nine to ten thousand feet, according to my estimate of the height above the mountains north of the camp. The monometer tube bubbled over. I previously had grabbed the valve cord immediately on the balloon breaking away and kept the valve open almost continually on my ascent, as the balloon became as tight as a drum and I feared it would burst. I held on to the valve cord with both hands, finally fastening it to one of the basket toggles, and then hunted for the altometer, finding it on the bottom of the basket in between the sand bags, it having snapped off when the balloon broke away. I fastened it to the suspension bar and it was then registering about 7,000 feet and coming down rapidly. I then looked at the territory around me, could see far over the tops of the mountains north of the camp and got my position as above San Gabriel, rapidly going southwest toward the ocean. The ocean appeared a great deal nearer than it actually was, due to my height. Meantime I had closed the valve, as I noticed the fins and tail were hanging loosely at the rear of the basket, and seeing the balloon almost two-thirds empty, realized I had valved it too much. It was then coming down too fast for safety, descending four thousand feet in about two minutes time, and I decided to jump, leaving the sand bags in the basket, as I thought possibly the balloon might be carried over to the ocean. Then, to make doubly sure of the balloon hanging in a large field, which I was approaching, I again decided to rip the balloon, leaving sand bags in as ballast so that the balloon would descend in the field and not be lost. I knew it would be foolhardy to say in the basket and throw the sand bags out because of the small amount of gas in the balloon. I ripped he balloon and vauled over the side of the basket, taking care to adjust all the straps of my harness before ripping and looking to see which was the correct side to jump from.

"I landed safely in a tomato patch on the north side of the field I had in mind, landing backward on my heels, turning a complete somersault over onto my feet again, and then running to the parachute, holding the edges down before the wind could open it and drag me. I then unfastened the hooks on my harness and rolled up the parachute in time to give it to the ambua scratch or a bruise. The baloon was carried over the field I had in mind into a wash borderlance driver as he came out. I landed without ing the west side of it, landing on some barb wire."



A Caquot observation balloon ascending for observation of artillery fire

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Dayton, Ohio District Accounts office. Wire DAP.
Note 3—Report to Dayton, Ohio, Chief Technical Section.
Note 4—Report to Dayton, Ohio, Dis. Mgr. Aircraft finance.
Note 5—Report to Dayton Ohio, Asst. Director Aircraft Production.
Note 6—Report to Dayton Wright Airplane Co., Dayton, O.
Note 7—Report to Newport News.
Note 8—Report to Aviation Gen. Supply depot, San Antonio, Texas.
Note 9—Report to Aircraft supply depot, Americus, Ga.
Note 10—Report to A. S. School for Radio mechanics, Pittsburgh.
Note 11—Report to 271st Sqd., Aberdeen, Md.
Note 12—Report to Lieut. F. J. Rascover, Aircraft Prod., Washington, D. C.
Note 13—Report to Det. No. 2, 480 Lexington Ave., N. Y. C.
Note 14—Report to Gen. Supply depot, Los Angeles, Cal.
Note 15—Report to Dis. Mgr. A. P., Pittsburgh, Pa.
Note 16—Report to Camp Knox, West Point, Ky.
Note 17—Report to Engel Aircraft Co., Niles, Ohio.
Note 18—Report to Camp Joseph E. Johnston, Jacksonville, Fla.
Note 19—Report to Army Balloon school, Lee Hall, Va.
Note 20—Report to Dis. Mgr. A. P., Detroit, Mich.
Note 21—Report to Planv accountance office, Hayes Iona Co., Grand Rapids, Mich.
Note 22—Report to Aviation repair depot, Speedway, Indianapolis, Ind.
Note 23—Report to Dis. Mgr. production, Dayton, Ohio.
Note 24—Report to Northeastern dept., Boston, Mass.
Note 25—Report to District Manager Aircraft Prod., Buffalo, N. Y., and Wire DAP—Washington.

Special Orders Nos. 249-253 Inc.

A

Adler, Elmer Edward.....CPA; DMA
Allen, Irving Ellis.....SLA; RWT
Atherton, Arlon Edward.....CPA; DAP
Alles, Oliver Wayne.....SLA; KST
Adregg, Louis Adolph.....SLA; KST
Amsden, Sherman C.....LHV
Ackley, Samuel Fowlen.....CPA
Agnew, Hobart McVickar.....SLA; PMT
Amory, Roger.....MJA
Andrews, Francis Swain.....SLA; AAD
Allan, Roy F.....LHV
Alcorn, Kent A.....PWM
Ashe, Clarence F.....PWM
Anderson, Samuel Herbert.....FLA
Ames, Charles Hayden.....SLA; MAT
Ainslie, Walter M.....EOT
Ackley, Oliver F.....SLA; EOT

B

Barnes, Earl D.....PWM
Benvie, Frank W.....PWM
Boggs, Paul R.....PWM
Brones, Frank L.....PWM
Burt, Monrose.....SLA; CFT
Brownback, Henry Lowe.....FLA
Behne, Thomas D.....EOT
Banta, George H.....PWM
Bennett, Thomas E.....PWM
Blair, James J.....PWM
Brock, Harry.....PWM
Bushman, Francis L.....PWM
Bleakley, William Henry.....FLA; BST
Batty, Thomas.....SLA; RWT
Babcock, Harold P.....FLA
Buckmaster, Harold P.....FLA
Browne, Rolla.....SLA; KST
Barger, Harold D.....LHV
Burtis, Edwin S.....LHV
Boyd, William Patton.....SLA; MAC
Brock, Howard Merle.....SLA; EOT
Bowman, Samuel C.....UIU
Blanchard, Ernest M.....EOT
Battles, Winthrop H.....CPA
Bedell, James W., Jr.....EOT
Benner, Harry Mark.....SLA; CUI
Bierman, Hugh E.....LHV
Brandon, Joseph Franklin.....SLA; SAG
Birdsall, Raymond Perry.....SLA; SAG
Browne, Kenneth Clinton.....SLA; DAP
Boulware, Barrett Woodward.....SLA; GLC
Beck, George Carl.....WFO
Brady, Lawrence B.....BFT
Baker, Earle Frederick.....SLA; BFT
Breeding, Harry Throckmorton.....SLA; ELA
Bergen, John Tallmadge.....FLA; VBW
Bixby, Rex Vancil.....SLA; MAC
Bonhag, George Valentine.....FLA; HHN
Bottomley, Harold.....SLA; AMV



One of the last German Gothas to participate in the war

Brock, William Stewart .....FLA; PMT
Bisland, Theodore Wensel .....SLA; GLC
Bradley, Matthew Henry .....SLA; CFT
Brandt, Howard Carlton .....SLA; BFT
Bartlett, Frank M. .....TMA
Bird, Clarence Plummer .....SLA; VBW
Brazil, Valdevino Haggberg .....SLA; MAC
Bostrom, Hjalmer O. .....TFT
Bunting, Wade H. .....DMA
Boyle, John Alexander .....SLA; SAG
Bonneville, William H. .....TFT
Bridgman, Orlando W. .....MAC
Billups, Val T. .....FLA
Bailey, James R. .....GLC
Belden, Charles L. .....PFO
Brayton, Howard Clinton .....SLA; MAC
Bremer, Carl A. .....EOT
Barrett, Clement Jones .....FLA
Bible, Frederick Robert .....SLA; MAT
Breathitt, John W. .....EOT
Bacon, Paul O. .....CAF
Backus, Paul M. .....TFT
Boyle, John A. .....CAF
Bulkley, Paul Groendycke .....MAC
Bowker, Harry Boquist .....SLA; MAC
Blount, Frederick R., Jr. .....TFT
Boyd, James F. .....ELA
Barns, Fred C. .....BST
Butler, Ben I. .....LHV
Byrnes, James E. F. .....CPA
Bedell, Leonard V. .....Note 4
Bliss, Chester Hascall .....FLA; Note 23
Bradley, Charles E. .....Note 11

C

Clark, Elmer C. .....PWM
Coleman, Andrew H. .....PWM
Cote, Charles L. .....PWM
Craig, Britt .....PWM
Conlon, James Marcus .....SLA; MAT
Campbell, Robert Lincoln .....FLA; MAC
Crawford, Carleton Turnbull .....SLA; BFT
Chaderton, Sydnet Stephen .....CPA; DMA
Creeden, Jeremiah Joseph .....SLA; AAD
Chase, Floyd Wadsworth .....SLA; TMA
Chapman, Henry Buckley .....SLA; MAC
Collins, Ralph Oliver .....SLA; ELA
Conrad, Glenn Virgil .....SLA; MAC
Cowie, Franklin Garrett .....SLA; ELA
Callander, Marshall Ellerd .....SLA; CFT
Cortelyou, Chester Harold .....SLA; GLC
Cameron, Cheever Joseph .....SLA; PMT
Cromelin, Paul Bowen .....CPA

Connell, John Davis .....SLA; SBI
Christy, William Glen .....SLA; MAT
Camiade, Xavier Jean .....SLA; ABC
Churchill, Lyle Cudworth .....SLA; CRI
Carroll, Collin Chandler .....SLA; CFT
Coxe, Howard Cleveland .....SLA; AAD
Clock, Frank Eugene, Jr. .....SLA; GLC
Cox, Joseph Frank .....FLA; DAP
Chamberlain, Stephen .....TFT
Clark, Carl F. .....TFT
Clay, Lucius Josiah .....SLA; BFT
Clark, Wright .....SLA; SAG
Connell, Ott Leckelt .....SLA; PMT
Cody, Joseph Leo .....SLA; PMT
Chrisholm, Stuart .....FLA; DAP
Carmody, John D. .....DMA; FOB; Note 1
Clark, Roy E. .....PWM
Connell, David E. .....PWM
Coulter, Wilmer V. .....PWM
Craighead, Phillip B. .....PWM
Chrustie, Edward P. .....LHV
Curran, James M. .....GLC
Cain, Lawrence .....SLA; CRI
Clark, Stuart Kenneth .....SLA; MAC
Coughlin, John R. .....BST
Cureton, James G. .....SLA
Caulfield, Hughes J. .....TFT
Carusi, Joseph E. .....PWM
Casey, Jack Francis .....SLA; MAC
Craig, James Charlton .....SLA; BFT
Chaney, James Mitchel .....SLA; EOT
Cox, Henry Ray .....TFT
Crowell, Harold Olin .....SLA; PMT
Cressy, George G. .....LHV
Conklin, Edward Herbert .....SLA; CFT
Cleveland, Bruce .....DMA
Citron, Alvin H. .....TFT
Church, Rollin Sherman, Jr. .....SLA; BFT
Chase, Lowell H. .....LHV
Churchill, Lyle C. .....CAF
Calhoun, Hugh L. .....TFT
Cullity, Emmett Richard .....SLA; MAT
Campbell, Ralph C. .....TFT
Clark, Clinton W. .....CGC
Cumbus, John W. .....MAC
Coffey, Arthur H. .....CAF
Chamberlin, Morgan G. .....FLA
Curtis, Tobin S. .....FLA
Chrystie, Edward P. .....LHV
Caldwell, Joe H. .....TFT
Cohen, John .....TFT
Colson, Joseph G. .....EOT
Cate, Theodore W. .....MAC

Carolan, George F. .....EOT
Chatterson, Marshall C. .....Note 16
Cimmino, Frank .....Note 19
Clark, Elmer J. .....DAP

D

Davison, Elmo L. .....CJW
Duke, John F. S. .....LHV
Delashmutt, Harry A. .....LHV
Dickens, George R. .....PWM
Dunavant, Elmer Mark .....SLA; CRI
Dahl, Newton A. .....PWM
Des Autels, Raymond Charter .....SLA; PMT
Day, Robin A. .....KST
Del Re, Michael J. .....LHV
Dean, Edward E. .....KST
Doyle, Horace M. .....LHV
DuVall, Donald William .....SLA; SAG
Dupuy, Fred D. .....RSD
Diggle, Burnham W. .....RSD
Dunavant, Elmer M. .....CAF
Dolch, Stanley Ferdinand Niggli .....SLA; ABC
Day, Frank R. .....UIU
Doyle, William J. .....DAP
Durfee, Francis Morris .....SLA; KST
Duba, Ralph Lafayette .....SLA; MAC
Durst, Elmer F. .....TFT
DuVall, Donald William .....GLC
Daviess, Marion L. .....BST
Dickens, George R. .....PWM
Driscoll, Egbert Gotzian .....SLA; CRI
Diggle, Burnham Wade .....SLA; MAT
Diebel, Alfred J. .....Note 14
Duffield, Leroy B. .....Note 3

E

Edwards, Richard D. .....MAT
Embury, David Augustus .....SLA; DAP
Eldridge, John R. .....EOT
Elliott, Philip Nelson .....SLA; SAG
Elliott, Clyde R. .....PWM
Ernst, Norman C. .....PWM
Eldred, Warren B. .....AGC
Evans, Maurice Willard .....SLA; PMT
Elbert, Robert G. .....MAC
Eagan, John Joseph .....SLA; AAD
Elliott, Frank Rollon .....SLA; RWT
Everall, James R. .....UTA
Eiffler, Carl Peter .....SLA; CJW
Earl, Kenneth A. .....PWM
Elkema, Emil C. .....PWM
Ennis, Elton D. .....TFT
Egan, John F. .....CAF
Evans, George Picton .....SLA; PMT

F

Fisher, Ivan L. .....CAF
Farrel, Roy Christopher .....SLA; KST
Field, William B. Osgood .....CPA
Foran, Stanley William .....SLA; BFT
Farrell, Joseph Richard .....SLA; GLC
Fisher, Ivan Lewis .....SLA; CRI
Fuller, Enoch Doble .....SLA; PMT
Fuller, Willard P. .....KST
Fox, Robert Russell .....SLA; KST
Fleming, Carl Summer .....LHV
Fairchild, Muir S. .....DMA
Fisher, Philip S. .....EOT
Fredell, Edwin Joseph .....CPA
Forsyth, Ralph E. .....PWM
Foster, Ellery N. .....LHV
Finsterwald, Verne H. .....LHV
Foltz, Joseph R. .....LHV
Field, Howard, Jr. .....LHV
Fitzpatrick, William H. .....Note 22
Freese, Harry Leo .....FLA; Note 5
Frees, Arthur L. .....Note 6
Finlay, George D., Jr. .....Note 16

G

Groves, Fred Alquin .....SLA; HHN
Garrett, Claude Wallace .....SLA; SBI
Glendinning, Edward Wood .....SLA; GLC
Guilford, Samuel G. .....BST
Gage, George R. .....TFT
Gary, Francis P. .....TFT
Gassaway, Kenneth .....PWM
Green, Gerald R. .....PWM
Glazier, Joseph .....SLA; SAG
Garlick, Charles Eugene .....SLA; PFO
Guilford, Samuel George .....SLA; PMT
Gowen, William Wasmer .....SLA; MAC
Gerard, John William .....SLA; EOT
Gaffney, Dale V. .....EOT
Galleher, Harry Ernst, Jr. .....FLA
Goodrich, Charles L. .....MAC
Gleckler, Arthur .....SLA; EOT
Grethen, John P. .....PWM
Gamble, Verne Dysert .....SLA; EOT
Griswold, Dale A. .....BST
Glose, Charles W. .....BST
Goodwin, Marvin M. .....LHV
Gell, Harry .....FLA
Gerdts, Robert B. .....CAF
Guthrie, Sidney Charles .....Note 2
Globus, Julius Raphael .....FLA; Note 18
Gren, Leroy S. .....Note 10

H

Hamer, Bert Lee .....PWM
Harris, Dale A. .....PWM
Haseltine, Emery .....PWM
Hammond, John Martin .....FLA; DAP
Hildebrand, Lee Ernest .....SLA; DAP
Haldeman, George W. .....PWM
Harrell, Benjamin F. .....PWM
Harvey, Harold W. .....PWM
Hill, Maurice B. .....PWM
Horsley, Robert S. .....PWM
Hughes, Horace Henry .....SLA; PMT
Halpin, George H. .....HHN
Hermanns, Edwin F. .....TFT
Herbert, William Helenberg .....FLA; LHV

Hasemeier, Ralph Edward .....SLA; CFT
Haynes, Stephen Wesley .....SLA; RFT
Haywood, George P. .....BST
Hinckley, George C. .....LHV
Harless, Frederick Emerson .....SLA; GLC
Hutchinson, William Burleigh ....SLA; MAC
Harmon, Millard F., Jr. .....HHN
Hussey, Clyde L. .....REL; MAC
Haynes, John Crepin .....SLA; PMT
Hildebrand, Floyd Ray .....SLA; MAC
Howard, Robert B. .....GLC
Halligan, Henry M. J. .....DMA
Hunting, Carol Sherman .....SLA; SBI
Harris, Robert William .....SLA; PMT
Holmes, Robert B. .....LHV
Hollahan, Robert Elton .....SLA; DAP
Harvey, Henry S. .....DMA
Hall, Stuart Gregory .....SLA; AAD
Hill, Lawson Traphagen .....SLA; SBI
Hoffman, Thomas Glenn .....SLA; DAP
Hill, James A., Jr. .....CAF
Hull, Justus M. .....LHV
Hammond, Charles H. .....MJA
Huser, Thomas Everett .....FLA
Hilliard, Thomas J. .....CPA
Heptig, William A. .....TFT
Hyde, William Albert .....FLA
Huszagh, Victor L. .....DMA
Hibbitt, George Whiting .....SLA; BFT
Huston, Aubrey .....FLA
Hesse, Otto A. .....EOT
Hudson, Harold .....LHV
Hollidge, Crawford Hooe .....SLA; TMA
Howe, Charles Walter .....SLA; SAG
Hardy, Clinton P. .....TFT
Hutchinson, William Thomas .....SLA; SAG
Haywood, Chester B. .....LHV
Hileman, David Joyce .....SLA; MAC
Hart, John F. .....LHV
Horst, John R. .....PWM
Hogel, Milton H., Jr. .....EOT
Hogan, William N. .....LHV
Halley, Samuel R. .....DMA
Hecht, Irving T. .....TFT
Hoffman, Charles R. .....TFT
Hayner, Ellsworth Griffith.....SLA; TMA
Horn, Norman E. .....LHV
Harrell, Samuel C. .....FLA
Hubbell, Harry L. .....MAC
Hobley, Alfred H. .....Note 3
Hodgkin, William Ogden .....SLA; Note 19
Hersch, Max M. .....Note 13
Hauch, John Paul .....SLA; Note 17
Holmes, John Howard .....FLA; Note 22

J

Jackson, Roger W. .....PWM
Jordan, Hebert W. .....PWM
Johnson, Oliver Francis .....CPA
Jordan, Frank L. .....CRI
Jones, Lucius Lee .....SLA; SBI
Jouvenant, Victor Frank .....SLA; MAT
Jacob, Walter P. .....CPA
Jones, Clifford Clarke .....SLA; CRI
Jewell, John Dodd .....SLA; GLC
Johnson, Herbert C. .....TFT
Johnson, Perry V. .....SLA; LHV
James, John A. .....CPA
James, Edward D. .....PWM

K

Kase, John A. .....PWM
Kamey, Francis William .....SLA; CRI
Kelso, John C. .....BST
Kingsbury, Edwin F. .....CPA
Keil, Otto Charles .....CPA
Kentworthy, Chester L. .....TFT
Kranz, Leon George .....SLA; CFT
Kirker, Edwin C. .....KST
Kelly, Frank Vincent .....FLA
Knight, Arthur R. .....DMA
Kofoed, Volorous Beckwith .....SLA; AAD
Kirsch, Gifford Karl .....MAC
Kessinger, Earle R. .....CAF
Kuhlman, Roy A. .....LHV
Kiernan, James I. .....CJW
Kennedy, Robert E. .....MAC
Kelleher, Melvin Bland .....FLA
Kemp, Wesley W. .....CAF
Kirkland, Henry S. .....PMT
Kohn, Edwin R. .....BST

L

Lea, William M. .....PWM
Lowell, Robert H. W. .....PWM
Lobdell, Edward Claude .....SLA; CRI
Livermore, William White.....SLA; ABC
Lynch, Walter Christopher.....SLA; RWT
Lyon, Howard Steven.....SLA; ELA
Lane, Charles Alfred.....SLA; MAC
Lutz, Norvin Edmund.....SLA; SAG
Leach, Leon Tony.....FLA; DAP
Lingle, David G. .....DMA
Lester, Hodge.....PWM
Lutz, David B.....LHV
Leonard, Leonard R. .....PWM
Lovejoy, Kenneth F. .....CAF
Lockhorn, Clifford J. .....EOT
Lawson, William E. .....EOT
Lamborn, Charles W. .....FLA
Ledbetter, Thomas D. .....EOT
Lyons, Thomas Gray.....SLA; CFT
Lloyd, William Folwell.....DAP
Lewis, Le Roy Danby.....MJA
Luddy, Joseph L. .....LHV
Landstrom, Adolph W.....EOT
Laughlin, Richard J. .....GLC
Lowe, Wayne M. .....EOT
Lucas, Lesley Howard.....SLA; MAT
Long, Winifred Joseph.....SLA; CRI
Lynch, Virgil Reges.....FLA
Lewis, Richard Charles.....GLC
Lewis, Mars.....EOT
Larned, Elmer.....SLA; Note 15
Louis, William Albert.....SLA; Note 12
Langmead, Harry W.....Note 16
Lytle, Lowry Raeburn.....Note 16
Lowe, Herman Jasper.....Note 3

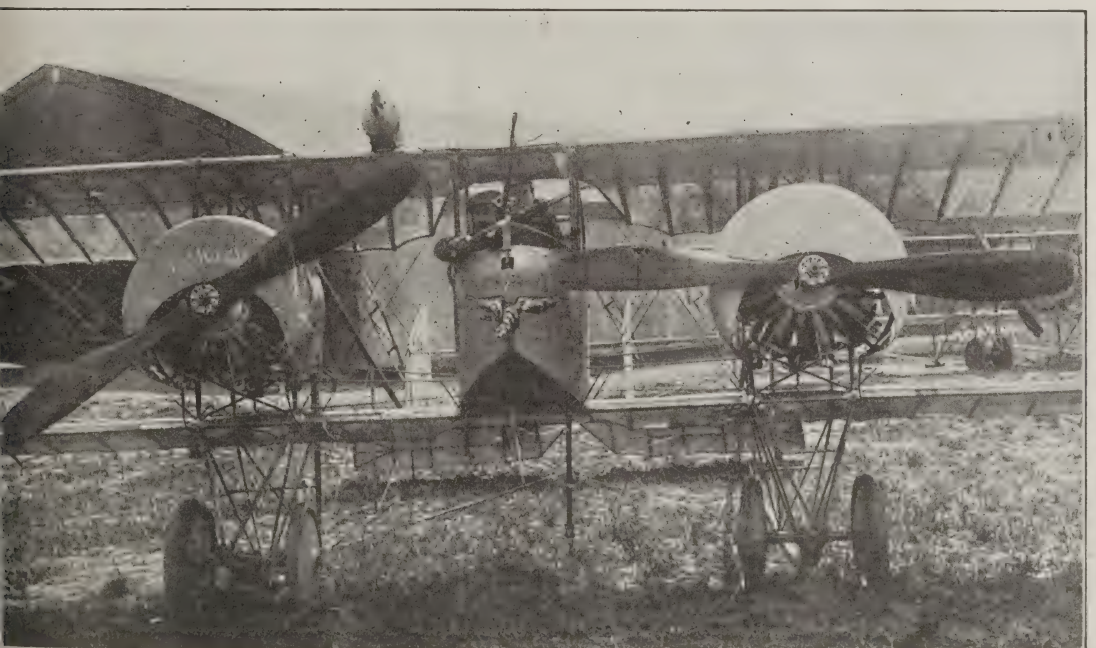
M

Marlier, Raymond M. .....PWM
Mills, Pittman W. .....PWM
Marks, Allan D. .....PWM
Miller, Arthur J. .....PWM
Morgan, John R. .....PWM
Murray, John L. .....PWM
Mullen, Michael C. .....PWM
Morrow, William McKinley.....TFT
Morrow, John, Jr. .....TFT
Muehlman, Harry G. .....LHV
Martin, Douglass E. .....TFT
Marsh, William Alexander.....KST
Marmon, Howard Carpenter.....LTA
Malott, Volney T.....FLA; KST
Madden, Jay .....ASM
Milbur, Arthur McKenzie.....SLA; SBI
Minich, Guy Clarence.....SLA; GLC
Moran, Martin F. .....CJW
Marks, Wirt Peebles, Jr.....SLA; ELA
Michael, Berkeley Strickland.....SLA; PMT
Moorman, Ivan Glenn.....SLA; ELA
Moran, Martin Francis.....SLA; ABC
Morton, Ralph Encell.....SLA; KST
Merrill, Homer T.....CPA; KST
Mayott, Charles.....SLA; MAT
Martin, Charles J. .....AGC
Myrick, Le Roy E. .....CAF
Murphy, William T. .....LHV
Maranville, Clarence H. .....FOB
Morrissey, Edward J. .....KST
Morse, Tyler .....DMA
Massie, Rowland Cooper.....FLA; HHN
Minott, Harold .....MJA
Merrill, Richard Stanley.....CPA
Mills, Harold Palmer.....CPA
Moore, Donn C. .....EOT
Myers, Vernon .....LHV
Marriner, Alfred W. .....FLA
Mahon, John J. .....LHV
Moreland, Andrew .....CAF
Miller, Robert L. .....LHV
Maitland, Lester J. .....Note 3
Mason, Shirley L. .....Note 16
Mactaggart, James Martin.....SLA; Note 21
Milling, Wear F. .....Note 7

Mc

McLeod, Leland S. .....TFT
McGuire, Cornelius J. .....TFT
McDonald, Frank W., Jr. .....PWM
McLean, John J. .....PWM
McLaughlin, Dennis J. .....TFT
McNeil, C. B. .....KST
McCluer, Charles F. .....TFT
McAfee, Allan Lindsay.....SLA; ASM
McCormick, Harold Vorhees.....SLA; KST
McGauley, John Joseph.....SLA; SAG
McConihe, Paul M.....SLA; DMA
McLaughlin, Edward J. .....PWM
McKnight, Ewell. .....EOT
McIntosh, Lawrence W. .....DMA
McCree, Robert D. .....PFO
McCabe, George Matthew.....SLA; SAG
McCabe, Charles Dwight.....SLA; SAG
MacLeod, Norman Langley.....FLA
McParland, Norman Dillon.....FLA
McMaster, Augustine Frank.....MAC
McKernon, George E. .....LHV

(*Continued on page* 584)



"L'Aiglon", one of the veteran Caudron machines, which is now a war trophy

FOREIGN NEWS

French Honors for Colonel Bishop, V.C.

It was announced on October 4th that Lieut.-Col. W. A. Bishop, V.C., D.S.O., M.C., D.F.C., has been made a Chevalier of the Legion of Honor, and been awarded the Croix de Guerre (with palms) for distinguished service in the zone of the French Armies.

Aircraft in the East

What the mastery of the air means in warlike operations is well illustrated in the reports which have come to hand relating to General Allenby's splendid victory over the Turks in Palestine. Thanks to the overwhelming nature of the British aerial equipment in this theatre of war, the enemy seems to have been entirely without warning of the blow which was in preparation. During the battle itself, but one solitary aerial scout made its appearance over the lines, and it was promptly driven off! The Turk was thus compelled to give battle blindly, believing that the impending blow was destined to fall in a direction totally different from that designed by the British commander.—*Flight.*

Germans Begin to Deliver Aeroplanes to Allies

With the American Army Near Verdun.—The first flocks of the 1,700 German aeroplanes which are to be turned over to the Allies by the terms of the armistice were winging across the lines to settle down peacably in our aerodromes when I walked down the road from Haumont toward the front on November 11, says Stephen Eyre in one of his cables to this side.

Turks Welcome British Fliers Led by Yale Man

Mudros, Island of Lemnos, Aegean Sea.—Nine British aeroplanes landed at Galatea, a suburb of Constantinople, two days after the signing of the Turkish armistice October 31. The first allied officer to reach European Turkish soil was Flight Commander Henry Wiser, a Canadian and a graduate of Yale in 1912.

The Turks gave the airmen an enthusiastic reception, declaring they were thankful that Turkey had been cleared of Germans, who had fled to the Rumanian and Russian ports in the Black Sea.

The Turks said they were eagerly awaiting the arrival of the allied fleet, which had been concentrated at Mudros.

An allied army and navy entry probably will be made simultaneously at the Dardanelles. No military occupation of Constantinople at present is probable unless disorder demands that such a course be taken.

A commission composed of British naval and military officers is now inspecting the forts of the Dardanelles, under escort of a son of Tewfik Pasha, Grand Vizier, with a view to occupation.

Aeroplanes Take Food to Reclaimed Italy

Washington.—Caproni aeroplanes are being used by the Italian supreme command to transport emergency rations to the famished citizens of the liberated cities of Italy and also of Pola and Fiume, said an official despatch from Rome.

Coppens's Thirty-First Victory

Belgian Official: On September 27 two enemy balloons were brought down in flames by our aviators. One of them was brought down by Flight-Lieutenant Coppens, who thus achieved his thirty-first victory.

64 Foe Planes Downed

London.—Sixty-four enemy planes were destroyed and 15 others driven down out of control on the western front November 1, says an official communication issued dealing with aerial operations.

French Aviation in the Battle

The following account of the work of French aviators in the recent battle has been communicated through the Press Bureau by the wireless stations of the French Government:—

On September 29th, during the day, misty weather and low clouds did not prevent the French aircraft from effecting a considerable amount of work. In the course of engagements in which they clearly maintained their ascendency over the enemy. French aviators destroyed or disabled 25 aeroplanes, and set fire to two captive balloons. In spite of poor visibility, French bombing machines successfully carried out several operations, flying over their objectives at low altitudes. Twenty-six tons of explosives were dropped on the enemy's convoys and bodies of troops in the battle area, especially at Challerange, Liry and Mont Saint Martin, and thousands of cartridges were fired on German troops in action. Besides this, the French aviators did extensive registering, and accomplished a great many reconnaissances far ahead of the hostile lines.

Allied Co-operation

The "Times" special correspondent on the Western Front writes on October 1st:

The co-operation of the Air Force, both Belgian and British, in the northern battle seems to have been most brilliant as soon as the weather permitted, and has continued throughout the advance. The Belgian flying men have always shown themselves most intrepid and gallant pilots.

The weather seems to have cleared, and the sun has shone nearly all day.

The A. F. C. in Palestine

Mr. H. S. Gullett, war correspondent with the Australian Force in Palestine, writing on September 25th, says:—

A few Australian aviators have been engaged among our Arab Allies to the far east of the Jordan. At the last they lived with the Arabs and did much effective bombing and reconnaissance in places beyond the range of the Air Force on this side. One day they crashed two enemy planes among the Arabs, who were frantic with delight and excitement. They also drove down more than three others. This adventure had a profound effect on our Allies, and spurred them up to continue and increase their fine efforts. Their escapades include blowing up railways and raiding Turkish posts, and were of a very exceptional kind.

An Aeroplane as a Decoy

From the "Daily Chronicle" of October 5th:—

Two British aviators, at great personal risk, enabled a successful local raid to be made with hardly a single casualty to the attacking British.

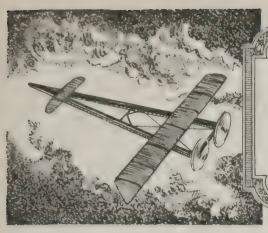
It had become necessary to take a small salient in the line. The Germans were expecting an ordinary attack, with its preliminary bombardment. Early in the morning a British aeroplane passed very low over the front trenches, and purposely flew slowly parallel to the German line, but about five or six hundred yards behind it.

The Germans thought this a target not to be missed, and unsuspectingly fell into the trap set for them, by turning their backs to the British trenches, in order to fire on the machines. Whilst they were thus busily engaging the aeroplane, the British infantry leaped from their trenches, and captured in a few minutes a position to which considerable importance was attached by the British Staff, incidentally taking quite a number of prisoners.

The aeroplane reurned to its aerodrome, riddled with bullet holes, but fortunately, both the pilot and observer were unscathed.



Two British Sopwith Camels and a De Haviland in the air



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

THE other method of determining the resistance of a body is to look up a table of "fineness ratios" of aeroplane bodies. The "fineness ratio" is determined from the ratio of the greatest depth to the length of the body; in other words, should the body measure 3 ft. through its greatest cross section and 21 feet long, the ratio would be 7, as 3 is contained into 21 seven times. The resistance of a body can never be found exactly, and must be tested in a wind tunnel for exact figures, because the resistance varies according to the conditions, such as shape of nose, number of openings for aviators, attachments of wings, and landing gear, whether the motor is partly exposed or entirely covered, and if radiator is set in front, attached to the sides or mounted on the top of the body.

Resistance for a body having a shape like that in use on the German Albatross scouts, which is almost a perfect streamline, figures out as approximately 15 lbs. at 60 M.P.H., the resistance of the radiator and that part of the engine which is exposed along with opening around the engine, opening of cockpit, etc., must be added to this, which would bring the total resistance of the body up to about 40 lbs. A perfect streamline body of "dirigible" form being 5¾ times as long as its greatest width, and whose greatest cross section figures out at 8 sq. ft. area has a resistance of only 7.4 lbs. at 60 M.P.H. That is, if no openings or other irregularities occur to disturb the wind when passing the body.

A body like the old Deperdussin racing monocoque, having a rotary motor partly enclosed in the nose and whose length is 5.6 times its greatest thickness figures out 15.6 pound resistance when the greatest cross section figures out at 8 sq. ft.

Pusher bodies have less resistance than tractor bodies, because the body is not in the slip stream of the propeller, but when you consider the uncovered outriggers in use on pusher machines the resistance is found to be much greater than for tractor machines.

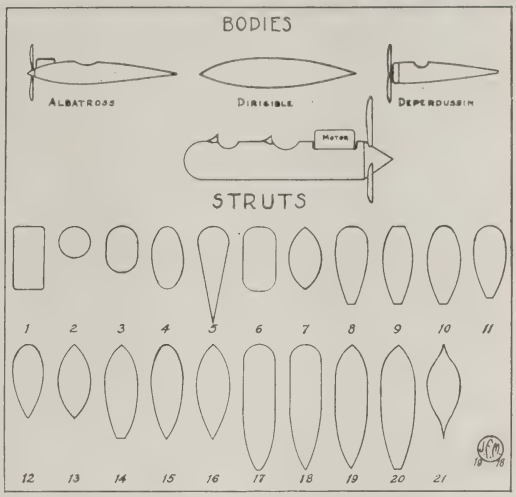
The Continental Pusher Biplane, which was described in AERIAL AGE some time ago, is a good type for a pusher machine, because through the elimination of struts on the outriggers the resistance was cut considerable. The body of this machine, which was made of veneer, and of very good streamline shape, showed a resistance of only 10 lbs. at 60 M.P.H. See attached cut.

Resistance of Struts

The resistance of struts varies according to the shape, and from the table accompanying this article the reader can determine the weight and resistance per 100 ft. of strut. (This weight is for spruce struts.)

No.	Resistance in lbs. for 100 ft. of strut 1 in. wide at 60 M.P.H.	Weight per 100 feet of strut if made of spruce.
1	104.4	41.6
2	81.9	16.4
3	59.2	30.4
4	36.9	34.8
5	63.0	33.4
6	28.6	37.7
7	54.9	30.0
8	12.8	39.7
9	12.8	41.0
10	13.5	39.7
11	13.5	38.0
12	29.9	36.4
13	45.9	36.6
14	14.2	51.9
15	13.5	47.0
16	18.7	44.1
17	15.1	71.0
18	16.4	67.2
19	13.5	62.0
20	13.5	66.1
21	24.6	42.5

The designer would naturally select the strut that shows the least resistance and weight. This will be found to be strut No. 8. Again the designer may wish to use one single strut in place of two, in that case he would use a strut somewhat like No. 9, which has less weight than if two No. 8



struts were used, but the resistance is higher on account of the added skin friction.

To figure the total resistance of struts we simply find the number of feet of strut used on the machine. For instance, we will say that the gap between the planes is 5 feet, and we will use eight interplane struts on the outer section of the wings and four 2½ feet struts over the body, then we have (8 × 5) plus (4 × 2½), or 50 feet of strut. Upon consulting the table we find for the No. 8 strut 12.8 lbs. per 100 feet of strut; then for 50 ft. the resistance would be one-half this amount, or 6.4 at 60 M.P.H. The weight, if made of spruce, would be one-half 39.7 lbs., or 19.85 lbs. for the 50 feet.

Wires, Cables, and Fittings.

The resistance of wires, cables and fittings can only be approximated, and for the lack of any better method would be quite safe for us to consider the resistance of these parts as 10% of the total resistance. Stranded wire or cable has about 20% greater resistance than smooth wires. If, when double wiring is used, a fairing strip of streamline form is placed between the wires, the resistance is reduced considerable. Again, inclined wires or cables offer less resistance than vertical. For instance, the wires on a staggered plane, control wires running fore and aft, etc.

(To be continued)



A model of a Nieuport made by John Krawie of the Illinois Model Aero Club. This machine has a spread of 35 inches on the top wing and 17 inches on the lower wing. The weight complete is 4 ounces



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Enthusiasm

Salute, oh Earth dwellers! with our motto of youth and joy, we greet ye, miserable mimes of the old mud ball!

As youth, we speak, for the call of the air echoes instinctively in the heart of youth, where there is blood of buccaneers clamoring for adventure, where grows a spirit of fearless enthusiasm, and where abides iron courage to rule the tense muscles; the keen eye, and the tingling nerves in the sport of all sports—the game of the young gods.

And Pan piped for a chorus!

For verily, every jaunt in ether is a joyride, the lever that guides us through the boundless space is a joystick, and in every way the life of lives in a reckless, wild, voluptious carnival of joy!

Enthusiastic, is it?

Yes, we are bubbling and gurgling with it! Moreover, gentle reader, take warning if you are one who chooses to sneer at children of enthusiasm, steer clear of these few lines, but, far more, dodge desperately all the wild young devils who are careering above space.

Our swank is simply boundless, and why not? Aren't we the Senior Service? The Infantry are mud dabblers, the Cavalry are stick-in-the-muds, the Artillery are camouflaged mud flounders; but who skims aloft, clear of the flotsam, shell-churned fields of Flanders, throwing mud at all others, but above muck, flying through clean pure wholesome fragrant air.

Why, us, of course.

Contempt for all the services. Long live swank in the R. A. F. Which reminds us that only a couple of months ago, we, of the R. F. C., hated to have wings on our machines because the R. N. A. S. had them, and none the less spurning were the Amphib aviators, who turned up snobbish noses at us and contemplated doing without engines because we had them.

But now all is one! Divided we stand, united in our contempt for all and sundry lubbers of the land, and above all for that fungus of the air, that sausage-shaped canteen of the atmosphere—the gasbag.

And where is the war to be won? In the air, of course, indubitably beyond cavil, and why ask silly questions with obvious answers.

Ah, yes, we are the handy kids when it comes to packing pestiferous wars away in our little air pockets.

There is really no dimension in Euclid that can circumscribe our accomplishments and our swank.

Who dropped 100,000 pounds of food into General Townshend's camp at Kut? Who, on shanksponies, or his trains, his liners, or his motor cars, has duplicated the feat of the Handley Page that flew from London to Constaninople?

Who, on terra-firma, has taken twenty-one full grown people to a height of 7,000 feet? Why, gentle, and by now, I hope, completely squelched reader, the answer is Airgods, race whirlwinds, and us.

Listen ye to the words of a contemporary ravista, and keep awesome silence as the aeroplane speaks. Ah! Readers, smile not unbelievingly, as you smiled but a few years past.

There may be greater wonders yet. Consider that as the speed increases so does the momentum in the mass of the aeroplane become terrific. And bearing that in mind, remember that with altitude gravity decreases.

There may be literally other worlds to conquer. We now have Aero Mail. We may yet circle the earth in a day.

It's all helicopters and ornithopters to me what all this means, but from the general drift, I opine Shakespeare may yet have to prod his Puck if he doesn't wish him overtaken in the cloudlands.

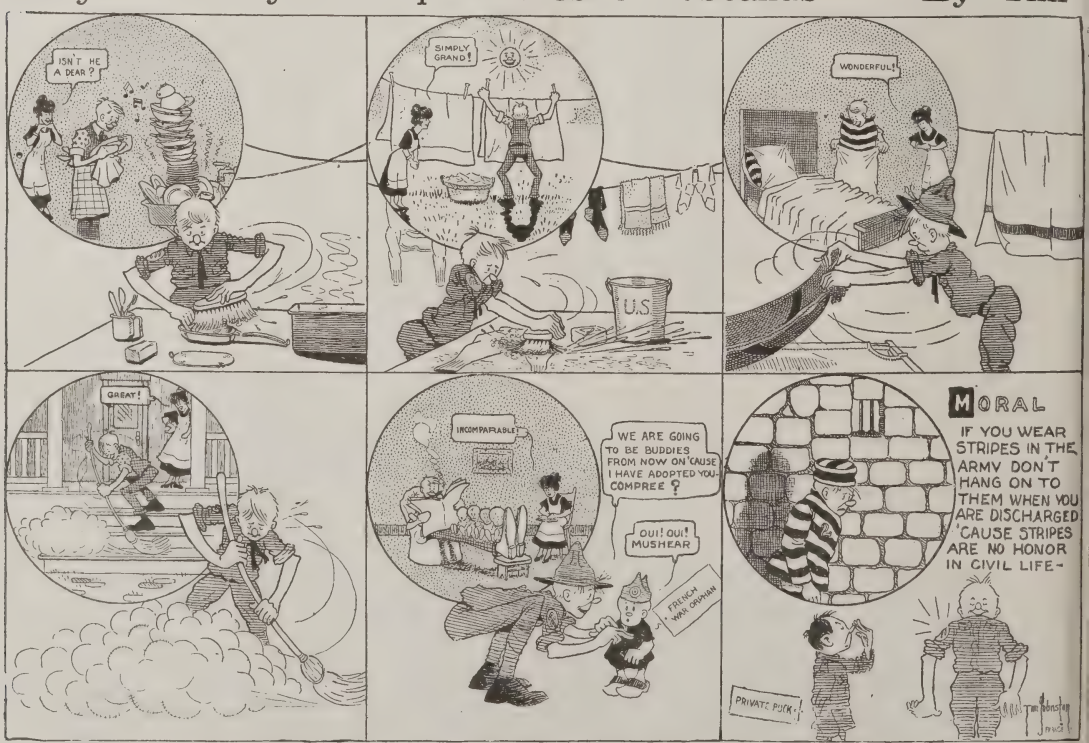
Totally smothered and, I avow, completely silenced reader, do you mind my obliterating you utterly with one more quotation?. "In time to come it will be a world without distance and without time, a world inhabited throughout, a Lilliputian world that can hold no darkness, no uncivilization, and no surprise. That world lies entirely within the imagination and capabilities of the designers and constructors.

Down, down, most miserable reader, down and worship. Infantrymen, present your arms. Cavalry! out with your sabres and saluute, guns boom out the salvo of honor. All ye insignificant, grovelling earth-crawlers, down—with your backs flat and your faces in the dust—down and worship me!

I'm a ground pilot! and I expect my license by the first mail tomorrow!

Creation's Dream!

Why The Army Develops Domestic Husbands — By "Tim"





With victory looming in the eastern skies, be it remembered that

PARAGON PROPELLERS

built and based on efficiency, are with the winning forces. In the fight for democracy our product is Ace High. Four plants. Total floor space 164,132 ft.

AMERICAN PROPELLER & MFG. CO.

Spencer Heath, Pres. **BALTIMORE, MD.** **J. M. Creamer, Vice-Pres.**

(Continued from page 563)

Parcel Post Can Be Speeded Up

"The cost of aerial mail night and day letters will be less than that of wire communication. The cost of an aerial mail letter is 16 cents for two ounces. For this price there can be sent a message that would cost $5 to send by telegraph.

"The estimate of $50,000,000 of potential postplane business takes no account of the possibilities of transporting parcel post aerial mail. One of the Caproni 2,100-horsepower machines now in operation could easily transport 2,500 pounds of mail. At least $25,000,000 worth of parcel post could be sent by aeroplane.

"Enthusiasts who look forward to the transatlantic transportation of aerial mail as certain to come within the next twelvemonth assert that there is another twenty-five million dollars' worth of transatlantic mail waiting for an aerial mail service. They point out that Uncle Sam now pays 80 cents a pound to American steamships to carry transatlantic mail and that a charge of $1 per letter across the Atlantic would be a paying proposition."

Aero Mail Pilot Eats Lunch En Route

William Dishler Warner, the inventor of the Warner Knee Control, has received an immensely interesting letter from Pilot Robert F. Shanle, of the New York-Philadelphia-Washington aero mail service. It follows:

"Mr. Chas. King, Chief Mechanic of this field, has equipped the planes I fly in the New York-Philadelphia-Washington air mail service with the 'Warner Knee Control.'

"The Warner control allows me the free use of both hands, and as schedule leaving time is twelve noon every day, I now take my lunch with me and eat it while en route.

"I consider the knee control a great advantage to cross-country fliers."

American-Made Aeroplane Cotton Fabric Now Produced for All U. S. Amy Needs

The War Department authorizes the following:

The production of American cotton aeroplane fabric is now averaging about 1,200,000 yards monthly, sufficient for all requirements, and capable of being largely increased if necessary. No more linen fabric is being imported from abroad for this purpose, and after the imported stock now on hand is exhausted, cotton fabric will be used exclusively in covering American aeroplane wings.

At the outbreak of the war in 1914 linen was the only material which had proved entirely satisfactory for covering aeroplane wings, the essential physical properties required being lightness in weight, proper absorption of dope, and strength and resistance to tear.

Pre-War Production

The chief countries before the war producing flax for fine grades of linen were Belgium, Russia, and Ireland. The Belgian supply was cut off from the Allies in 1914. The Russian flax was difficult to obtain and was later cut off entirely. In the meantime the consumption of linen for war purposes had increased enormously. By the spring of 1917, when the United States entered the war, the linen situation was very serious, and it was obvious that some substitute would have to be found.

In developing a cotton aeroplane fabric which would have the necessary qualities of the linen the United States Government received the greatest assistance from the various cotton mills.

Samples were made from cotton of many constructions and numbers of yarn, varying from No. 40 two-ply to No. 100 four-ply, the cloth having from 50 to 90 threads per inch. Yarns were in some cases mercerized under tension and various twists were tried. Several cotton mills co-operated in this work.

Testing of Samples

When the new fabrics were secured samples were put on aeroplanes, "doped" and varnished, according to regulation practice, and tested in actual use at Langley Field and Pensacola. Flying tests were also made with several other varieties of fabric. The tests were for three months of service, averaging 10 hours per day. Members of the United States Air Service, members of the foreign flying corps, and other experts assisted in the experiments. They reported that the cotton fabrics developed in the United States appeared to serve most favorably. Other very favorable reports have recently been received from tests made in Great Britain on American cloth sent over there.

After many experiments had been made the first contracts for 10,000 yards each of cotton aeroplane fabric were placed in the middle of September, 1917. The results obtained with the first cotton fabric produced were satisfactory and it was decided to place further contracts for cotton aeroplane fabric.

Adopted Last November

Two fabrics were adopted, the specifications calling for a strength of not less than 80 pounds per inch in both warp and filling. The cotton used in the manufacture of the cotton aeroplane fabric had to be of a very long staple, and in November, 1917, the Air Service purchased 15,000 bales of long-staple Sea Island cotton.

The first quantity orders for cotton aeroplane fabric were placed in October and November, 1917, and were for 1,280,000 yards of grade A and 200,000 yards of grade B cotton aeroplane fabric. Deliveries of cotton aeroplane fabric started in January with the production of 173,000 yards. Production has gradually increased until at the present time 1,200,000 yards are being produced monthly.

Subsequent Contracts Let

Subsequent contracts have been let for cotton aeroplane fabric amounting to 11,513,084 yards. All of these later contracts, however, have been for grade A cotton fabric, as it now seems clear that this cloth is superior to the other.

While the cotton aeroplane fabric was at first only used for training planes, and the grade A standard linen fabric, which was imported from Great Britain, was used for combat planes, it was decided in April, 1918, that the grade A cotton fabric could be used for all types of planes.

War Trade Board Interprets Ruling as to Balsa Wood

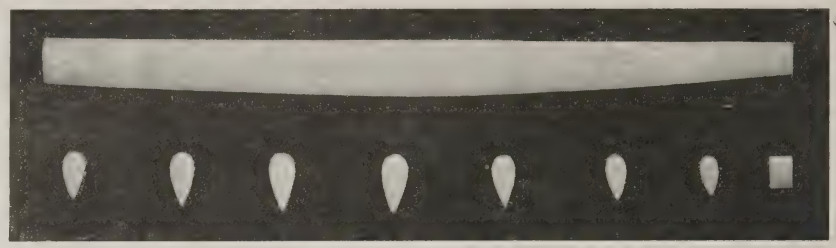
The War Trade Board announces in a new ruling (W. T. B. R. No. 318) that they will not construe balsa wood as included in the restriction announced in W. T. B. R. 284, issued October 21, 1918, covering all wood as specified in or classified under paragraph 647 of the tariff act of 1913, except cedar. W. T. B. R. 284 has therefore been amended to read:

"The War Trade Board have, by a new ruling, extended the restriction upon the importation of wood. All outstanding licenses for the importation of wood as specified in or classified under paragraph 647 of the tariff act of 1913, except cedar and balsa wood, have been revoked as to ocean shipment after October 25, 1918. Hereafter no licenses will be issued for the importation of wood as specified in or classified under paragraph 647 of the tariff act of 1913, except cedar and balsa wood, other than to cover the following:

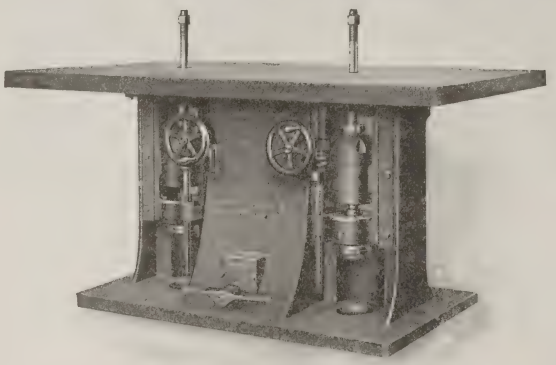
"1. Shipments from Mexico or Canada by other than ocean transportation, when such commodities originated in such countries.

"2. Shipments from Europe or Mediterranean Africa when coming as return cargo from convenient ports where loading can be done without delay."

The War Trade Board regulation affecting the importation of balsa wood will be found in W. T. B. R. 273, issued October 17, 1918.



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(*Continued from page 579*)

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McDaniel, Lancy C.....LHV
McCaffrey, Harold Winfield.....SLA; EOT
McAllen, William D.....LHV
MacClain, Albert Lewis.....SLA; MAT

N

Nill, Joseph Henry.....FLA; HHN
Newland, Phillip J.....Note 24
Neale, Peter Charles.....SLA; GLC
Ney, John J.....SLA; DMA
Nash, Halsey Reginald.....SLA; PMT
Norton, Maurice Atherton.....SLA; SAG
Norton, Harrison E.....LHV
Newbury, Frank J.....DMA
Newbold, Edwin E.....DMA
Nixon, John Fred.....SLA; CFT
Nielsen, Alvin John.....SLA; KST
Nelson, Martin A.....TFT
Nunn, Charles Harry.....SLA; SBI

O

Olmstead, Rossiter D.....TFT
Orr, Tasso V.....KST
Osborn, George M.....HHN
Owens, William Charles.....SLA; CRI
Oaks, Harry C.....LHV
O'Brien, Edwin Downey.....SLA; KST
O'Brien, Roland H.....LHV
O'Brien, Matthew H.....FLA

P

Potts, Thomas Rives.....SLA; SAG
Phillips, Caldwell Sweet.....SLA; AAD
Phipps, Lawrence Clinton, Jr.....AMV
Perley, Walter Lee.....SLA; DAP
Panzer, Carl H.....PWM
Pinaire, Owen H.....PWM
Pound, Murphey.....Note 3
Peck, Lee H.....Note 3
Phillips, Wendell Kingsley.....SLA; CRI
Parker, Roy C.....KST
Pennington, Victor Power.....SLA; AAD
Parsell, Charles C., Jr.....Note 3
Pierce, Stanley W.....SMM
Pence, Frank Allen.....FLA; LHV
Paulson, Glenn Arden.....SLA; GLC
Phillips, Wendell K.....AAD
Peabody, Dwight V.....CAF
Pinckney, Jerald J.....LHV
Perrin, William Joseph.....SLA; CRI
Packard, John H.....MJA
Paul, Clarence Le Roy.....SLA; MAT
Page, Richard Marshall.....FLA
Polhemus, Dudley Abram.....FLA
Proper, James H.....CAF
Patterson, William L.....DAP
Phetteplace, Charles Glenn.....SLA; MAT
Prentice, James.....REL; DMA
Pittman, William Manning.....CFT
Pillsbury, Edwin S.....CPA
Pinkstaff, Everett W.....TFT
Peterson, Frank S.....LHV

R

Randall, Norman L.....PWM
Ringholm, Howard E.....PWM
Rumney, Raymond C.....PWM
Reinhard, Henry A.....PWM
Royce, Gardner.....PWM
Richardson, Elbert Lindsy.....FLA
Ramsey, John Patterson.....Note 22
Rogers, George Washington.....SLA; SAG
Rogers, James Clarence.....SLA; KST
Robinson, Leo Jay.....CPA; Note 20
Robinson, Clarence A.....LHV
Robinson, Adrian Ashcroft.....SLA; CFT
Rockcastle, Charles Joseph.....SLA; ELA
Reed, Charles William.....FLA; DAP
Ransom, Ira Edward.....SLA; PMT
Robertson, Lawson.....SLA; HHN
Raney, James A., Jr.....TFT
Rafter, John M.....TFT
Regan, Joseph J.....TFT
Rebling, Roy Thomas.....SLA; DAP
Robards, Charles M.....SLA; DMA
Rowell, Fred William.....SLA; KST
Raymore, Henry Bond.....SLA; CFT
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Rice, Thomas E. P.....DMA
Reik, Raymond Carlisle.....CPA
Rockcastle, Charles J.....CAF
Rowe, Lindley P.....LHV
Renfro, DeGrimm.....FLA
Reed, Harold Arthur.....SLA; MAT
Roberts, Carroll H.....ELA
Rennebaum, Ernest H.....LHV
Roberts, George L.....Note 3

S

Sanford, Frank W.....PWM
Silverman, Silas P.....PWM
Stewart, Hal W.....PWM
Scherck, George.....PWM
Sly, Nelson A.....PWM
Swift, Arthur D.....PWM
Sisson, Benjamin Frank.....SLA; MAT
Sutherland, Frank Everett.....SLA; PMT
Smith, Fred Lester.....SLA; EOT
Stevens, Winthrop Parsons.....SLA; CRI
Schroeder, Wainwright.....FLA; PWM
Shaneberger, Roy Clifton.....FLA; DAP
Smith, Ellis Glen.....TMA
Strahlmann, Otto E.....CPA
Smith, Curtis Walter.....SLA; CFT
Snow, Lancy.....SLA; KST
Smith, Lowell H.....CPA
Shields, Gerald Joseph.....SLA; DAF
Setzler, Harry G.....Note 16
Schenck, Ralph Eugene.....SLA; EOT
Sutter, Walter Frederick.....SLA; SAG
Smiley, Erle Boyd.....SLA; MAC
Spearman, Roy Jonstone.....SLA; CRI
Schinkel, Herbert J.....CAF
Shifflett, Olan Grandville.....SLA; LDT
Simpson, Arthur Lee.....SLA; DAP
Stout, Clyde Joseph.....SLA; CFT
Stafford, Edward E.....EOT
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(*Continued from previous page*)

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Shaver, John B.....Note 3
Sturges, Carl Brooks.....SLA; KST
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Sweet, William Manly.....SLA; DAP
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Sherwood, Horace Moore.....SLA; KST
Speedie, Matthew Riley.....SLA; SBI
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Stanton, Thomas Joyce.....SLA; KST
Sternhagen, John Meier.....SLA; DAP
Stinchfield, Paul Marston.....SLA; SBI
Shangraw, Clayton Charles.....SLA; GLC
Schofield, Earle S.....Note 9
Sweeney, David R.....LHV
Simpson, Harold Goodsir.....SLA; MAT
Sceeles, Walter P. R.....BST

T

Tucker, McKendree Augustus.....SLA; PWM
Towle, Francis Bartram.....SLA; CFT
Turner, Carroll John.....SLA; TMA
Tench, George Edward.....SLA; MAC
Tuohy, John Francis, Jr.....SLA; SAG
Turner, Wellmore Baldy.....SLA; DAP
Tantum, William Harris.....CPA; DAP
Torrance, Kirby E.....TFT
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Todd, Clarence W.....PWM
Thorne, William B.....PWM
Tongue, Walter Barnard.....SLA; EOT
Thompson, Homer Thomas.....SLA; KST
Tate, John Torrence.....FLA
Trask, Verne A.....TFT

U

Umlauf, Louis Blanton.....SLA; AAD
Underhill, Donald P.....TFT
Uhler, Theodore C.....EOT

V

Vandervee, Charles A.....CAF
Vautsmeier, Walter W.....ASM
Van Artsdale, Lee William.....SLA; GLC
Volkhardt, Aquila N.....HHN
Victor, Hugo Burdett.....SLA; KST
Vernon, John Stephen.....SLA; ELA
Von Hasslacher, Harold Seymour...SLA; CRI
Vogel, Henry William.....SLA; CRI
Vogel, Paul O. Michele.....SLA; SBI
Von Sprecken, Theodore M. W.....GLC
Von Beren, Russell David.....SLA; ABC
Vivian, Johnson Knight.....SLA; BFT
Vedder, Horace Egleston.....FLA
Vaden, Ferris E.....TFT

W

Walters, Harold Wrigley.....SLA; CRI
Wilson, Reynolds D.....Note 22
Wright, Francis M.....Note 8
White, Thomas H.....DAP
Wine, Edward Alden.....CJS
Wenner, Edward Francis.....SLA; GLC
White, Harold Kirk.....DIK
Whipple, Byron E.....TFT
White, Robert B.....TFT
Watson, Minor S.....TFT
Williams, Isaac F.....TFT
Webster, David Locke.....CPA
White, George Leland.....SLA; MAC
Ward, Charles P.....PWM
Welty, James A.....PWM
Wilbur, Jerry F.....PWM
Woody, Kenyon.....PWM
Winslow, Warren W.....AGC
Webster, Robert Morris.....SLA; CRI
Wiggins, Frederick C.....LHV
Willis, Eppa Hunton.....SLA; SAG
Walters, John E., Jr.....MAT
Wright, Fay Linton.....SLA; MAC
Wise, Andrew Boyd.....SLA; MAT
Wood, Benjamin F.....LHV
Wood, Edward Watson.....SLA; CRI
Waterworth, Harold A.....PWM
Wiedersum, Roy.....PWM
Woodbury, Philip J.....PWM
Wilkinson, Charles Henry.....SLA; SAG
Woodman, Joseph Edward.....SLA; SAG
Wasserman, Max J.....TFT
Wade, Robert Mosby.....FLA
Walker, Walter Treat.....CPA
Wierman, Paul Dennis.....Note 3
Webster, Robert M.....CAF
Walters, Harold W.....CAF
Wood, Edward W.....CAF

Y

Young, Seward W.....BST
Young, Leslie Bernard.....SLA; PMT
Young, Crawford M.....CAF
Yaple, Lee G.....TFT

Z

Zeller, Max J.....TFT

(*Continued from page* 561)

thrills by dashing down and spinning their landing wheels on the surface of the Brazos River.

Pathe News' Movie Man was on hand for the occasion to film the events of the day and he obtained some excellent pictures of aeroplanes in formation and stunt flying which will be soon released to the public.

Major Whitesides, Commanding Officer of Rich Field, is in receipt of a congratulatory telegram upon the success of the flight from Major-General William L. Kenly, Director Department Military Aeronautics.

Aside from the spectacular display, this remarkable formation of one hundred and forty-nine ships is looked upon as indication of the progress being made by the flying schools of the United States. With so many ships in line, representing eight of the country's different flying fields, this Rich Field Formation will go down in Air Service history with the credit it deserves.

Long Flight in Bomb Plane

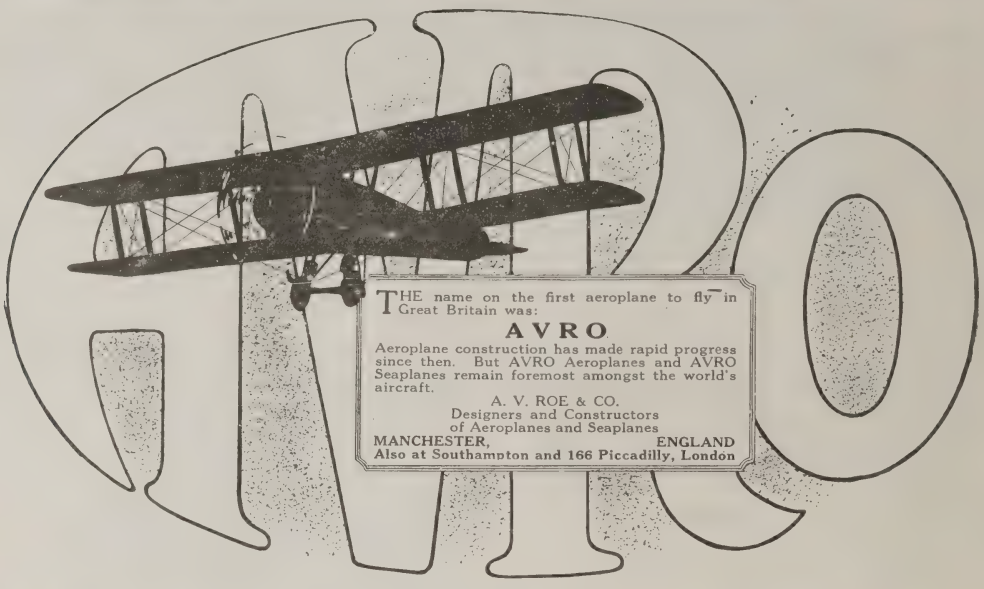
Washington.—A big Handley-Page bombing aeroplane arrived at Bolling Field here at 2:55 o'clock on November 13 from Hazelhurst Field, Mineola, L. I., having made the trip of 230 miles in three hours and one minute actual flying time. The machine was forced to stop at Alfred Vail Field, Little Silver, N. J., because of a broken oil connection.

The plane left Hazelhurst at 9:25 o'clock and was piloted by Capt. Weller of the British Royal Air Forces, with Lieut. Ludick of the United States Army Air Service as guide. Four passengers were carried. The flight was made at an average of 4,000 feet. A sleet storm was encountered while passing over New Jersey.

Most Wounded of Fliers Sent Home

Major Malcolm McB. Bell-Irving, Vancouver, the first Canadian aviator to win the Distinguished Service Order, landed at an Atlantic port on November 11, bearing more wounds than any other member of the Royal Air Force and forced out of the service against his will.

The Major has an artificial leg, a badly scarred face and a gold plate over a great gap in his skull. His final injuries were not received in battle, but in a flying stunt, as instructor at Gosport, England, in the spring. He crashed to earth and was picked up unconscious, his left leg smashed and otherwise hurt. They told him recently, after he was well enough to walk, to go home.



Aeroplanes and Parts

Report from Pershing a Record of Victory

Washington.—General Pershing has cabled the following report for the operation of November 8:

"Despite adverse weather conditions our aviators, flying at a height of 100 metres, carried out a number of reconnaissance missions. They bombed and machine gunned concentrations of enemy troops in Baalon and Remoiville and blew up an ammunition dump at Gibercy. Four enemy balloons were destroyed and three enemy aeroplanes were shot down during the day. One of our planes is missing."

Those Who Went "Over the Edge"

A memorandum for the Commander of the Army Balloons, First Army, contains the following list of observers who have made parachute jumps on the line under fire with a slight history of each case.

1st Lieut. Paul N. A. Rooney, 4th Company, A. S., U. S. A. Two jumps; July 22, 1918, Lt. Rooney and Lt. Ferrenbach performed a mission in balloon opposite Seicheprey. The balloon was attacked and burned; both observers jumped. They ascended four hours later in another balloon and continued the work. September 26, 1918, during the advance northwest of Verdun, Lt. P. N. A. Rooney and Lt. E. S. Montgomery, both 4th Co., were forced to jump when attacked by three enemy planes.

2d Lt. E. S. Montgomery, 4th Company, A. S., U. S. A. One jump given above with Lieut. Rooney.

1st Lt. Winfred C. MacBrayne, 102 F. A. (4th Company). One jump; September 2, 1918, Lt. MacBrayne and Sgt., 1st Class, Normal Brunnel, performing a mission during the advance near the Vesle River, were forced to jump when an enemy plane dove and fired upon the balloon.

Sgt., 1st Class, Norman Brunnel, Student Observer, 4th Co. One jump given above with Lt. MacBrayne.

1st Lt. S. V. Clarke, 9th Co., A. S., U. S. A. Two jumps; August 28, 1918, Lt. S. V. Clarke was forced to jump from balloon when attacked by an enemy plane. The balloon was burned. He ascended a few hours later in another balloon. September 26, 1918, Lt. S. V. Clarke and Lt. S. E. White were observing in balloon when attacked by an enemy plane. The balloon was burned. Both observers showed coolness in jumping, one waiting for the other's parachute to open before going over.

2d Lt. S. E. White, 9th Co., A. S., U. S. A. History of this jump given above with Lieut. Clarke.

1st Lt. James A. McDevitt, 11th Co., A. S., U. S. A. Four jumps. September 17, 1918, at Mamey, Lt. McDevitt jumped when attacked by enemy plane. October 5, 1918, Lt. McDevitt jumped during the advance northwest of Verdum. There were eight holes in the balloon and four in the basket from the enemy's bullets. October 6, 1918, Lt. McDevitt while observing in a balloon was atacked by two enemy planes and forced to jump. Eighteen minutes later he ascended and continued his work. October 6, 1918, Lt. McDevitt was attacked the second time an hour and eight minutes later. He jumped. The balloon was burned.

2d Lt. George D. Armstron, 11th Company, A. S., U. S. A. Three jumps. September 26, 1918 Lt. Armstrong, while in a balloon at Germanville, during the drive Northwest of Verdun, was attacked by enemy planes and forced to jump. October 6, 1918, Lt. Armstrong was forced to jump when his balloon was attacked by an enemy aeroplane. October 6, 1918, Lt. Armstrong was attacked by two enemy aeroplanes, Fokkers, and forced to jump. He reascended immediately but was forced to jump again thirteen minutes later. There was one bullet hole in the basket.

1st Lt. Birge M. Clark, 3d Company, A. S., U. S. A. One Jump: August 30, 1918, 1st Lt. B. M. Clark and 1st Lt. Ralph L. Dold were forced to jump when attacked by a German Pfalz plane. This jump occurred at Brouville, Meurthe et Moselle while under the jurisdiction of the 6th Corps of the 8th French Army. The balloon was not burned. Eight holes were found in the fabric.

1st Lt. Ralph S. Dold, F. A., U. S. A., attached to 3d Company. One jump as above.

1st Lt. Harlou P. Neibling, F. A., U. S. A., attached to 3d Company. Two jumps: September 2, 1918, near Brouville, Meurthe et Moselle, France, while under the jurisdiction of the 6th Corps of the 8th French Army, 1st Lts. Harlou P. Neibling and George C. Carroll were attacked by two enemy aeroplanes and forced to jump. The balloon was burned. September 26, 1918, 1st Lt. Harlou P. Neibling and George C. Carroll were forced to jump during the advance Northwest of Verdun when attacked by two enemy planes. The balloon was burned.

1st Lt. George C. Carroll, 3d Company, A. S., U. S. A. Two jumps as above.

151 Loops Made in Aeroplane

Dallas, Tex.—What is said to be the world's record for consecutive loops in an aeroplane was made at Love Field on Nov. 12 by Lieut. W. T. Campbell, who made 151 loops. The old record, 143 loops, was made recently at San Antonio by Lieut. Edward Stinson.

Iowa Aviator Escapes from Austrian Prison

Trieste—Aviator C. O. Young of Des Moines Ia., who was supposed to have been killed, has arrived here with a number of Allied prisoners who succeeded in escaping from Austrian concentration camps owing to local riots. With him was Paul G. Ratliff of Drew, Miss.

Drop Fliers' Death List

With the American Army in France—In a recent night raid upon Toul by German aviators the Germans not only dropped bombs, but a flaring parachute containing a list of American fliers who are dead within the German lines or are prisoners.

The list, which was headed "Americanische Flirgerkorps," contained thirty-five names, sixteen of them given as dead and the others as prisoners, some of them wounded. The list was signed by Lieutenant A. B. Kraft.

(*Continued from page 562*)

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 203 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 235 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 257 degrees Fahr. and the end point shall not exceed this temperature by more than 27 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

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When 50 per cent has been recovered in the receiver the thermometer shall not read more than 221 degres Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 311 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 347 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

AERIAL AGE WEEKLY

Vol. 8, No. 12 DECEMBER 2, 1918 10 CENTS A COPY



A formation flight at one of the American Aviation Fields

AERO MAIL SERVICE PLANS FIFTY NEW LINES

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VOL. VIII DECEMBER 2, 1918 No. 12

TABLE OF CONTENTS

PAGE

Aero Mail Service Plans Fifty New Lines 605

Meeting Demand for Landing Places for Sport and Pleasure.... 606

News of the Week 607

The Aircraft Trade Review..... 610

U. S. Aerial Mail..... 611

The Breguet Biplane 612

The Hughes Aircraft Report 616

Some Recent Aeronautic Books.... 619

Improved Arc Welding Tool 619

The Advent of the Era of Commercial Aeronautics 620

The Metal Airscrew 622

Naval and Military Aeronautics.... 624

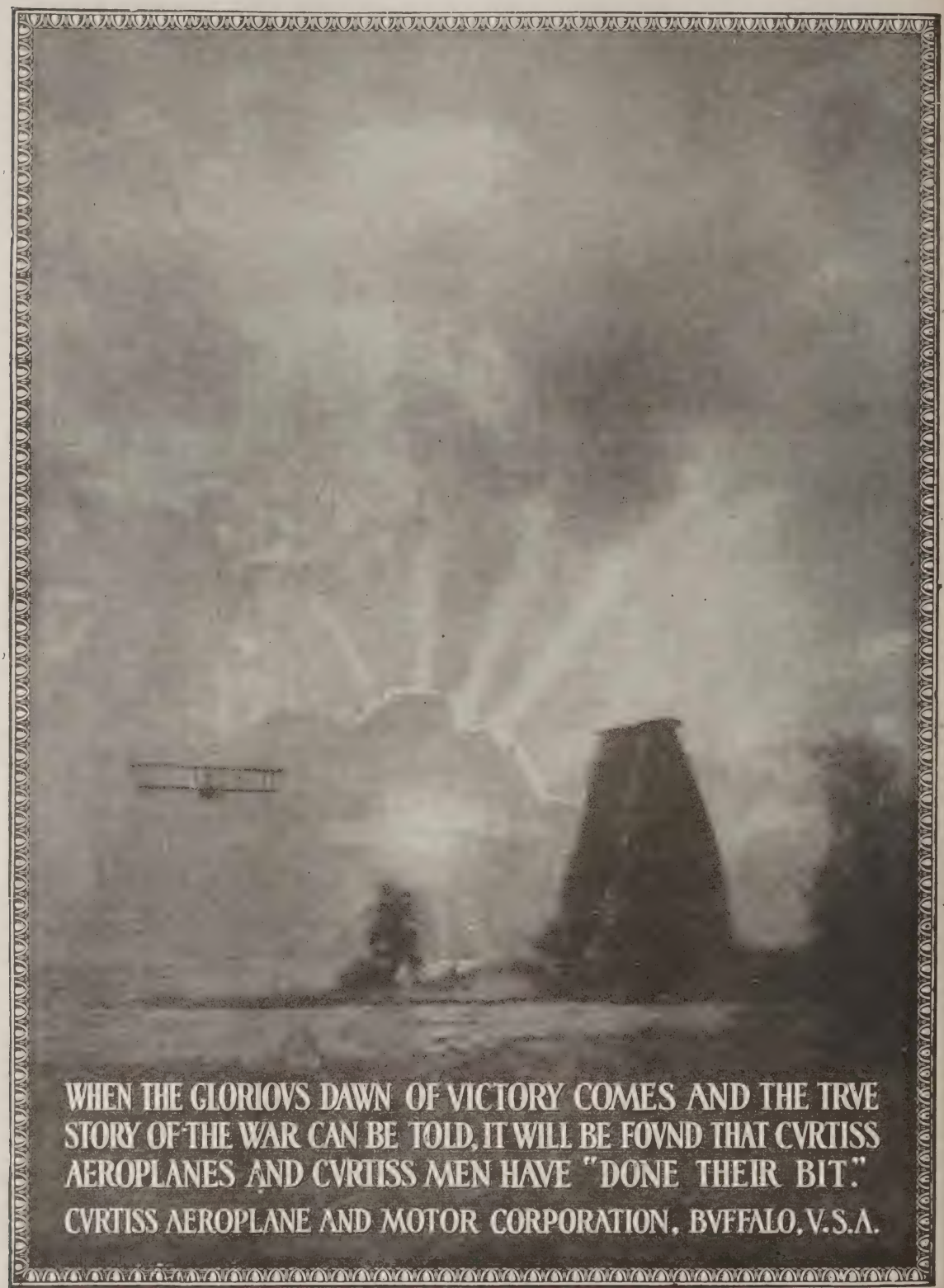
Foreign News 626

Elementary Aeronautics and Model Notes 627

Aeronitis 628

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879


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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, *at the Post Office at New York, N. Y., under the Act of March* 3, 1879

Copyright, THE AERIAL AGE CO., Dec. 2, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, DECEMBER 2, 1918 NO. 12

AERO MAIL SERVICE PLANS FIFTY NEW LINES

THE immediate establishment of fifty new air mail lines is contemplated by the Post Office Department and will be effected almost at once through the use of army aeroplanes, equipment and trained personnel if the War Department can be induced to turn over its surplus planes and fliers. Necessity for rapid action has arisen, according to the Aero Club of America, through the fact that hundreds of army aviators have been notified that they must resign within a few days or identify themselves with the regular army.

According to Captain B. B. Lipsner, Superintendent of the Aerial Mail Service, who came to New York to consult with aircraft men whose aid in extending the service he desires to enlist, ample authority already exists for the army to turn over to the Post Office Department all the essentials of a nation-wide air service. He declared the last general army appropriation bill provided that such disposition should be made by the army of all superfluous material which it did not require for actual combat and training purposes. Captain Lipsner said that Secretary Baker is in cordial sympathy with the expansive program of the aero service.

Development of aero mail service to a point where rapid transmission of millions of letters from New England to the far South and from coast to coast will be but a matter of weeks or months may already be on the verge of accomplishment, according to Henry Woodhouse and other leaders here, as they said it was possible favorable action already had been taken by the War Department on the request of the Aerial Mail Service for its fliers, planes, and general equipment. They pointed out that the recent resignation of John D. Ryan, Assistant Secretary of War and Director of Aircraft Production, and with him of a number of minor chiefs of the army aero service, had possibly obscured for the moment favorable action already taken by the War Department. If this is not so, Mr. Woodhouse added, their going would delay such action only momentarily, for the army could not use a fraction of its men and planes. Alan R. Hawley, of the Aero Club of America, last night sent this telegram to Secretary Baker:

"Hundreds of army aviators who have been notified that they must decide in a few days whether to resign their commissions or join the regular army have applied to the Aero Club of America for positions. Most of them are anxious to join the Aerial Mail Service; therefore, we urge that the time in which they must place their resignations with the army be delayed long enough to permit them to connect themselves with the Post Office for aerial mail service.

Country Wants Aero Service

"Second Assistant Postmaster General Praeger and Captain B. B. Lipsner, the Superintendent of the Aerial Mail Service, have been preparing for exactly such an emergency, and they are ready to establish fifty aerial mail lines throughout the United States and employ 1,000 military aviators to carry mail. You can hasten the establishing of these aerial mail lines and employing of these aviators by turning over to the postal authorities 500 of the aeroplanes which the army cannot use at present, and which will deteriorate and be wasted unless they are turned over to the Post Office.

"We know from the hundreds of requests received from the Chambers of Commerce throughout the United States that the country as a whole wants the extension of the aerial mail service, because it has been run at 100 per cent. efficiency for six months and promises to solve some of the most difficult problems of mail transportation and distribution."

Captain Lipsner said that the 100-per-cent. success already scored by the aero mail service, without the loss of a man or a machine, amply justified its ambitious program, and that the millions of letters already transported afforded indisputable evidence that the business public is eager for extension of the service. He said that already many highly trained fliers and mechanics are returning from the battlefields of Europe and are eager to turn their training to good account.

In defining the army equipment which would be most valuable to the postal men, Captain Lipsner mentioned the vast accumulation of instruments of all sorts, as well as hundreds of Handley Paige planes which can carry one and one-half tons of mail at the rate of 100 miles an hour, more hundreds of De Havilands, each of which can transport 1,000 pounds of mail at the rate of 140 miles an hour, and numerous other twin-motor types of aeroplanes readily adaptable to the mail service.

Transcontinental Airways

Rear Admiral Robert E. Peary, President of the Aerial League of America, Chairman of the National Aerial Coast Patrol Commission and of the Committee on Aeronautic Landing Places of the Aero Club of America, recently has completed a survey of the logical transcontinental airways in the United States. His conclusions, which are expected to be of material value in the development of the aero mail service, are to be published soon by the Century Company in the first American Aero Blue Book, edited by Henry Woodhouse. Admiral Peary says:

"Among the things being done to so assist the Government in its plans for aerial development is the plan of the Aero Club of America to establish eight great American airways and a number of air routes, which plan is being developed by the Committee on Aeronautic Maps and Landing Places of the Aero Club of America, with the co-operation of the thirty affiliated aero clubs, the Aerial League of America, and as many co-operating organizations. The term airways is used for transcontinental airways; air routes for interconnecting routes. The five transcontinental airways and the three coastal airways will be as follows:

"1. The Woodrow Wilson Airway, which is an almost straight line from New York to San Francisco, touching Cleveland, Toledo, Chicago, and other important cities on the way to San Francisco. The straight line has been generally approved because it presents the best principle of air travel, which can be done in a straight line, as the aviators can make their own route, flying over all obstructions.

"2. The Wright Brothers' Airway.—Starting from Washington, Fort Myer, where the Wrights made their first public flights, and through North Carolina, the State where the Wrights made the historic first flight, through Georgia, Alabama, Mississippi, Louisiana, Texas—with a station at San Antonio, where an aeroplane, a Wright machine, was used for the first time in history under conditions approximating warfare, then through New Mexico, Arizona, ending at San Diego, Cal.

"3. The Langley Airway.—Named after Professor Samuel Pierrepont Langley, the pioneer experimenter in aeronautics. It will start from Philadelphia, pass through Pittsburgh, Columbus, Dayton, Indianapolis, Rantoul, St. Louis, Kansas City—and then on to Santa Barbara, Cal.

"4. The Chanute and Bell Airway.—Named after the American experimenters in aviation, Octave Chanute, who encouraged and assisted the Wright brothers, and Alexander Graham Bell and Mrs. Bell, who paid for the early experiments of Glenn H. Curtiss. It will extend from Boston, Mass., to Seattle, and Portland, Ore., touching Albany, New York, Syracuse, Rochester, Erie, Buffalo, Detroit, Grand Rapids, Mich.; Minneapolis, Minn.; Bismarck, N. D.; Great Falls, Mont., and other cities along the route.

"5. The Rodgers Airway.—Named in honor of Calbraith Perry Rodges, the American aviator who was the first to make a transcontinental flight, in 1911. It will extend from Newport News and Norfolk, Va., to Los Angeles, Cal., touching the important cities and towns on the way.

"6. The Atlantic Airway will extend from Bangor, Me., to Key West, Fla., and will touch every city on the Atlantic seaboard.

"7. The Gulf Airway will extend from Key West to the mouth of the Rio Grande, following the coast and touching every city on the Gulf seaboard.

"8. The Pacific Airway will extend from San Diego to Puget Sound, following the coast line, touching every city on the Pacific seaboard."

John D. Ryan Says Hundreds of New Planes Are Available for Mail Service

Under the plans for the demobilization of the army circular orders have been issued by General March for the discharge from the military service of all officers not members of the regular army as rapidly as their services can be dispensed with. A conference was held last week between Otto Praeger, Second Assistant Postmaster General, and John D. Ryan, then Director of the Army Aircraft Service, relative to the use of army aeroplanes. In this conference types of army planes were considered with a view to ascertaining the extent to which they might be utilized in peace work.

Mr. Ryan said tonight that the number of aeroplanes already built which the army would be able to spare, as well as planes in course of production, would run into the hundreds, and that he had told Mr. Praeger the army would be glad to sell to the postal service those which were available for its purposes. Mr. Ryan also said that thousands of aviators would be released from the army at the close of the war, and that any army aviator not discharged who wished to enter the aero mail service, instead of asking for a transfer, might apply for his discharge from the army with a view to entering the new service.

War Department officials wish to encourage the development of the aero mail service as much as possible because they recognize that the latter will absorb many of the most promising of the young men from civil life who entered the army and became expert fliers, and that the use of aircraft by the mail service will contribute largely to the development of the aircraft industry in the United States.

MEETING DEMAND FOR LANDING PLACES FOR SPORT AND PLEASURE

THE Committee on Landing Places of the Aero Club of America, of which Rear Admiral Robert E. Peary, is Chairman, and Henry Woodhouse, Vice-Chairman, reported to the Executive Committee of the Club today that the committee has received a large enough number of offers from organizations and people who are ready to establish landing places for land aeroplanes and flying boats, to have a landing place on land or water at practically every mile from the center of New York to 100 miles away in every direction of the compass.

"The interest in aeronautics is tremendous," said Mr. Alan R. Hawley, the President of the Aero Club of America, today. "Older people are just as enthusiastic about the prospects of using aeroplanes for travel, sport and pleasure as the young men who have learned to fly for military purposes, and who are now ready to use aeroplanes for every purpose and are planning to use aeroplanes as they use automobiles, fast motor boats and yachts.

"The Army and Navy have trained about 20,000 college men to pilot aeroplanes and a large number of these men are well to do and find that they can use aeroplanes for travel and sport, and a number of them have already expressed their intention to purchase aeroplanes as soon as peace is declared.

"From the statements made to Aero Club of America officials it seems that a great many of the yacht owners within a radius of 100 miles of New York will have flying boats ranging from two passengers to twenty passengers in capacity. The Sound and Bay offer splendid places for air boating and it is expected that a great many of the business men who live on the Long Island, New Jersey and Connecticut shores will use flying boats and air yachts to fly to business instead of using the speed boats and yachts as they did before the war.

"By using flying boats and air yachts it will make it possible to save between two hours and three hours every day in going to and from New York. There will also be a number of people who will use land aeroplanes, the number depending on how near a landing place can be established for aeroplanes in New York City."

The report of the Committee on Landing Places of the Club states that the offer of the Automobile Club of America to establish a landing place for flying boats and air yachts at the foot of East 72nd Street can now be accepted. This landing place will be especially convenient to aeroplane owners because the Automobile Club garage is located at the foot of East 72nd Street and people arriving or leaving can put up or take out their cars at the garage.

The New York Yacht Club, the Columbia Yacht Club and Atlantic Yacht Club landings will also afford excellent landing places for air yachts. A number of landing places for air boats and air yachts have been offered to the Aero Club of America covering different points between the Battery and Spuyten Duyvil on both the North and East Rivers.

On Long Island Sound the landing places available are sufficient to accommodate thousands of aircraft, both on the water and on land.

The facilities for housing flying boats and land aeroplanes in New York are under consideration.

The most ambitious project for an aeronautic center is the plan of a group of prominent men of New York, Baltimore, Chicago and San Francisco to establish an aviation center at Lloyd's Neck, Long Island. Mr. Reginald C. Vanderbilt is President of this newly incorporated Lloyd's Neck Club, and Mr. Alan R. Hawley, the President of the Aero Club of America, is one of the directors. The Vice Presidents are Harry Payne Whitney, and Lawrence Lewis Gillespie. Their associates on the Board of Governors are C. Oliver Iselin, Edwin D. Morgan, Frederick N. Watriss, Elbert H. Gary, General T. Coleman du Point, Cornelius K. G. Billings, Leroy W. Baldwin, Frank C. Henderson, William Russell Grace, A. Kingsley Macomber, Arthur V. Davis, Roy A. Rainey, Nicholas F. Brady, William R. Coe and William Godby Loew. Mr. Watriss and Charles K. Beckman have worked out the necessary legal details of this club for national service.

The Lloyd's Neck Club property consists of 260 acres facing Long Island Sound a few miles from Oyster Bay and Huntington. It is about thirty-nine miles from the Queensboro Bridge, with fine roads for motoring leading to the point. On the property is a fresh water lake covering ten acres. The location for schooling and post-graduate work and hydro-aeroplaning is therefore ideal. A farmhouse on the property, together with portable barracks, will furnish comfortable accommodations for aviators.

The Committee on Landing Places at the Aero Club of America also submitted a list of offers of landing places in different cities throughout the United States, which includes the offer of a landing place at Jackyl Island, Georgia, made by Edwin Gould, and of an island near Portland, Maine, by Rear Admiral Peary.



THE NEWS OF THE WEEK



Ryan and Potter Resign

John D. Ryan has resigned his position as Second Assistant Secretary of War and Director of Aircraft Production. Correspondence made public by Secretary Baker shows that Mr. Ryan feels that his usefulness to the Government passed with the signing of the armistice, and that his duty lies in his former work in connection with the production and distribution of copper.

Mr. Ryan is President of the Anaconda Copper Company, the United Metals Selling Company, and the Montana Power Company. He was Director of many industrial enterprises and banks and of the Chicago, Milwaukee & St. Paul Railway when he entered upon war work in Washington.

In April of this year, when the aircraft activities of the army were reorganized, Mr. Ryan was made Director of Aircraft Production, and later he was made Second Assistant Secretary of War and Director of the Army Air Service.

Mr. Ryan's letter of resignation was as follows:

"DEAR MR. SECRETARY:

"With the signing of the armistice and the consequent reduction in the program of aircraft production, I believe my work here has become relatively unimportant. I have not taken over the actual direction of military aeronautics and my connection with it has not made any real change in its operations.

"I feel strongly that now the war is over my duty lies in the line of my former work. Labor and industry of the country must be quickly adjusted from a war to a peace basis, and the copper production is one of the most vital to the country's welfare. I believe I can do much in helping to bring about stable conditions, and that I should take up the work immediately. I therefore resign as Second Assistant Secretary of War and Director of Air Service, to take effect as soon as convenient to you.

"I desire to express to you my sincere gratitude for the opportunity given me to serve in the war. I have had at your hands the greatest assistance and encouragement in all the work I have had to do. I shall always prize the association with you and with the War Department.

"Sincerely yours,

"JOHN D. RYAN."

Secretary Baker's letter of acceptance follows:

November 22, 1918.

"MY DEAR MR. RYAN:

"I have just received your letter of November 21. Realizing the very great importance of the production and distribution of copper in the re-establishment of our national civilian industry, and your own antimation relative to this great business, I reluctantly acquiesce in your desire to return to it and to terminate your relations as Second Assistant Secretary of War and Director of Air Service.

"Your unfailing courtesy has been a source of great personal happiness to me, and your services to the country as Director of Air Service have been conspicuous; the sense of sureness and executive efficiency which your advent contributed to the air service made from the first a marked improvement in the entire prospect. The armistice, of course, has interrupted the constructive development of that great program. It had, however, advanced beyond the experimental stages, and even in so new an art as the air service America's contribution within a year and a half was substantial and would, in a short time, have been determinative.

"I shall set your own judgment as to the most appropriate time for the termination of your office, expressing only the hope that you will continue until the plans for contract cancellation and demobilization as sufficiently matured to allow those who are to carry them out to have definite and fixed principles for their guidance.

"Cordially yours,

"NEWTON D. BAKER.

"Secretary of War."

William C. Potter, Mr. Ryan's chief assistant, who has also resigned, is a banker, mining engineer, a railroad man, and was formerly General Manager of the American Smelting and Refining Company. He, too, is anxious to return to his private occupation.

Walter S. Gifford Resigns

Washington.—Brig.-Gen. Walter S. Gifford, Director of the Council of National Defense, has resigned to return to the American Telephone and Telegraph Company as comptroller of that organization, his services having been loaned the Government throughout the war period.

U. S. Fliers Destroy 926 Planes in War

When hostilities were suspended American aviators had destroyed 661 more German planes and 35 more German balloons than the Americans had lost. The total number of enemy planes destroyed by the Americans was 926, and the total number of balloons 73.

Two hundred and sixty-five American planes and thirty-eight balloons were destroyed by the enemy.

These statistics of the American air activities have been officially revealed to the Associated Press for the first time. The authorities now feel that the deeds of the American aviators should be made known, together with other information on this branch of the subject.

On November 11, the day of the signing of the armistice, there were actually engaged on the front 740 American planes, 744 pilots, 457 observers and 23 aerial gunners. Of the total number of planes, 329 were of the pursuit type, 296 were for observation and 115 were bombers. In addition, several hundred planes of various types were being used at the instruction camps when the war ended.

Between September 12 and November 11, the air forces operating with the First Army alone dropped 108,984 kilograms (about 120 tons) of high explosives on the enemy lines and supply depots and railroads behind his lines. It is not yet known what was accomplished on other portions of the front.

Wilson Tests Radio Phone

Washington.—Through a radio telephone installed on the south portico of the White House, President Wilson on November 22 directed the manoeuvres of half a dozen army aeroplanes flying over the Potomac River, several miles away. Mrs. Wilson and George Creel, Chairman of the Committee on Public Information, were the spectators, with a group of army officers, who conducted the installation of the aerial connected with a small field switchboard at which the President stood.

The planes in formation nose-dived several times and swung around a circle 1,500 to 2,000 feet above the ground. They were scarcely visible.

Several telephone receivers were connected to the switchboard and Mrs. Wilson and other members of the party were enabled to listen to the command as well as watch the execution. A single plane carrying a flight commander rose in the air first and flew up and down, dived and looped in accordance with the order telephoned from the ground. Then following directions the flight commander flew back to Bolling Field and in response to orders called upon his squadron to manoeuvre.

The telephone as used was adjusted for three to five or six miles. It is similar to the instruments used by American aviators in France, the secret of which was disclosed after the armistice was signed.

Plane Built to Bomb Berlin Carries Forty Passengers Over London

London—The Handlay-Page aeroplane set up a record in its flight when it took up no fewer than forty passengers for a trip over London. The previous record was twenty.

This giant machine is the first of a series that had been specially constructed to bomb Berlin, but it was not completed until three days after the signing of the armistice.

Takes 14 Passengers Mile in Air

Paris—Mr. Lorgnat, who inaugurated the London-Paris Aerial Postal Service in June, made an attempt for an altitude record to-day. With fourteen passengers in his machine he ascended 1,425 metres (about 5,300 feet), when the attempt had to be abandoned because of a rainstorm. The flight consumed an hour and fifteen minutes.

To Find After-War Work for Aeroplanes

Paris—The French Government is studying a proposition for about twenty aerial lines connecting Paris with the chief towns of France and the great foreign centers.

Open Club for Air Service Officers in Paris

Paris.—The latest link in the chain of relief work in Paris is the Aviation Officers' Club, which has been provided with a home by Louis Beaumond, who has granted his Pavilion de Lysee. This has been equipped for the use of American aviation officers.

The foreign service committee of the Aero Club of America, composed of Ambassador William Graves Sharp, honorary chairman; Laurence V. Benet, John Weare, Robert Woods, Bliss Williams, H. S. Weit, Major E. L. Gross, Major William Thaw, Dr. A. L. Hipwell, Raymond Price, and G. F. Campbell, is placed in control of the club. M. Beaumond will also be an active member of this board of control.

The club will be open to aviation officers visiting Paris, and will be a social center for the men in the air service and their allied colleagues for fraternal reunions. It will be open from 8 A. M. till 11 P. M. There will be no dues or initiation fees. The building is well equipped for use as a clubhouse.

Marries Army Aviator

Boston.—Announcement is made of the marriage of Miss Katherine Register to Geraldyn L. Redmond, air service, U. S. A., at the home of Mrs. E. P. Simmons, the bride's grandmother. Mr. and Mrs. Albert L. Register, parents of the bride, live in Philadelphia.



President Wilson, with Mrs. Wilson, General Peyton C. March, and Mr. John D. Ryan, interested in some of America's aeroplanes in a park in Washington

Danish Prince Is Here on Aeronautic Mission

With a party of prominent Danish aeronautical experts Captain-Commander in the Danish Navy, Prince Axel of Denmark, is at present the guest of the U. S. Navy and is touring the country inspecting the U. S. war industries, in particular the aircraft industries.

Prince Axel, who is cousin to the King of Denmark, became an aviator so early as in 1912 and obtained in February, 1913, the international certificate granted by the Aero Club of Denmark as No. 10.

Over here the Prince is accompanied by Captain-Commander J. Corbing, Director of Construction of the Royal Danish Shipyard; Lieutenant-Commander W. Laub, Chief Pilot of the Danish Naval Air Service, and Lieutenant-Commander A. Thiele, Naval Aviator.

In the homeland of Prince Axel—as in the other Scandinavian countries, Sweden and Norway,—aviation has, in spite of the war, been developed on a peace time basis quite extensively.

On April 26th and 27th this year an Inter-Scandinavian Conference on aviation was held in Stockholm, presided by the Swedish Crown Prince. Here delegates from the aero clubs of the three countries planned lines for aerial transportation and discussed judicial problems regarding aviation.

In May an Inter-Scandinavian Aeroplane and Motor Exposition was held in Christiania and Swedish, Danish, and Norwegian aeroplane manufacturers exhibited here more than a dozen of different types of full equipped flying machines.

In each of the three countries large corporations for aerial transportation has been established and mail and passenger between the capital cities will start operation next summer.

Unquestionably therefore the observation of the capacity and the achievements of the U. S. aircraft industries must be valuable and inspiring to the Danish visitors and to the aviation in their homeland.

Roosevelt Touched by French Sympathy

Paris—Henri Rouselle, Vice-President of the Municipal Council of Paris, has made public the following message received from Col. Theodore Roosevelt replying to a cablegram of condolence on the death of Lieut. Quentin Roosevelt:

"I am profoundly touched by the cablegram you sent me in the name of the Municipal Council of Paris. I thank you for your sympathy. The death of our son is a bitter affliction, but this affliction would have been more bitter if our boy had not had an ardent desire to face death for such a noble cause. You will not forget that he was given the name of a French ancestor who left France 225 years ago."

Two Aviators Liberated

When the Americans entered Longwy they found in a hospital there two American aviators, Vernon Remington and Arthur C. Dineen, who were captured in October.

Remington was a member of a second pursuit group, and Dineen, whose home is in Huntington, Ind., belonged to the 91st Squadron. The aviators were brought down within the enemy lines in the week of October 22. Their fate was not known and they were reported by their organizations as missing.

Plane Flies with 35

Paris.—A huge aeroplane, carrying thirty-five passengers, flew over Paris yesterday.

The machine started from Combes la Ville, forty miles from the capital, and returned without a hitch.

British Had "Flying Tanks"

London—"Flying tanks" are war's newest implement. They are armor-plated scout planes. Invulnerable against ordinary ground fire, capable of climbing quickly and of developing remarkable speed, and designed almost entirely for the most demoralizing of any kind of warfare—ground-strafing.

These machines can accomplish the maximum amount of damage with the minimum amount of danger to both pilot and plane. They caused great havoc among the retreating German forces in France.

Detroit S. A. E. to Hear Wardrop

Detroit.—The Detroit Section, Society of Automotive Engineers, will hold its regular meeting at the Hotel Pontchartrain convention hall November 29. A government film, "Process of Manufacture of the Liberty Engine," will be shown, after which G. Douglas Wardrop, managing editor of AERIAL AGE WEEKLY, who has just returned from France, will deliver a lecture on "The War in the Air."

Student Aviators Can Quit or Stay

Washington.—All cadet aviators now in training in the United States will get the option of immediate discharge without commissions or of completing their training. Instructions to this effect were sent to all aviation fields and camps by Major Gen. Kenly, Chief of the Division of Military Aeronautics.

Cadets who elect to complete their training will be discharged when they finish the course with commissions as Second Lieutenants in the Officers' Reserve Corps. Candidates for commissions at balloon schools also will get a similar opportunity to complete their training.

Orders have been issued for the closing of Selfridge Field, Mount Clemens, Mich.; Chanute Field, Rantoul, Ill., and Scott Field, Belleville, Ill., and for the abandonment of the Air Service Mechanics' School at St. Paul.

Demobilization of the army air service presents a separate problem, on which War Department officials now are at work. Secretary Baker is known to regard the air service as the field of military enterprise in which the greatest developments are to be expected, and the army programme to be laid before Congress probably will recommend large allowances for it.

Provision also will be made for retaining officers and men who have displayed marked ability in the aircraft field.

Outstanding contracts for military planes of various types are understood to total between 25,000 and 30,000.

It is to new types that chief attention will be given by the Government. In addition to the manufacturing monopoly, which includes assembling of scientific data of the utmost value on the whole question of air flight, the Government has complete monopoly over the training facilities for flyers. Home aviation schools are fitted to turn out 2,000 men a month, rated as reserve military aviators, while there now are more than 12,000 men who either have passed through that school system or are nearing completion of their training.

In the opinion of many officials, the future of air navigation in the United States rests largely with these men trained to fly by the Government. Having had a taste of air work, it is believed the majority will wish to continue flying. For the time being, however, the Army and Navy services, supplemented by the aerial postal service, will be the only outlet for the product of such an industry.



Prince Axel, of Denmark, on a visit to the Curtiss Aeroplane & Motors Co., Buffalo. From left to right: Mayor Buck, Prince Axel, Mr. Kepperley, Captain Andrews, Lieut.-Comm. W. Laub, Captain-Comm. Corbing, Lieut.-Comm. Thiele, Buffalo City Officials and Curtiss Engineers

Liberty Motor Tests

The following statement is authorized by William C. Porter, Acting Director of Aircraft Production:

The British Air Mission have handed me a cable from London, dated September 26, from the British Air Ministry, reading as follows: After 100 hours flying, one engine (Liberty) was stripped and found to be in very good condition. Tests have been made in the DeHaviland 9-a and DeHaviland 10 machines. Engines have performed uniformly satisfactory in these tests.

Information expressed officially four months ago to effect that engine would prove satisfactory in service fully confirmed.

Dayton Aero Club Will Reorganize

Steps will be taken shortly to rejuvenate the Aero Club of Dayton, increase the membership roster and take on a more active existence. Club officers are of the opinion that the government will continue considerable aeronautical activity in Dayton and that this city should maintain a large and active aero club to foster aeronautical activities and perpetuate the memory of the Wright brothers. Dr. L. E. Custor is president of the organization which is affiliated with the Aero Club of America.

Airmen Decorated

First Lieutenant Frank Baer, as S. R. C. Pilot, 103d Aero Pursuit Squadron—"For the following repeated acts of extraordinary heroism in action five, April 12 and 23, May 8 and 21, 1918, Lieutenant Baer is awarded a bronze oak leaf to be worn on the distinguished service cross awarded him April 12, 1918. Lieutenant Baer brought down enemy planes on April 5, April 12, and on April 23, 1918. On May, 1918, he destroyed two German machines, and on May 21 he destroyed his eighth enemy plane."

Next of kin: Mrs. Emma B. Dyer, mother, 1304 Maud Street, Fort Wayne, Ind.

First Lieutenant Wallace Coleman, pilot, Observation Group, Fourth Corps. "For extraordinary heroism in action near Jaulny, France, September 12-13, 1918. On September 12 Lieutenant Coleman, with Second Lieutenant William Belzer, observer, while on an artillery surveillance mission, was attacked by an enemy plane. They waited until the enemy was at close range, fired fifty rounds directly into the vital parts of the machine, when the machine was seen to disappear out of control. The next day Lieutenants Belzer and Coleman while on a reconnaissance mission were attacked by seven enemy aircraft. They unhesitatingly opened fire, but owing to their guns being jammed, were forced to withdraw to our lines, where, clearing the jam, they returned to finish the mission. Their guns again jammed, and they were driven back by a large patrol of enemy planes. After skillful manœuvring they succeeded in putting one gun into use and returned a third time, only to be driven back. Undaunted, they returned the fourth time and accomplished their mission, transmitting valuable information to the infantry headquarters."

Home address, R. B. Coleman, father, 1625 Boyd avenue, Racine, Wis.

Second Lieutenant William Belzer, observer, Observation Group, Fourth Corps. "For extraordinary heroism in action near Jaulny, France, Sept. 12-13, 1918. He accompanied and aided Lieutenant Coleman as told above."

Home address, Frank B. Belzer, Glasgow, Mont.

First Lieutenant William Duckstein, pilot, First Aero Squadron. "For extraordinary heroism in action between Montrebeau and Exermont, France, Sept. 29, 1918. While on a special command reconnaissance to ascertain whether or not there was any concentration of enemy troops between Montrebeau and Exermont, which might indicate a possible counter-attack, this officer obtained information of the very greatest value. Flying over the enemy's line at an altitude of less than 200 metres, in spite of most unfavorable atmospheric conditions, in the presence of numerous enemy aircraft, and under continuous heavy rifle and machine gun fire from the ground, Lieutenant Duckstein spotted enemy troops massed for counter-attack, and although severely wounded by a machine gun bullet from the ground, continued his mission until he had clearly and accurately located the position. He then returned, and though suffering from the pain of his wound, succeeded in writing out and dropping a clear and complete message. The counter-attack launched shortly afterward by a fresh enemy division we crushed, and the accurate and timely information brought back by Lieutenant Duckstein after a very gallant flight under highly adverse conditions, was of the greatest importance in this success."

Home address: Mrs. A. W. Duckstein, wife, Wardman Courts, West, Washington, D. C.

First Lieutenant Alan Nutt (deceased), pilot, Ninety-fourth Aero Squadron. "For extraordinary heroism in action near Forges, France, Sept. 26, 1918. While on a patrol Lieutenant Nutt encountered and unhesitatingly attacked eight Fokker planes. After a few minutes of severe fighting, during which he displayed indomitable courage and determination, this officer shot down one of the enmey planes. Totally surrounded, outnumbered, and without a thought of escape, he

continued the attack until he was shot down in flames near Drillancourt."

Next of kin: Robert H. Nutt, Cliffside, N. J.

Second Lieutenant Percival G. Hart, 135th Aero Squadron.—"For extraordinary heroism in action during the battle of the St. Mihiel salient, Sept. 12-13, 1918. On Sept. 12 he made three infantry liaison patrols and obtained valuable information of the location of our advancing line, which information he conveyed to organization commanders. Bad weather conditions necessitated flying at a very low altitude, but, in spite of this and repeated attacks by superior numbers of enemy aircraft, he drove them off by his accurate fire and accomplished his mission. On Sept. 13 he unhesitatingly went to the assistance of three allied planes which were being attacked by a large patrol of the enemy and by his steady fire drove off the enemy patrol and enabled the three allied planes to return."

Home address: D. M. Hart, father, Chicago, Ill.

Citation for Bravery

Col. (Brig.-Gen.) William Mitchell, Chief of Air Service, First Army.—For repeated acts of extraordinary heroism in action at Noyon, France, March 26, 1918; near the Marne River, France, during July, 1918, and in the St. Mihiel salient, France, September 12-16, 1918. For displaying bravery far beyond that required by his position as Chief of Air Service, First Army, American Expeditionary Forces, setting a personal example to the United States aviation by piloting his aeroplane over the battle lines since the entry of the United States into the war, some instances being a flight in a monoplane over the battle of Noyon on March 26, 1918, and the back areas, seeing and reporting upon the action of both air and ground troops, which led to a change in our aviation's tactical methods; a flight in a monoplane over the bridges which the Germans had laid across the Marne during July, 1918, which led to the first definite reports of the location of these bridges and the subsequent attack upon the German troops by our air forces; daily reconnaissances over the lines during the battle of St. Mihiel salient September 12 to 16, securing valuable information of the enemy troops in the air and on the ground, which led to the excellent combined action by the allied air services and ground troops, particularly in this battle.

La Guardia Resigns Army Commission

Washington.—Major F. H. La Guardia, who commanded the American air forces in Italy, has resigned his commission in the army to resume his Congressional duties.

Witness Flies To Court

The first witness to fly to court in an aeroplane dropped out of the sky at Mineola, L. I. Lieut. John Kelly winged over from Brindley Field, Commack, L. I., to testify before Justice Scudder in the Supreme Court in the divorce action brought by Mrs. Laura Kelly, violinist, against Lou Kelly, vaudeville actor. Lieutenant Kelly landed in front of the court house and, after testifying, took the air again and returned to Commack.

Decision Concerning Inducted Men

The following order to chiefs of all staff corps and departments has been issued by the Adjutant General of the Army:

1. The Secretary of War directs that you immediately take necessary steps to cause the honorable discharge for the convenience of the government, quoting this letter as authority, of all men whom you have caused to be inducted into the service with a view to being commissioned. Travel to the original points of entrainment is directed as necessary in the military service. In all cases where recommendations for appointment of such men have been forwarded by you, you will request by special messenger return of papers from the Personnel Branch, General Staff, Room 597.

If doubt exists as to whether or not appointment has been made in any case, request for papers will precede any other action by you.

Upon receipt of notification of discharge in each case you will send complete papers to The Adjutant General, Room 463, for file.

To Chart Air Lanes

The War Department authorizes the following:

Beginning Friday, November 22d, Army planes from flying fields in various parts of the United States will start a series of cross-country flights to cities in their sectors to chart air lanes, make air maps and gather valuable air statistics. Incidentally they will locate sites for landing fields and airdromes: the landing fields to become part of a great chain that soon will "air link" every important community in the country from coast o coast; the airdromes in addition to offering shelter to visiting flyers, to be made available if needed in helping to house the equipment the Air Service will bring back from overseas. This reconnaissance work will be gradually extended as fast as arrangements can be made.

An important part of this work by the Air Service is bringing up to date the records started years ago by the cavalry, which by cross-country rides made extensive maps for future emergencies, showing all avilable shelter, battery locations, good roads, bad roads, fords, safe bridges, poor and plentiful sources of water and food supplies.

Then the cavalry was the eyes of the Army. Today the airplane takes the cavalry's place, and to operate successfully in the air, squadron commanders must know their sky routes as cavalry leaders knew the turnpikes and highways. As the horsemen needed water and forage, so the air pilots use gas, oil and landing fields. Without landing fields under him and without charted lands through the sky, the flyer today is just as much up against it as the pathfinder of colonial times blazing a trail through a trackless forest.

The flyers who start this air map making campaign Friday are combat pilots trained in the United States for fighting overseas and whose battle training has, by the armistice, been turned to account in preparing for the times of peace.

Major General Kenly, Director of Military Aeronautics, has placed in charge of this immense reconnaisance work Colonel M. F. Davis, head of the Training Section and an army officer who saw his first field service on the plains with the First and Fourth Cavalry, and who has ridden horseback all three historic trails across the continent—the Lewis and Clark, Oregon and Santa Fe.

On a War Basis

The gasoline-less Sunday order didn't worry Glenn L. Martin, the aviator and head of the Glenn L. Martin Company, of Cleveland. Mr. Martin, remembering some of the devices used in Europe to save gasoline in the running of motor cars, had the Goodyear Tire & Rubber Company make up for him a huge gas bag, which he installed on the top of his brougham.

This he filled with regular fuel gas and then ran his machine about the streets of Cleveland and elsewhere quite unconcernedly, serene in the knowledge that he was not violating the Government's gasoline order and happy in the further belief that he was making a suggestion that might well be followed by car owners generally for the conservation of gasoline.

In a letter to Goodyear Mr. Martin says: "The gas did its work well. It was installed on a Saturday afternoon, and Sunday I drove down through the streets of Cleveland, going about my work in general and filling the bag three times during the day.

"We have had dozens of inquiries from men wanting more information about the use of gas for automobiles and from any numbers of inventors who have methods for improvements of mileage and convenience with gas and coal oil and many other substitutes, which would indicate that the American populace is patriotic enough to want to do most anything if the Fuel Administrator is still of the opinion that there should be a decided saving of gasoline."

Goodyear's experience in building airships, observation and spherical balloons, covering a number of years, brings the company a great many requests for experimental devices. It may be said of Mr. Martin's request that it worked finely, taught a patriotic lesson and has caused much activity among the inventors.

Colonel Archie Miller Flies to Washington

Colonel Archie Miller, the popular commander of the numerous aviation fields on Long Island, on November 1 flew to Washington, covering the distance in 2 hours and 40 minutes. Lieutenant J. J. Redfield piloted the plane.

Aeroplane Uses After the War

London.—The more obvious uses of the aeroplane after the war, as carrier of passengers and mails, are likely to be supplemented by several others, which may appeal more than the ordinary routine to many British pilots who will like to use their skill in the spread of the civilization they are now fighting to preserve.

For such men Canada, Africa, Australia, India, South America—any country of great and sparsely populated areas—will be the future field of operations. Forest and bush fires, for instance, cause vast destruction before they are detected, and an immense waste of natural wealth is caused which could be minimized, if not entirely prevented, by setting up aeroplane patrols, with headquarters in townships to which pilots could report by wireless the outbreak of fire as soon as it occurs in the region under patrol.

The world can afford no waste of its resources, and the aeroplane which saves a forest from destruction is serving civilization in the most practically effective way.

Aeroplanes can carry first aid to famine or disease smitten districts, conveying doctors and light hospital requisites; and in the case of pests to crops information can be disseminated of the means of destruction. Loss through ignorance can be avoided.

The observer who from the skies can detect the presence of a submarine under water and follow its course can spot a shoal of fish and the direction taken by the shoal, and can report by wireless to harbor or to the fishing fleet at sea. The harvest of the sea can be very greatly increased by the use of the aeroplane.

The aeroplane will serve railway construction. It may some day supplant the railway, but meantime, in the important matter of railway survey in difficult country, aerial photography will replace the hardy pioneer who hewed his way through trackless forest, only too often to discover that a railway was impracticable. There will be no such costly mistakes after a survey by aerial photography.

Rubber can be "spotted" from the air; and nobody supposes that the known areas of wild rubber exhaust the world's natural supply, and so with other valuable trees, like mahogany.

The prime fact about the aeroplane is that it annihilates remoteness, and from that springs an infinite variety of ways in which the air can be exploited in the service of humanity.



A Blimp maneuvring around the Woolworth Building in New York City

The AIRCRAFT TRADE REVIEW

Government to Retain Control of Steel Prices

Washington.—In accordance with the expressed wishes of steel producers at the first Reconstruction Conference of the War Industries Board held November 12, the Government will continue for the time being the regulation of the sale and distribution of steel.

It was felt that this course was desirable in order to insure against the possibility of disturbance to the steel industry or to other industries in which steel plays an important part. An informal statement was issued jointly after the meeting of the chairmen of the War Industries Board and of the American Iron and Steel Institute. This was to the effect that the general discussion had the main purpose of preserving industrial stability, and that it was characterized by a spirit of co-operation and that further data and information would be collected for the use of further conferences.

Liberty Engine Builders Form Association

Indianapolis.—The men and women building Liberty aeroplane engines have formed an association in which they pledge themselves to use every effort to keep production at its topmost point. Following the unveiling of a 10,000th motor at Detroit three weeks ago, the United States Liberty Motor League was formed. It now has a membership of over 25,000 workers, in some 600 plants, making Liberty engines and Liberty engine parts, and every day finds thousands more applications.

To Discuss Problems of Reconstruction

Washington.—Preliminary plans for the War Emergency and Reconstruction Conference of War Service Committees to be held at Atlantic City, December 4, 5 and 6, are announced by the Chamber of Commerce of the United States.

Reconstruction will be given a prominent place on the program, as it is recognized this subject must be taken up by business men to the end that there may be placed at the command of the Government all available sources of information. The work of reconstruction suggests the creation of a federation of all war service committees that whatever study and planning is carried on may be on behalf of all business. War industries and non-war industries are concerned equally in the determination of reconstruction problems. All European countries already are under way with reconstruction plans.

The Atlantic City conference, a call for which was sent out last week by the War Service Executive Committee of the Chamber of Commerce of the United States, will include four general sessions and numerous group and committee meetings. Into the final session will be brought for final action all the proceedings of the meetings.

There will be four general sessions participated in by all the delegates. On December 4 there will be both morning and afternoon sessions, and on the 5th and 6th morning sessions. The chamber is engaged now in obtaining the best speakers available to discuss among others the following suggestions: Reconstruction, industrial relations, raw materials and their control, price control, economic legislation affecting combinations, export and import operations, finance, etc.

The conference will be divided into groups at three sessions, the first to be held on the evening of December 4, the second on the afternoon of December 5, and the third on the evening of the same day.

On the evening of December 4 each war service committee will meet with its chairman to consider the problems of reconstruction as they affect that particular industry, as well as to take up other problems which the war has demonstrated are vital to industry.

On the afternoon of December 5 the war service committees will meet in groups which are related as to their use of basic materials and as to their distribution problems, etc.

With these groups will meet the commodity or section chiefs of the War Industries Board. Related groups will form themselves into ten major groups on the evening of December 5 to take up the question of raw materials, price control and subjects arising from related group meetings.

After the general meetings of the committees of the related groups and of the major groups it is hoped there will be presented definite recommendations covering the reconstruction period, with the possibility of creating an executive committee empowered to gather data and to function with industries to meet the many problems that the nation's industries will be called upon to solve with the end of the war.

$75,000,000 Worth of Aeroplane Contracts Cancelled

New York.—Government contracts for training and fighting planes amounting to approximately $75,000,000 and held by the Curtiss Aeroplane & Motor Corporation, Buffalo, have been cancelled. Late last week the company discharged 6,000 of its men. The cancelled contracts cover almost entirely orders for JN-4 training planes, an order for SE-5 fighting planes, which is understood originally to have been for 1,000 and is now cut to 250 or approximately the number for which the company has parts on hand; the USB, the De Haviland 9 for the army, the HS-1 and the F-5 for the navy.

About the only government contracts which remain include orders for 144 training planes, 60 large flying boats and about 75 smaller boats. It seems likely in view of these cancellations that it may be necessary for a large part of the Buffalo plant to be shut down. Rumor has it that the Churchill plant may be used for the production of the new $500 Overland car. Nothing official, however, has been given out.

S. A. E. Winter Meeting Jan. 12-14

New York.—The Society of Automotive Engineers' winter meeting has been definitely placed on the calendar for January 12-14, and is to be held in the auditorium of the Engineering Societies Building, New York. The "Carry Through Meeting" will be brought to a close with a "Victory Dinner" which is to be held at the Hotel Astor.

The meeting will be almost entirely devoted to war and post-war matters, and it is expected that the program of speakers will be of unparalleled interest because of the great events which have been taking place and because a number of men usually diffident about appearing in public have consented to address the sessions.

The views of many men who have been engaged abroad with our Army or that of our Allies will be given. There has never been a time when members of the S. A. E. were more actively engaged in professional work in so many lines of national importance to the world and to the automotive industry. The time is at hand to acquire broader views and entirely new conceptions of engineering subjects.

A number of matters relating intimately to the automotive industries which it is planned to cover include fuel, thermo-dynamics of the internal combustion engine, carburetion, including the use of heavy fuels and apparatus designed to compensate for variations in atmospheric density, etc. Tanks, types of post-war automobiles, radial-type aeronautic engines, relation in plane design of performance to weight, power and location of engine, and farm and road tractors will be discussed.

The recent intensive work in aircraft engines will be discussed and the lessons to be learned therefrom in automobile practice considered. The development of motor patrol boats will be covered as well as important features of stationary and farm engines and motorcycles for delivery and messenger service.

Victor Company Makes Plane

The first scouting hydro-aeroplane made from parts manufactured by the Victor Talking Machine Co., of New Jersey, has had a successful tryout. The test showed the machine is capable of turning in a remarkably small area.—*On the Wing.*

The Service Flag now flying over the Standard Aircraft plant in Elizabeth contains 286 stars, while the flag over the Plainfield plant of the Company shows 64 service stars.

At a meeting of a Reorganization Committee of the Standard Aircraft Club at the plant of the Standard Aircraft Corporation, in Elizabeth, New Jersey, the following nominations for office were unanimously made:

President—Mr. Charles Lindblum.

First Vice President—Mr. Albert Johnson.

Second Vice President—Mr. Clifford Hamblin.

Recording Secretary—Peter Hoffman.

Treasurer—Mr. Thomas Killea.

Trustees—Mr. G. M. Anderson, Mr. Wm. Knaus, Mr. Alex. Milne.

Chairman of House Committee—Mr. Wm. Tynan.

The Standard Aircraft's new Club will shortly be finished and the following Committees were appointed to take charge of the opening event:

Chairman Reception Committee—Mr. E. E. Pennewill.

Chairman Arrangements Committee—Mr. G. M. Anderson.

Chairman Music Committee—Mr. Kettley.

Chairman Decoration Committee—Mr. Wm. Dornan.



Officers and engineering staff of the Standard Aircraft Corporation at a factory get-together luncheon

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Frank Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Darneille
August Thiele
Herman E. Fremming
Frank Tower

Navy Starts New Aero Mail Service

An aerial mail route between the battleship fleet stationed at Hampton Roads and the Navy Department was inaugurated November 16th by one of the "flying fish" in the naval service. The air route was designed for the transmission of the official mail.

The plane, piloted by Lieutenant Jacobs and Ensign Devidson, flew the 200 miles in one hour and fifty-two minutes. Within eight minutes after the plane landed on the river at the naval air station, the mail was in the hands of Secretary Daniels, delivery from the air station being made by a fast motor boat and automobile.

A return trip to Hampton Roads was made at 1 o'clock today, and at the same time a second plane was scheduled to leave Hampton Roads with mail for Washington. Daily mail service in both directions will be maintained.

The planes used in this service are the standard machines of the navy service. They are eighty-six feet across, from wing tip to wing tip, and are powered with a 400-horsepower Liberty motor. Fuel tanks with a capacity of 200 gallons furnish gasoline for a five-hour flight. These ships are not equipped for ground landings, consequently all flights follow water courses, so that forced landings can be made without damage to the plane. The mail planes follow the Potomac River to Washington.

Allen Adams Not Aerial Mail Aviator

Allen Adams, the aviator who was killed recently while flying an L. W. F. machine, was *not* an aerial mail aviator, as was reported in the press.

He was flying an L. W. F. to demonstrate it to the postal authorities, and was killed during the flight, before arriving to Belmont Park.

Seek $1,500,000 for Air and Motor Truck Mail

Washington—The Post Office Department is planning to ask Congress soon for at least $1,500,000 to be used in expanding the aeroplane and motor truck mail service into every section of the United States. This will provide a future for the trained aviators and motor truck operators now in the army service and prevent the loss of millions of dollars invested in aeroplanes and army trucks, besides giving more rapid mail communication between remote sections of the country. In addition it is desired that the funds appropriated by Congress be in the nature of revolving funds, with 50 per cent. of the profits to go toward making better roads and the other 50 per cent. to go toward maintenance of the service.

With $1,000,000 it is planned, according to semi-official reports, to employ as soon as the army can release them in the neighborhood of 20,000 motor trucks to be operated annually.

Another $500,000 will be devoted to 500 to 1,000 single motor aeroplanes—probably many more—for establishment of air lines. Eventually it will be possible to send mail direct by air from New York via Chicago and Denver to San Francisco; from New York to Atlanta, Ga., Jacksonville, Fla., and New Orleans, La.; from New Orleans to San Francisco, Washington to Detroit and Washington to St. Louis, until the entire country is linked up by air.

Aerial Mails from Australia

Cable messages from Sydney state that a local company has been formed with the object of arranging the preliminaries for an aerial mail service between Australia and England. At a meeting in Sydney, on October 2, of representative business men, it was stated that the flight would take 150 hours, and sufficient capital was guaranteed for the purpose, provided that permission was obtainable.

Peace Will Boom Aero Mail Service

Washington.—The Post Office is going to take up the aircraft program where the army and navy drop it. Plans have been worked out by which every aircraft that can be spared from military service may be put to work carrying mails instead of bombs. If these plans carry, practically the entire first class mail of the nation will travel through the air.

The Washington-New York aerial mail, which many regarded as a mere spectacular by-product of the war, has been successful. Not only will the carrying of letter mail be expedited, but the aero service will be a paying department of the Post Office, statstics show.

They also show that mail from New York can be landed in Chicago in nine hours against the twenty-three it takes by the fast trains, and against the four days it takes to get a letter from the Atlantic to the Pacific the aero mail will give a delivery in less than forty-eight hours.

It is expected that the aero letter service will almost entirely supersede the night-letter telegraph between cities within a radius of 500 miles. It will be cheaper; there will be no limitation on the number of words and the danger of errors of transmission will be done away with.

It is understood the extent of the new system will be limited only by the demand for its use. This means that hundreds and perhaps thousands of planes will be in constant service, and likewise that landing places must be provided and repair stations be established in or near every big city.

The Post Office program also answers the question "What is to become of the flying men when the war has released them?" There are 7,000 young men who have received more or less training. If the program goes through, there will be use for all the men the military branches can spare.

Spain-U. S. A. Aerial Mail Service

It is reported from Madrid that Captain Herraro, chief of the Spanish Air Service, has had several interviews with King Alfonso on the subject of aerial services between Spain and America. The scheme is also said to have been discussed at Cabinet meetings, and a shipping company are willing to finance it. The plan, it is understood, is to use large machines capable of carrying 40 passengers besides mails, and the fare suggested is $400 and a rate of 25 cents an ounce for letters.



Max Miller, left, and Edward V. Gardner, right, two of the pioneer Aerial Mail Pilots

THE BREGUET BIPLANE

IN a German technical journal, the automobile and aerotechnical paper "Der Motorwagen," an extensive description of the Bréguet 14 B2 biplane, with 300 h.p. Renault engine, is to be found in the issues of July 30th and Aug. 10th.

The Wings

This biplane, characterized by two sets of struts, is produced almost exclusively of aluminium, and is intended for bombing purposes. The upper planes have a backwards stagger of 0.21 m. and a span of 14.4 m., and are mounted on a cabane frame, while the lower planes have a span of 13.77 m.

Both upper and lower planes have large cuttings at the fuselage and their arrow shape amounts to 175 deg. The angle of incidence of the upper planes is 4.5 deg. in the middle and 2.5 deg. at the ends, that of the lower ones decreasing from 3 deg. to 2 deg.

The spars of both planes are drawn aluminium tubes of rectangular section 65.6 x 34.6 mm. The thickness of the walls of these tubes amounts in the inner section of the upper plane to 2.6 mm., elsewhere to 1.6 mm. The rear spar grows thinner towards the wing tips till the thickness of the edge, where auxiliary spars with ash bands of 6 mm. thickness and 3 mm. three plywood glued to both sides are provided. At the points of juncture and at the ends of the stampings the spars are strengthened by ash pieces, in some instances of I shape. A socket of 20 cm. length, made of welded sheet steel of a thickness of 1.5 mm., is provided at the strut ends of the upper planes and at the strut bases. These sockets and the wooden linings are held in position by iron tube-rivets.

The main spar of the upper plane is strengthened in the interior section of a pine support of a thickness of 10 mm. being fixed to one side of the spar by means of small brass screws. The spars of the upper planes are equipped with compression supports at the joints of the two sets of struts and the lower planes for the outer strut set, the support being an aluminium tube of the diameters 30 and 27 mm. exterior and interior. Further there are two aluminium ribs of a width of 40 mm., one at the beginning of the ailerons and one by the bomb store in the lower plane. The interior wiring consists of single wire.

The ribs are very strong. They have a depth of 2 mm. above, of 1.9 below. A web provided with weight diminishing holes in glued between the longtitudinals of three-ply wood, 3 mm. thick. On both sides of the spars as well as at five points between them the flange is strengthened by glued and nailed birch laths and wrapped bands. The ribs are arranged loosely on the spars. The ribs lie parallel to the axis of longitude, forming in relation to the spars an angle corresponding with the arrow shape. They are connected with each other by means of the veneer planking, reaching on the upper side from the leading edge to the main spar, as well as by the leading and trailing edges. Further they are connected by two bands, lying behind each other and alternately wound from above and below the ribs. The distance between them amounts to 40 mm. Forward and in front of the rear spar more 4 mm. thick auxiliary ribs of plywood are arranged. To reinforce the aerofoil, thin birch ribs reaching to the trailing edge are screwed to the rear of the ribs on the underside.

The yellow-white colored fabric is sewed to the ribs and secured with thin nailed strips where exposed to the airscrew draught. The provisions of hooks and eyes on the under side of the planes behind the leading edge and in front of the trailing edge is to permit the draining off of moisture.

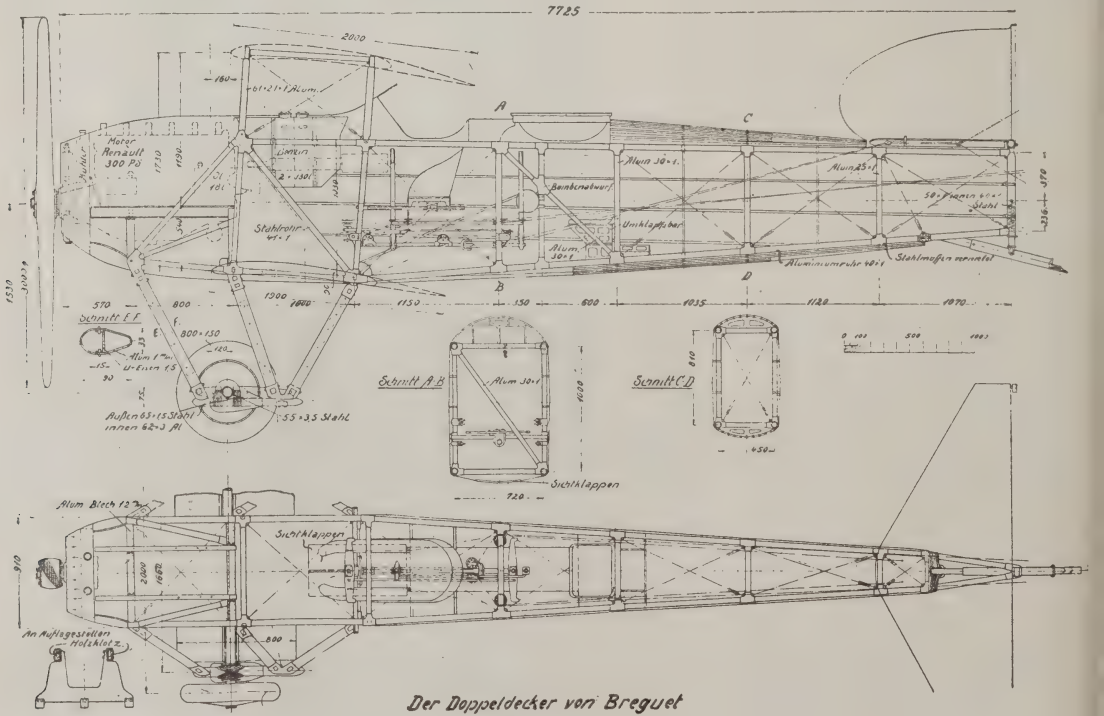
ailerons, attached direct to the rear spar.

The part of the lower plane lying behind the rear spar is hinged along its total length and is pulled downwards by means of 12 rubber cords fixed on the under side of the ribs, the tension of these can be adjusted by means of screws, an automatic change of the aerofoil corresponding with the load and speed thus results with an easier control of the aeroplane with and without a load of bombs. The stampings for the hinges of the ailerons and the flexible lower plane pieces embrace the spars and are connected with them by means of bolts passing right through. The spare have no linings at these points.

The construction of the stampings of the spars is very simple. Several sheet steel pieces with corresponding angle pieces are fixed to the spars with two screws penetrating them.

The interplane struts are made of streamlined aluminium tubes with aluminium sockets in both ends. The inner struts are further strengthened by the insertion of riveted U irons. The aluminium employed has a strength of 40 kg. per sq. mm. with a stretching of 18 per cent. The bending figure is 1—2.

The 4.5 mm. thick load-carrying cables are double, the space between them being filled by a wooden lath. In the same manner the landing wires as well as those crossing from the upper planes forward



Der Doppeldecker von Breguet
Typ 14. B. 2.



Factory assembly of Breguet Biplanes

and backwards of the fuselage are arranged, being wires of a thickness of 2½ mm. that are connected with the stampings and the turnbuckles in a primitive way by means of eyes and spiral wire pushed over. To give a better support to the lower planes, being much stressed by the bomb store, the load-carrying cables are in the inner section led to the stamping on the main ribs arranged by the bomb store, and thence downwards to the landing gear. The rear spar of the upper planes is also provided with a cable to the fuselage between the cabane and strut.

The stampings for the fixing of the wiring is constructed very simply. A bent sheet metal of U form and with drilled holes for the bolts carries the nipples of the eyebolts.

The Fuselage

The canvas-covered body consists almost exclusively of aluminium tubes that are riveted with welded steel tube sleeves and spanned with wire. Only at specially stressed points in the front part have steel tubes been employed. The upper and lower sides of the fuselage are rounded by the employment of fairings.

The engine rests on aluminium U bearers that are supported by riveted aluminium struts. Two pairs of large view traps are provided below the seats of the pilot and observer, and are operated by cable by the observer.

The Undercarriage

The very strong landing gear has three pairs of struts of aluminium streamline tubes, strengthened by U irons riveted in, and resting below on horizontal steel tubes. The wheel shaft rests in an auxiliary one of steel sheet in U shape welded on. The back root points of the struts are connected by means of a second steel tube auxiliary shaft, welded on, and by a tension band lying behind. A diagonal wiring is further provided horizontally in the auxiliary shaft level. The streamlining of the shafts is cut out in the middle behind the front auxiliary shaft to improve the sight downwards. There is only a diagonal wiring to the fuselage in the level of the middle struts.

The ash tail skid hangs in rubber springs from the fuselage and is strengthened in the rear end by a covering of a rectangular aluminium tube. Its wire stay is supported in the rear stem by a spiral spring. Leaf springs are further fixed to the end of the skid.

Tail plane, rudder and elevator are of welded thin steel tubes.

The aeroplane is equipped with complete dual control. The control in the observer's cockpit can be removed.

The ailerons are interconnected. The twin control cables run behind the rear spar of the lower planes to two direction changing rollers resting on a shaft. Here they part and are led as separate wires of thickness of 2 mm. to the underside of the aileron. In the upper planes the ailerons are connected by control cables, governing two levers in each side. The ailerons are balanced and welded to a common shart.

According to a label on the aeroplane the performance of the 12-cylinder Renault engine of V type is 300 h.p. at 1500-1600 normal r.p.m. The engine is the same as the 260 h.p. model, the increase in horse-power being the result of the employment of aluminium pistons and a greater number of revolutions. The engine drives the two-bladed airscrew direct. The exhaust going inwards is led above the upper planes by a collector.

The aluminium radiator forms the front part of the fuselage, and is divided in the middle, each row of cylinders having thus its own cooling system with a separate water-pump.

The Petrol System

Two gravity tanks of 130 litres capacity each are positioned behind the motor. As their underside lies only a little above the carburetors an auxiliary tank of 5.6 litres capacity is provided in front of each carburetor behind the engine, the petrol being led on to the tank from the carburetor. These tanks fill themselves by gravity in horizontal or descending flight from the main tanks. Whereas, if the main tank may be unable to supply any more petrol in climbing, the auxiliary ones then feed the carburetor. Check non-return vales are mounted in the piping to prevent the petrol from running back into the main tanks.

As there is by this arrangement a petrol quantity of 11.2 litres in front of the carburetors without any possibility of being cut off, grave accidents may occur by carburetor fires.

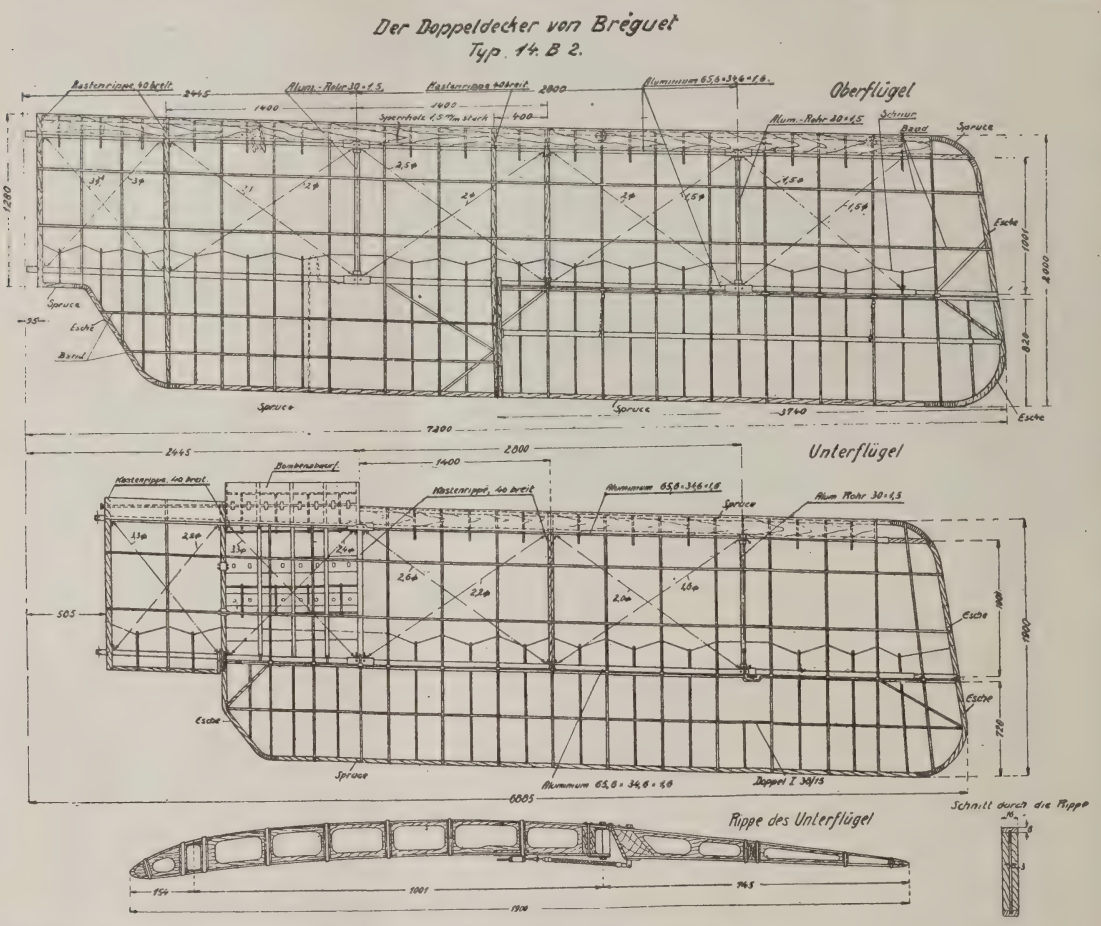
The petrol level in the main tanks is indicated electrically by pressing a contact. A hard rubber tube is mounted in each tank inside a tube and wound with a resistance wire of 0.4 m. thickness, above which a cork float with contacts moves. An oil tank of 18 litres' capacity is mounted on the right side of the engine. The fuel suffices for a height of about 2½ hours' duration under ground conditions.

The Instruments

On the instrument board, protected by a large Triplex safety glass, in aluminium framing, is mounted a tachometer, a watch, altimeter, two cooling water thermometers, the pressure buttons and the indicator arrangement of the petrol height with the dry cell battery lying behind, and the compass. To right of the



A view in the French Breguet factory





A Breguet Biplane ready for flight test

pilot is to be found the manipulation of the radiator-binding arrangement, the starting magneto, the petrol start spray pump, oil and petrol stop-cocks, as well as the connections for the illumination for night flying and for wireless. To left are the levers for the gas throttle, the spark-timing, the regulation of extra air suply, the magneto switch, as well a a petrol stop-cock.

The observer's cockpit is arranged in the middle of the turning and raising machine-gun ring mounted on the top of the body. The seat is hinged so that the observer may sit either high or low on the bottom of the fuselage. The mounting of Cellon windows in both sides gives him an outside view. The bottom is of steel tube girder work, the sight being thus unhindered downwards when the sight-trap is opened by means of the cables arranged to right of the seat. On the right fuselage wall the bomb dropping mechanism is mounted; to left levers connected with the gas lever and magneto switch in the pilot's cockpit. To both sides are connections for wireless.

The aeroplane is equipped with illumination for night flying and with position lights on the outer struts. Under the root points of the front struts hanging provision for the mounting of searchlights is further to be found. The current for the light and the wireless is produced by a dynamo, which is mounted on

a seat below the fuselage and driven by a propeller.

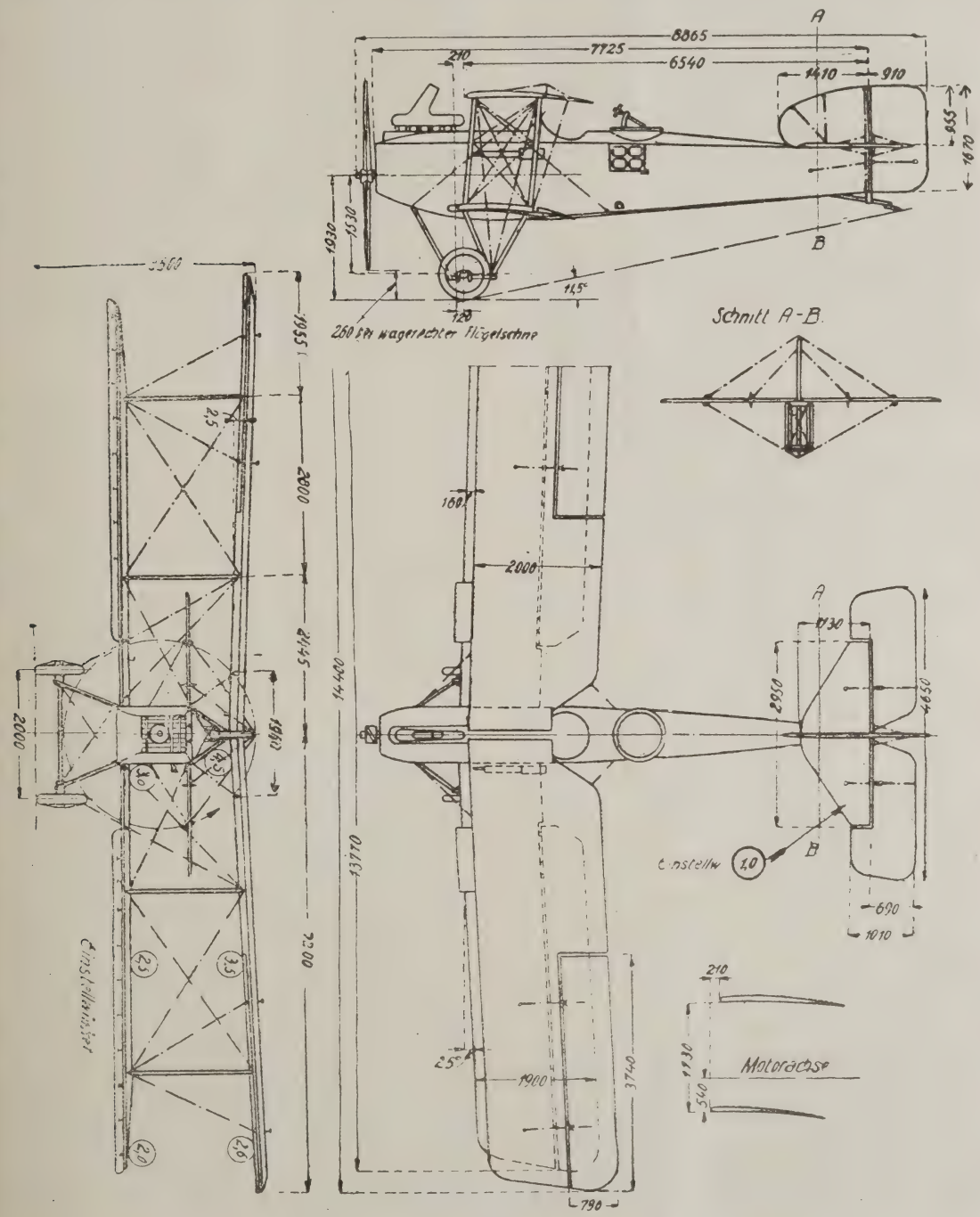
To left on the outside of the body a fixed machine-gun for the pilot is mounted, being operated from the camshaft of the left row of cylinders.

The observer is armed with two machine-guns clutched together and mounted on a raising and turning ring. As the ring is mounted high, the firing range forward is good.

The bomb store is mounted in the inner section of the power planes with a capacity of 16 small bombs, arranged hanging in two rows of eight. In the dropping operation the two bombs, lying behind each other, are released, at the same time, by a camshaft lying in front of the main spar. The camshafts are connected by chain drive with a shaft in cross position in the fuselage with a grooved pulley mounted, driven by a strong rubber cable.

Another chain drive connects this shaft with a gear wheel mounted to right of the seat of the observer, on the shaft of which a locking quadrant as well as a transmission gear for the stretching of the rubber cord is keyed on. To load the bomb store the chain wheel is first by means of the crank-handle in the observer's cockpit turned till the locking engages again after revolution. When

(*Continued on page* 634)



THE HUGHES AIRCRAFT REPORT

(*Continued from last week*)

SIXTH—THE COURSE OF PRODUCTION; DELAYS; MISLEADING PUBLIC STATEMENTS

It is not deemed to be necessary to review in detail in this report such delays as occurred in the delivery of training planes and engines therefor. As early as February 16, 1918, 1,733 had been delivered of the JN4-D and 683 of the SJ-1 elementary training planes. As already stated, 2,972 of the JN4-D had been delivered by June 30 and the total order for the SJ-1 (1,660) was completed by May 11, 1918. By February 16, 1918, there had been delivered 1,438 of the OX-5 engines and 1,083 of the A-7a engines and deliveries continued from week to week.

The elementary training planes of the JN-4D type seem to have been satisfactory. In connection with this phase of the execution of the aircraft program it should be said that the general average of accidents in training for all the camps in the United States, is one accident for every 3,200 to 3,600 hours of actual flying. The worst school, in this respect, is one accident for every 1,900 hours of flying and the best school shows one accident for every 4,800 hours of flying. While it is somewhat difficult to obtain comparative statistics with respect to accidents in French and British training camps, it is believed from reports from our officers serving in the English and French schools that we have about twice as much flying per accident as either of the other nations.

The condemnation of the SJ-1 plane as dangerous, because of the Hall-Scott engine, has already been mentioned. It is to be noted that as early as February 12, 1918, the Joint Army and Navy Technical Aircraft Board passed a resolution reciting the opinion of the Board "that the Standard aeroplane as completed with the Hall-Scott engine is not a satisfactory training machine" and recommending "that if it is necessary to make further purchases from the Standard Company of types that have been developed by them, that such machines be of the type designed for the installation of the Hispano-Suiza engine and the 150 Hispano-Suiza engines be purchased for these machines". The Standard J training plane with the Hall-Scott engine continued to be used until it was condemned in June, 1918, on General Kenly's return from overseas and after his careful examination of its operation. The order of General Kenly, under date of June 6, 1918, is as follows:

"1. Due to the shortage of training aeroplanes in the past it was necessary to use a certain number of Standard J-1 aeroplanes for training as filler-in until there were sufficient JN-4 machines manufactured for all schools.

"2. At the present time there are sufficient JN-4 machines in storage to entirely replace all Standard machines in use. The Director of Military Aeronautics therefore desires that no more Standard aeroplanes be used in flying training and that steps be taken at once to entirely replace the Standard J-1 machines now in use by JN-4 aeroplanes. The Standard machines can be utilized in Mechanics' Training Schools, Ground Schools and any other schools where it is not necessary that they be taken into the air."

With respect to advanced training planes, it may be said that by February 16, 1918, 60 had been received of the S4-B and 105 of the JN4-H. The delivery of Penguins did not begin until the middle of April, and of S4-Cs until May. There had been delivered by February 16, 1918, 121 of the Gnome (100 H. P.) and 444 of the Hispano (150 H. P.) engines. Deliveries of the Lawrence (28 H. P.) began in March and of the LeRhone (80 H. P.) in May, 1918.

Service Planes

As already stated, the program during the period under consideration and until recently has been practically limited to the DeHaviland 4s and the Bristol Fighters.

The DeHavilands

The contracts for these planes, after the substitution of DeH-4s for DeH-9s, called for 8,500 DeH-4s, viz: Dayton Wright Aeroplane Company, 4,000; Fisher Body Corporation, 4,000; Standard Aircraft Corporation, 500.

Under the first contract with the Dayton Wright Aeroplane Company (dated September 7, 1917), deliveries of the DeH-9s then provided for were to begin in November, and the entire 2,000 were to be delivered by the end of June, 1918. Under the modified contract (January 17, 1918, for 1,000 DeH-4s and 3,000 DeH-9s, deliveries were to begin in January and to be completed by the of July, 1918. Under the final contract (April 1, 1918), substituting 4,000 DeH-4s, the latter were divided into two lots of 2,000 each, the first lot for immediate production to be delivered by August 1, 1918, and the remainder to be delivered as ordered.

The first DeH-4 was shipped from the plant of the Dayton Wright Aeroplane Company on February 5, 1918. It was intended for the American Expeditionary Forces in France, but it was not completely equipped; it did not have any bomb gear that would work. On February 14, 1918, the following telegram was addressed by Mr. Talbott to Colonel Deeds:

"Wire received reference Secretary Redfield and Dr. Stratton. Major Shepler advises first one hundred DeHavilands to remain in this country. If so, will you recall plane shipped for foreign shipment, allowing us to substitute plane completely equipped. Progress here encouraging."

However, the plane already shipped, was not recalled. The transport containing it sailed on March 22nd and, on account of engine trouble in the Azores, it did not reach Europe until May 4th.

Nine additional DeH-4s were shipped by the Dayton Wright Aeroplane Company in February for the use of various fields; two on the 15th, one on the 16th and two on the 17th, intended for Gerstner Field in Louisiana; one on the 21st for McCook Field (which was sent to South Field); one on the 22nd for the Fisher Body Corporation; one on the 23rd for the Standard Aircraft Corporation, and one on the 25th for McCook Field. Four were shipped in March; two for Gerstner Field on the 9th and 12, one for McCook Field on the 10th, and one on the 21st was delivered to the Property Officer at the Dayton Wright Aeroplane Company.

There were no shipments for the American Expeditionary Forces between February 5th and April 3, 1918, when four were shipped; four more were shipped on April 14th and four on April 22nd, and there were no more shipped for use abroad until May 2, 1918. That is to say, up to May 2nd there had been thirteen DeH-4s shipped for our forces abroad. It was in May, 1918, that what may properly be called quantity production of DeH-4s began. By the end of that month 193 DeH-4s, and by the end of June, 529 DeH-4s had been delivered by the Dayton Wright Aeroplane Company. Of these 529, it appears 381 had gone to ports of embarkation, 116 to the Navy and 32 to various destinations in this country, including training fields.

On June 25, advices were received that there were serious defects in the planes which had been received abroad. At the meeting of the Aircraft Board on July 31, Colonel Arnold stated that all planes shipped to Europe by the Army which were found on arrival to have weaknesses were rebuilt at the aircraft production centers. At the same meeting, Mr. Potter stated that the DeHaviland planes for the Navy which had been shipped from the factory but were not yet floated should be sent back to the Dayton Wright Company to be rebuilt.

From June 30th to October 11, 1918 the Dayton Wright Aeroplane Company delivered 1,320 DeH-4s, making 1,849 in all to the latter date.

In the contract with the Fisher Body Corporation (November 6, 1917) provision was originally made for 3,000 DeH-9s, the deliveries to be completed before July 1, 1918. For these there were subsequently substituted 4,000 DeH-4s, of which 2,000 were to be delivered by September 1, 1918—afterwards extended to November 1, 1918—and 2,000 more at dates to be fixed. Up to June 30, 1918 no deliveries of DeH-4s had been made by the Fisher Body Corporation. This company got into quantity production in August and had delivered 452 up to October 11, 1918.

For the order of 500 DeH-9s placed with the Standard Aircraft Corporation (January 26, 1918) there were eventually substituted 500 DeH-4s by the contract of March 28, 1918. No deliveries had been made up to June 30, 1918, and only 49 had been delivered up to October 11, 1918.

The total deliveries of DeH-4s, to October 11, 1918, amounted to 2,350. Of these, 1,617 had been floated, 388 were at ports or in transit, 177 had been shipped to camps and training fields, and 168 are described as being for "manufacturers and miscellaneous."

Bristol Fighters

The contract with the Curtiss Aeroplane and Motor Corporation called for 2,000 Bristols to be delivered by August 31,1918.

There was no definite release for production until February and then only to the extent of 25 machines. 400 were released for production in the latter part of March and 400 more on April 24th. As already stated, only 27 were delivered in all, and the order was cancelled in July.

Liberty Engines

The deliveries were to be completed as follows:

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Lincoln Motor Co.	5	80	160	275	700	1400	1900	1480					
Packard Motor Car Co.	50	200	500	800	1000	1200	1200	1050					
Nordyke & Marmon Co.			25	125	550	700	800	800					
Ford Motor Co.						200	800	1000	1000	1000	1000		
General Motors Co.							25	125	250	300	400	500	400

These were the actual deliveries:*

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept. to Oct. 11	Total
Lincoln Motor Co.				7	24	134	106	309	484	701	1022	2787
Packard Motor Car Co.	1	25	43	98	153	314	439	556	724	543	970	3864
Nordyke & Marmon Co.								0	16	24	117	157
Ford Motor Co.								53	197	459	1212	1868
General Motors Co.								130	244	398	371	1013
												9689

The total deliveries of Liberty motors (US-12s) to October 11, 1918 amounted to 9,689, of which 6,895 were for the Army and 2,794 for the Navy. Of those for the Army, 3,555 had been floated, 456 were at ports or in transit; and there had been delivered 990 to Allied Governments, 260 to flying fields, 1,429 to manufacturers, etc., the remainder, or 205, being turned over to the Navy.

Contracts have recently been made for the production of the Liberty 8 (US-8), but no deliveries had been made to October 11, 1918.

Misleading Public Statements

In the face of the delays in production a series of misleading public statements were made with official authority. While these statements were authorized by the Secretary of War, he states that they were issued in reliance upon information furnished by the Chief Signal Officer, General Squier, and by Colonel Deeds, who were acquainted with the actual conditions. It is unnecessary to review the delusive predictions and exaggerations contained in these utterances.

But particular attention should be directed to the official statement released for publication in the papers of February 21, 1918, which contained the following:

"The first American built battle planes are today en route to the front in France. This first shipment, though in itself not large marked the final overcoming of many difficulties met in building up this new and intricate industry."

This statement had its origin in a conversation between Colonel Deeds and a representative of the Committee on Public Information a week or two before the completed statement was issued. A draft was first prepared and submitted to Colonel Deeds, who examined it and made some corrections. The statement contained in the paragraph above quoted was not only left unchanged but was the subject of special inquiry. Colonel Deeds was asked what was meant by the "first shipment", and he replied, "They are on the water now, on the way to France." He was then asked, "How many?" and he answered, "I do not know, but I do not think more than ten." The statement in its final form was then presented to the Secretary of War, who permitted it to be issued upon the understanding that it had been verified by General Squier and Colonel Deeds.

At the time this statement was issued (February 20th) only one plane had been delivered for shipment to the American Expeditionary Forces, and while this had been shipped from the factory on February 5th it did not leave the United States until March 22nd. The only other service planes which had been delivered were five DeH-4s, which had been shipped for use at Gerstner Field, Louisiana. No additional shipments of aeroplanes for the use of our forces abroad were made until April 3rd. Actual production in quantity did not really begin until May.

* There are slight discrepancies between the factory records and the Government reports, and the latter apparently based on actual receipts are used in this tabulation.

Colonel Deeds admits that this statement was brought to him before its publication, and that he went through it. He examined it minutely enough to correct with his own hand one of the paragraphs following that above quoted, which gave the number of men required on the ground for every plane in the air, his correction making it 46 instead of 45. Colonel Deeds denies, however, that he said in response to the inquiry upon the point that the battle planes were "on the water now, on the way to France." That he did make this statement is testified to directly and unequivocally by John W. McConaughy and Marlen E. Pew, representing the Committee on Public Information.

When Colonel Deeds was examined as a witness before the Committee on Military Affairs of the Senate, on April 2, 1918, he was asked this question and gave this answer:

"Senator Wadsworth. Did you see, or do you know whether any other responsible officers in your Aviation Section of the Signal Corps saw the statement given out by Secretary Baker on February 21st before it was published?

"Colonel Deeds. No, sir, I did not see it. I do not know of anybody seeing it."

Colonel Deeds admits giving this testimony. He testified that he did not then recall the paper in question.

Colonel Deeds further testifies, in explanation that when the paper was before him, his information was that "four planes were on the cars en route to France", and that it later developed that only one was sent and the others were diverted to Lake Charles, that is, to Gerstner Field, for tests on radiators. The shipments to Gerstner Field, however, had been made directly from the Dayton Wright Aeroplane Company on February 15th, 16th and 17th, and these planes had not been shipped from the factory for the American Expeditionary Forces. There is evidence, also, (*ante*, p. 113) that on February 14th Mr. Talbott had telegraphed to Colonel Deeds that Major Shepler advised that first one hundred DeHavilands should remain in this country and asking on this assumption for the recall of the one plane "shipped for foreign shipment," so that another could be substituted "completely equipped."

There is no question but that this grossly misleading statement was published on the authority of Colonel Deeds and that the Secretary of War relied upon the fact that it had Colonel Deeds' approval in giving it his official sanction. While this conduct of Colonel Deeds does not come within the scope of the Criminal Code, it deserves the prompt attention of the military authorities.

General Squier testifies that he had nothing to do with the statement that was issued for publication on February 21st and that he did not know of it before it was published. He testifies that when it was brought to his attention, he did not regard it as a proper statement to have been sent out, but that he did not institute an inquiry to ascertain who was responsible for it. It is evident that the matter called for immediate investigation and for suitable disciplinary measures, but no steps were taken either for correction or punishment.

The Secretary of War states that the responsibility for the statement clearly rested with General Squier and Colonel Deeds, and that he did not learn of the inaccruacies of the statement until his return from Europe in the latter of April.

There were earlier statements of a delusive character as to the progress of aircraft production, but the particular statement to which attention has been called was inaccurate in its specific statement of facts, and its misleading character was obvious to anyone having knowledge of the actual conditions.

SEVENTH. CAUSES OF DELAY IN PRODUCTION

First: Lack of Knowledge and Experience

This was a fundamental difficulty affecting production in all its stages. The industry was new, and there was a lack of engineers and skilled workmen. Novel problems were encountered at every step, and lack of knowledge bred indecision and confusion. Experience in other manufacturing enterprises gave no assurance of facility in this untried field. In addition, it was necessary to develop new sources of supply of needed materials, and the difficulties of the main contractors had their counterparts in the plants of sub-contractors by which various sorts of material or fabricated parts were supplied.

Second: Defective Organization in the Signal Corps

The duty of providing an adequate organization for Aircraft Production was left to the Signal Corps. It is quite clear that this undertaking was beyond the competency of the Chief Signal Officer, who had neither training nor experience for such a large industrial enterprise, and those who were brought to the task in his department failed to produce an organization which was adapted to meet the exigency.

The contracts were for production, and presupposed that the manufacturers should have an established design. The contractors agreed to produce the described machines in accordance with drawings and specifications to be furnished by the Government. In order to secure production of types of planes unknown to our manufacturers it was necessary that the Government should create an engineering department which should settle the design and furnish adequate and accurate drawings and specifications. But this esential condition of achievement was not met.

Undoubtedly the lack of aeroplane engineers was a serious obstacle. Still, there were a few in the country who had devoted themselves sedulously for a considerable time to the study of aviation problems, and it does not appear that there was a suitable effort to draw to the Government's service such talent as was available. Whether or not much assistance could have been obtained in this way is a question which cannot be answered in the absence of an appropriate test. It was, however, entirely obvious that the exigency called for the most efficient organization and that to add to inexperience the lack of a suitable organization and the confusion of a divided responsibility would inevitably lead to serious delays and threaten the entire program.

There was an Engine Design Section established about July 1, 1917, in charge of Mr. Vincent, who had been engineer of the Packard Motor Car Company, but had no experience in the designing of aeroplanes. And this department did not have anything to do with the designing of aeroplanes as distinguished from aeroplane engines.

Captain (afterwards Lt.-Col.) Virginius E. Clark, who had had perhaps as much aeronautical experience as anyone in the Army, had been in charge of aeroplane designing, but he was absent in Europe with the Aeronautical Commission from June until about the first of September, 1917. On his return he resumed the work of aeroplane designing, and the Aeroplane Experimental Department was organized about October 1, 1917, in charge of Lt.-Col. Clark, who was put in command at McCook Field, Dayton. This organization continued until February 6, 1918. Lt.-Col. Vincent testifies that he had been arguing for an "engineering department" with the idea that it would take entire charge of engineering as it pertained to engines and planes and "definitely straighten out" what he thought to be "an unsettled condition." By this he meant that "an attempt was being made to put planes into production in his country without having complete drawings or a complete understanding as to just what equipment such planes were to carry." But for the purpose of settling designs of aeroplanes and furnishing drawings to the manufacturers the Aeroplane Experimental Department proved to be hopelessly inadequate, and the result was that it was largely left to the manufacturers themselves to work out the designs of service planes, an undertaking for which they were ill-equipped.

When the Aeroplane Experimental Department failed to give satisfaction, instead of strengthening it and making it adequate to the engineering work which had to be done, an additional department was created (about January 1, 1918) which was called the Production Engineering Department. This Department was also located at Dayton, because the Dayton Wright Aeroplane Company was at that place, and there the Department remained until the middle of April. It was said to be its function to supply manufacturers with engineering information, drawings, specifications, etc., from which they could produce in quantity what they were to manufacture; to specify materials, to decide upon details of design, etc. It was not, however, established merely as an aid to the manufacturer in producing according to a settled design, that is to enable the manufacturer to cope with the difficulties which were sure to arise in the course of production, but this Department was largely placed in control of the aeroplane design itself, which the Aeroplane Experimental Department had failed to establish satisfactorily. The new Department was never informed or equipped so that it could perform its function adequately. It was under the general supervision of the head of the Production Department of the Equipment Division, who was experienced in aeroplane engineering or in aeroplane production, and this creation of another inadequate department failed to solve the difficulty.

On February 6, 1918, the Aeroplane Engineering Department was established in charge of Lt.-Col. Vincent, who was put in command at McCook field. Lt.-Col. Vincent at once began to direct the efforts of the new department towards getting some well known machines ready for production, rather than doing the purely experimental or research work, and he obtained permission from Mr. Potter to take the DeHaviland 9 from the Dayton Wright Company at South Field "and put it through McCook Field." But this new department did not have a definite function with respect to the types of service planes already under contract, that is, the DeHaviland 4 and the Bristol, and these were left apparently as before, subject to the inadequate direction of the Production Engineering Department.

The consequences are easy to trace. When the model DeH-4 was received in this country it was accompanied by the English drawings. It was necessary to re-design the plane to accommodate it to the Liberty motor. The model was sent to the Dayton Wright Aeroplane Company, and this Company, which under its contract was to produce in accordance with drawings and specifications furnished by the Government, appears to have undertaken the work of redesigning and making the new drawings. These were made and the DeH-4 as re-designed was flown on October 29, 1917. When, later, changes were required, the company expected drawings to be furnished by the Signal Corps; the Production Engineering Department apparently expected the drawing to be provided by the Company. Rapid and successful production which demanded clearly defined responsibility could not be expected under such conditions. About February 21, 1918, the Production Engineering Department having been unable to secure production, the work on the DeH-4 was virtually taken out of its hands and placed in charge of Lt.-Col. E. J. Hall for the purpose of a swift effort to get results. Lt.-Col. Hall proceeded to get necessary information as to equipment, developed a little organization of his own, at once built three model planes (one for the Dayton Wright Aeroplane Company, one for the Fisher Body Corporation and one for the Standard Aircraft Corporation) and sought to remove as rapidly as possible the various hindrances to production. In this way, production in quantity was finally attained. But this was not the perfecting of the organization, but in substance was a desperate effort outside the regular instrumentalities of the Equipment Division because those instrumentalities could not be relied upon.

With respect to the development of the Bristol, similar conditions existed. When Lt.-Col. Hall had made sufficient progress at the plant of the Dayton Wright Aeroplane Company to warrant it, he turned his attention to the production of the Bristol, at the plant of the Curtiss Aeroplane and Motor Corporation. As he testifies, "they were worse than at a stand-still". "It would have been easier", he says, "for me to have taken and designed the whole machine around the equipment if they had not had the material started". He found that "practically all they did was to get in a row, so that the condition when I went in there was that everybody was damning everybody else." This was about April 11, 1918.

It appears that Captain Clark in the Fall of 1917 began the work of redesigning in order to adapt the Bristol to the Liberty motor, and about the last of October the model Bristol with a large number of drawings was sent to the Curtiss Company. Mr. Mueller, who was the Chief Engineer of the Curtiss Company, states that they were unable to make the plane from the drawings, that "the dimensions would not check up" and that "it was impossible to get the machine together from the parts made from the details of the Signal Corps drawings." In January, 1918, the Production Engineering Department took over the work on the Bristol, but differences with the contractors speedily arose, and at the end of January, for the purpose of reconciling these differences, a conference was held between the representatives of the Signal Corps and of the Company, respectively, and it was determined that engineering decisions should thereafter be left to the engineer of the Curtiss Company. This authority apparently was exercised for two or three weeks, but opposition developed and there was no real progress. Lt.-Col. Hall took the matter up in April and an effort was made to drive through to production. It is apparent, however, that this plane never got beyond an experimental stage, and yet 400 were released for production in March and 400 more in April. This was evidently in response to criticism of delays. But the plane as designed for the Liberty motor was doomed to failure. Had there been an adequate engineering department to settle the matter of design and make the necessary engineering tests and decisions before production was entered upon, much time and money expended in fruitless effort would have been saved.

Throughout this period, the Equipment Division of the Signal Corps presented an organization with a host of sections and departments, with all-defined functions, creating disorder and confusion rather than sustained, well directed and expert effort. There was a vast amount of lost motion. Manufacturers were brought into contact with various divisions with overlapping powers; earnest and able scientific men, who were brought into particular sections, found themselves locking in authority or in conflict with other sections; and uncertainty, indecision and vacillation enfeebled the entire undertaking. Military organization was another obstacle to the rapid prosecution of what was essentially an industrial enterprise. Whatever might be accomplished by such an organization in a thoroughly understood activity, it was certainly unsuited to an entirely new industrial endeavor of this sort. A mobile force in which men could readily be moved about, tested, elevated and deposed without regard to military rank or precedent, was absolutely required.

The inherent difficulties of the situation were thus greatly increased by defective organization. No doubt, also, the swift creation of a large force of inspectors, without the qualification of experience in their line of work, not only opened the door to abuses, but to an extent retarded production.

The situation, as it appeared to Archer A. Landon (Mr. Coffin's assistant) more than six months after we had entered the War, is strikingly shown in his letter to Mr. Coffin, dated October 16, 1917, in the course of which Mr. Landon said:

". . . The lack of organization and continuity of responsibility is so apparent that success will be a miracle. . . . If we are to be successful there must be fixed, from the Secretary of War or the Secretary of the Navy down almost to the office boy, a direct line of responsibility that will make every individual assume the absolute responsibility for the work he is undertaking and under no circumstances should any conflict of authority or responsibility occur. Industrial men of known responsibility and capacity for the particular work undertaken must be selected. They should be peculiarly fitted for the positions they occupy and should be responsible for their work as in civil life. . . .

"We men who have come here in an effort to assist you find ourselves very seriously embarrassed and justly so. We are started off to do what seems to be an important piece of work only to find that this work has been delegated to somebody else in some other department and that we are treading on other people's toes. The result is that we do not get the information we want and we do not get anywhere. They do not throw us out, but they are all adept at pulling the latest Washington game of 'passing the buck', or else, frankly, resenting our appearance in the matter.

"Take the spruce situation as an example of dilly dallying through a lack of organization. The first I knew of the spruce situation was around the latter part of July or the first of August. At that time it was one of your great worries. The entire aircraft program was and is now endangered by the lack of ability to get spruce; and yet from that time until now, notwithstanding repeated conferences, there was nothing done on the spruce situation, either towards closing contracts or increasing production, until October 13th, when Colonel Disque was sent west on the situation; a loss of time of practically three months. If this had been your own business, the men would have been on their way west the day after the matter was first brought up. The only reason that there was no action in July was because we do not possess an organization of direct responsibility and on that account these inefficiencies are possible and they will continue to occur until such time as somebody wakes up and thoroughly organizes the work."

After giving a further illustration, Mr. Landon continued:

"This is not intended as a criticism of General Squier or the other officers, but it is intended to be a very vigorous criticism of methods of organization that make such a condition possible; and I submit to you, sir, that, if this same condition exists in all departments and continues to exist, we might as well submit to the Germans now, because the one way you can beat efficiency is to match it with efficiency, and efficiency can only be obtained by a thorough organizing of our responsibilities and following them through to a definite conclusion, which conclusion should be the winning of the war."

Mr. Landon, leaving the aircraft work in October, 1917, returned to it in June, 1918, then becoming chief of the Production of Aircraft in the Bureau of Aircraft Production. Up to that time, the policy he had recommended had not been carried out. He testifies that he "could see practically no change in the organization in six months"; that is, prior to the new organization through the Bureau of Aircraft Production which had just been instituted.

It should be understood, of course, that the complaint so emphatically voiced was not directed at the Aircraft Board, as this, as Mr. Landon stated in his letter, was "merely an executive advisory board". The responsibility lay with the officers entrusted with the duty of affecting an adequate organization for Aircraft Production.

Third: Lack of Information as to the Equipment Required for Service Planes

The model DeHaviland 4 was not received until about the beginning of August, 1917, and, as already stated, it was necessary to re-design it and make new drawings. But whatever delay was due to a failure to obtain a model earlier, or to the necessity of redesigning the plant, was greatly increased by the lack of needed information as to the equipment which was to be put on it. From the time the model machine, as redesigned, was completed and flown on October 29, 1917, several months elapsed before its equipment was finally determined upon. The engineer of the Dayton Wright Company testifies that "the information which we were anxious to receive and which was necessary for production was not forthcoming until the middle of April."

There appear to have been several reasons for this. There was always the difficulty created by lack of experience in equipping aeroplanes for service in war and there was considerable trouble in obtaining some portions of the equipment. But, in addition, it appears that there was a lack of exact and detailed information as to just what was required. The drawings and the specifications which accompanied the sample plane sent here were supposed to designate definitely the apparatus to be put upon the planes and its location. The testimony is that these drawings and specifications "did not check up with the actual plane," and there was resulting uncertainty as to what should be done. Communications with the other side were had frequently with regard to instruments, accessories and various parts of equipment, but, despite this, the uncertainty seems to have continued for a long period and there was apparently an inability to frame a definite bill of material which could be given to the manufacturer. The showing indicates either an extraordinary lack of decision on the part of those whose duty it was to decide, or an even more remarkable absence of administrative efficiency in seeking and obtaining necessary information.

About February 10, 1918, definite instructions were received from the other side as to the armament and instruuments of the DeH-4, but these instructions involved serious changes in the plane. And, subsequently, there were further changes in equipment, as stated below, causing still further delay.

Fourth: Changes in Design and Equipment of Service Planes

The folowing statement, set forth in the testimony of Mr. Schoonmaker, the engineer of the Dayton Wright Aeroplane Company, which is substantially uncontroverted by the representatives of the Signal Corps, is an illuminating description of the delays in production incident to changes in design made necessary by changes in equipment so far as the DeHaviland 4 is concerned and also indicates the waste thereby occasioned. It will be observed that changes were made necessary not only by new requirements as to equipment, but by inaccuracies in drawings and various defects. Mr. Schoonmaker testifies:

'The first sample DeHaviland machine was received on August 14, 1917. This was accompanied by an incomplete set of drawings, but with the machine as a sample and with what drawings we had at hand, we were able to complete the necessary lay-out from which to build one sample machine which was flown on October 29, 1917. This plane was satisfactory in every detail as a machine and practicaly no changes have been made in the construction except where they were affected by the equipment which the machine was to carry.

'We were advised at that time in answer to our request for information on guns, that the machine was to be equipped with the Vickers Gun and that the gun mounts would necessarily be the same as the English gun mounts. This information was requested by the Dayton Wright Company during August when the preliminary lay-outs of the machine were being made. At a late date we were advised that the Marlin Gun would supplant the Vickers, and that the Signal Corps would take care of the necessary design of gun mounts, etc. The front gun mount design was received on January 8; after a conference with Signal Corps men, it was decided that this mount would not be satisfactory and, therefore, was discarded. The Dayton Wright Company produced a design of gun mount and cartridge box which was built and installed and accepted by the Signal Corps after a firing test on January 26.

"Owing to the fact that the Marlin Gun was not similar to the Vicker, a complete re-arangement of the cowling over what had already been designed was necessary. The first drawing of the Marlin Gun which we received was delivered to us on February 12, but no bill of material on the complete gun equipment accompanied same. On February 26 we were requested to mount two staionary guns on the forward cowling. This necessitated a re-design of the gun mounts already ordered into production, and this work was carried on by the Signal Corps. This also affected all cartridge boxes of which drawings had been made and which were released to production. A re-design of the cartridge boxes for the double gun mount was furnished by the Signal Corps on March 5. This design was not satisfactory, as the drawings were incorrect and the pieces manufactured from them did not assemble in the machine. A new re-design was furnished by the Signal Corps on March 15; parts were made from these drawings and were released to production. On April 1 the Dayton Wright Company was ordered by the Signal Corps to again re-design the cartridge boxes changing certain dimensions; since that date few minor changes have been necessary, but nothing which directly interfered with the production of these parts.

"Changing the gun equipment as mentioned above, necessarily changed the shell chute lay-out. The first drawing which we received from the Signal Corps for the left hand gun chute came to us on March 5. Parts made from these drawings were not satisfactory as they did not assemble in the machine. The Signal Corps corrected these drawings and sample parts were made and the Dayton Wright Company's drawings were released for production several days later. The Signal Corps found, however, that these samples were not satisfactory and they were rejected as there had been an error in the drawings. The Dayton Wright Company re-designed the chute for the left hand gun on March 29. Samples were made from these drawings which were satisfactory to the Signal Corps and released to production on April 7.

"The first right hand shell chute was laid out by the Signal Corps on March 6. Samples manufactured from these drawings were not satisfactory and did not assemble properly in the machine. The Signal Corps proceeded on the correction of these drawings and they were released for the production of sample. These drawings were very difficult to work to and samples manufactured from them were not satisfactory and rejected.

"The Dayton Wright Company produced a new design of this shell chute on March 29, which before the samples could be made and tried out, it was seen that a new design would be necessary due to the change of location of the electric generator for the electrically heated clothing. A new design was started by the Dayton Wright Company on March 30.

"A design along entirely different lines had been started in the meantime by some Signal Corps men at South Field on March 29, and this type was approved on March 31 by the Signal Corps and drawings were made and released to production. This design was tested out on the evening of April 2 and proved unsatisfactory. Another new design was started by the Signal Corps on April 3, which after a few modifications was released to production on April 11.

"The same procedure of re-design and development as was required for the shell chutes applies also to the cartridge box and shell chute covers.

"Our first request for information on the synchronizing device was in November, 1917, but up to February 14 no bill of material or complete set of drawings had been delivered. We received on January 23 a few parts which were intended for production, however, the assembly was incomplete and the parts made would not fit the engine. We received drawings of the hand pump on February 5. During January a sample hand pump was delivered to South Field; no drawing or instructions accompanied this to show mounting and this office was never advised as to its use. When assembled on the machine in January, it was found that an interference was encountered with the gasoline shut-off cocks and strainer, necessitating a re-design of these parts and the transferring of them to the other side of the fuselage. This in turn caused an interference of the spark and throttle controls necessitating scrappage of parts then on hand and re-design of this lay-out.

"The first synchronizing outfit which we received caused a considerable amount of trouble and upon examination of the trigger motors, it was found that practically no two of them were alike and it was almost impossible to get a pair of guns on a machine which would function correctly. The first synchronizers were delivered directly to us instead of the engine builder, and they were not made so as to be directly interchangeable with the motor crank shaft, the result being that a considerable amount of hand work had to be done in the fitting up of these synchronizers.

"On April 2 it was found that the synchronizer generator did not have a satisfactory lubrication system and it was necessary to connect it to the motor oiling system. This necessitated the dissembling of the synchronizer head and welding on a special boss for the attachment of this oil line. This has been done on all of the synchronizers to date.

"Information, drawings and bill of material for the gun sights were requested on October 19, 1917. A list of different types of sights were received on January 4 but no bill of material or drawings. Drawings for wind vane sights were received February 6. No drawings were ever furnished on any of the sight mounts, however, the sight locations were approved February 13.

"This will recall that it was advised that the old English DeHaviland be used for the mounting of guns and sights so that all of the difficulties which were likely to be encountered, could be worked out on this job. Our engine cowling was held within the limit of the cowling used on the English job so that no interference would occur. On November 20, it was called to the attention of the Signal Corps that no use had been made of this machine to date, and early in the Spring was shipped to Wilbur Wright Field.

(*Continued on page* 630)

SOME RECENT AERONAUTIC BOOKS

Internal Combustion Engine Manual

THE fourth edition of this volume, which marks its eighth year as a text-book at the Naval Academy, has been completely rewritten, enlarged and brought up to date. The subject of fuels is first treated. These fuels follow in natural sequence. The engine proper naturally divides itself into four systems: fuel system, ignition system, cooling system and lubricating system. Each is treated in detail. A comprehensive chapter on aeroplane engines is included, covering the five types: vertical, horizontal opposed, V type, radial and rotary. The book is clearly written and well illustrated with half-tones and line cuts.

Lubrication of Internal Combustion Engines

C. W. Stratford, the consulting engineer of the Tide Water Oil Company, has rendered a service to engineers confronted with the problem of efficient lubrication by the publication of the handbook on "Lubrication of Internal Combustion Engines." Part I deals with "Internal Combustion Engines: Design, Operation and Lubrication"; Part II, "Oils: Characteristics and Methods of Testing Qualities"; Part III, "Transmissions, Differentials and Their Lubrication Charts." Some of the diagramatic illustrations are particularly well worked out, and ought to be of great service to the student of lubrication. The book has been prepared for complimentary distribution amongst engineers and copies may be had from the Tide Water Oil Company, Veedol Department, 11 Broadway, New York.

High Speed Internal Combustion Engines

This volume by Arthur W. Judge, A.R.C. Sc., Diplomat of the Imperial College of Science and Technology, is one of the most complete single volume discussions of the subject and was used during the late war by practically every school where internal combustion engineering was studied. It comprises seven chapters as follows: The Thermodynamics of the Internal Combustion Engine; Explosion and Combustion in the Engine; The Conditions Occurring in Actual Engines; Pressures and Temperatures in Internal Combustion Engines; Indicators and Indicator Diagrams; The Mechanics of the High Speed Internal Combustion Engine; Engine Balance. The book should be on the desk of every automotive engineer. Price, $7.50 postpaid.

Automotive Magneto Ignition

Automotive Magneto Ignition, its principle and application with special reference to aviation engines, by Mich. E. Toepel, and instructor in the U. S. Government School for the study of magneto ignition, is the latest addition to printed discussion on this subejct. It is a small volume of some ninety-six pages, but it goes into the subject very thoroughly, and is so written that it is quite understandable to the non-technical subject. Copious illustrations and diagrams add to the clarity of the text matter.

Aeroplanes and Aero Engines

In the preface to this volume it is characterized as "As an introduction to the study of flight in simple language for the man in the street," and this is accurate. It will be useful for the layman who wants to grasp quickly the elementals and then pass on to a sincere study of the science of aeronautics.

Submarine Vessels

Because of the past aircraft has played in the battle against undersea craft, "Submarines, Torpedoes and Mines," by W. E. Dommett, is of interest at this time. It is a well put together book and the text matter and illustrations are well chosen. Price, $1.10 postpaid.

Aero Engines, Magnetos and Carburetors

As a lieutenant in the Royal Air Force, Harold Pollard secured the engine experience which he places permanently on record in this little book. In his preface he says:

"To the aviator of the future this book is dedicated by the author with the hope that it may aid in smoothing the difficulties from the path of some of those who are striving to qualify as pilots. Every endeavor has been made to write in simple, everyday language on a subject necessarily somewhat technical, so as to bring it within the capacity of the amateur.

"During many years of experience with the engines of the types dealt with the writer has gathered a quantity of information valuable to the leaner, and publication of this has been urged upon him by those in touch with his work. It was considered that a volume of this nature would not only be helpful, but almost a necessity to the beginner."

It is quite a satisfying volume and should be decidedly useful to the aviator who is not desirous of going too deeply in the study of ignition and carburetion. Price, $1.10 postpaid.

(Copies of the above volumes can be secured at the Aeronautic Library, Inc., 299 Madison Avenue, New York)

IMPROVED ARC WELDING TOOL

IN arc welding, a considerable portion of the operator's time is consumed in changing welding electrodes. Therefore, the lack of a suitable welding tool has been a distinct disadvantage.

Up to the present time a large variety of welding tools have been developed and placed on the market. The oldest forms consisted of a spring tongs which had to be spread apart by an instrument similar to an offset screwdriver, when it was desired to insert the electrode and release it. Another type employed a pair of tongs, that could be operated by a thumb lever. The disadvantage of this scheme was that in case the electrode stuck to the work, the operator released the tool, drawing an arc between the tongs and the electrode, which practice soon destroyed the tongs.

The type in most common use to-day employs a strong compression spring. If this spring is strong enough to hold the electrode when it freezes to the work, so that the electrode cannot be pulled away from the tool, it requires considerable strength to operate it, and therefore it is not always well suited where girl operators are employed.

The present development first of all was designed to make the operation of changing electrodes absolutely definite, so that in production work it could be counted upon. The next was to make an instrument that would hold the electrode and permit any amount of pull, in case

(*Continued on page* 634)

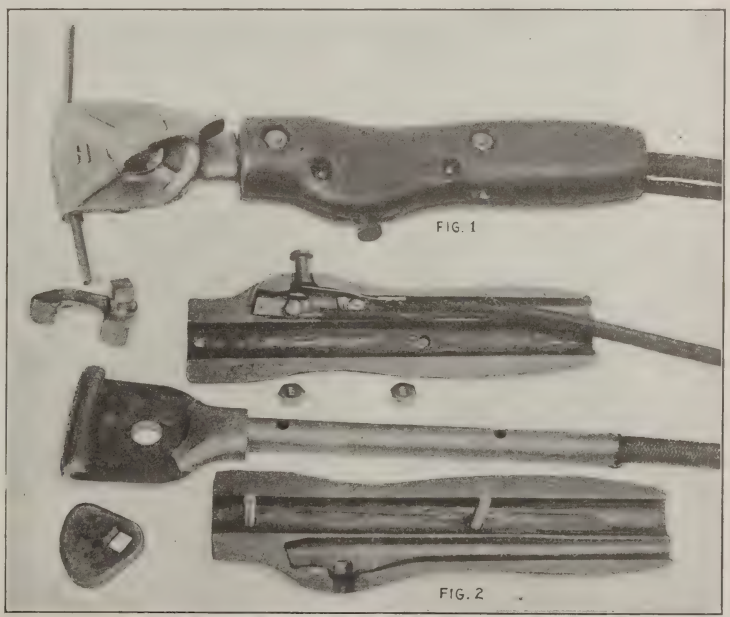
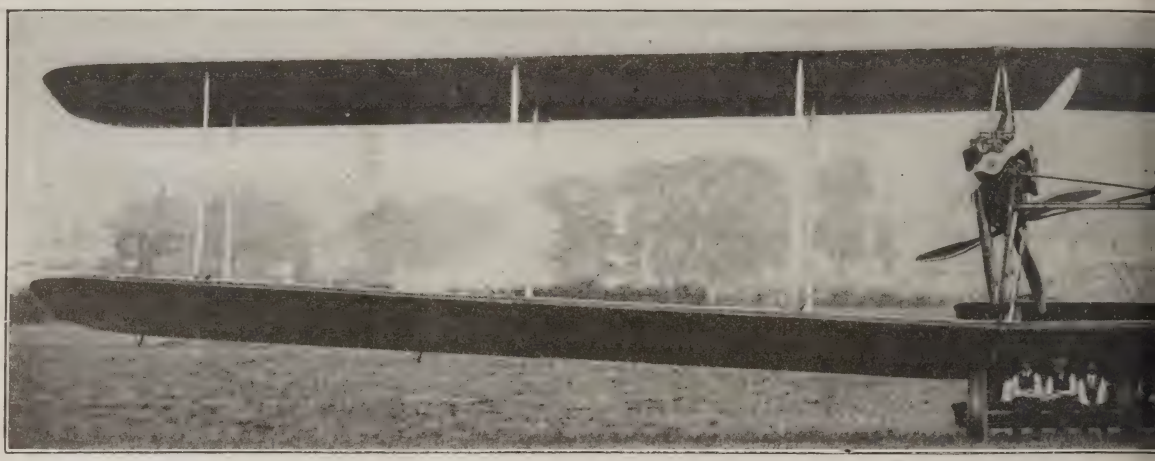


Fig. 1—Ready for use. Fig. 2—Dissembled

THE ADVENT OF THE ERA

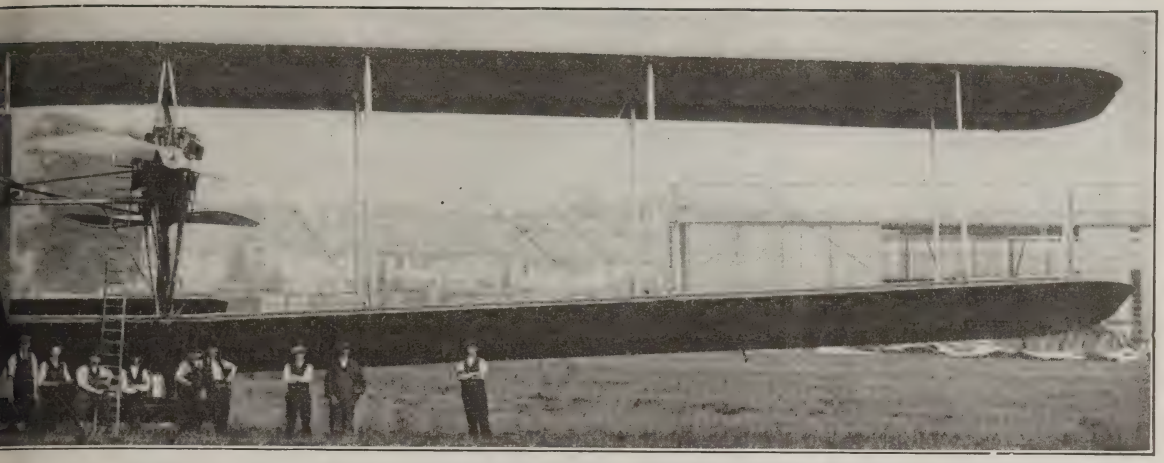


The huge Handley Page air cruiser which took forty passengers over the city of London last week. I
quired to cross the Atlantic. It has been an open secret in aeronautic circles for a long time that as soo
machine, above illustrated, v



This row of De Havilands, one day's production, was built for Uncle Sam's air fleet in France, bu
Second Assistant Secretary of War in Charge of Aircraft Production has been in conference with
for the aerial mail service, and it is contemplated that an arrangement will be soon consummated.
York has resulted in demands for aerial mail throughout the entire nat

COMMERCIAL AERONAUTICS



ered with four Rolls-Royce or Liberty Motors, and can carry more fuel and useful load than would be re-ditions were feasible Mr. Handley Page would be amongst the first to endeavor to make the trip. The to bomb Berlin in the Spring



e probable that the machines will be used for Uncle Sam's aerial mail. Mr John D. Ryan, former sistant Postmaster Otto Praeger, with a view to the Post Office Department utilizing the machines ordinary enthusiasm which has been aroused by the success of the Washington-Philadelphia-New ery effort is being made to meet these demands as promptly as possible

THE METAL AIRSCREW

By VLADIMIR OLHOVSKY

WHETHER the future belongs to the wooden airscrew now in use, or whether it will give way to the metal airscrew, is a question that has risen in many minds.

The writer has had the opportunity of devoting himself to the above question for the last six years, and he has also had the opportunity of making the most varied experiments under the most favorable conditions both upon wooden airscrews and metal propellors.

I have tested the best types of airscrews in use today in Europe. Moreover, I have built 122 propellers of my own design, using different kinds of wood, and seven metal airscrews, made by hand. Of the latter, five were iron and hollow inside; from among these five, three operated successfully on the Russian front for over two years (1915-1917).

All the airscrews were tested both on the ground, by means of specially constructed mountings or an immovable aeroplane, as well as in flight.

The results of the experiments were as follows:

The Wooden Airscrews, lacking in any special advantages and *not being in harmony with the aeroplane motor,* conissting wholly of metallic parts, has the following defects:

1. Atmosphere changes influence it strongly. From the constant changes of temperature, which are sometimes considerable, and from the *dampness* of the surrounding air (summer heat, winter cold, dry air, damp air, rain, and so on), the screw becomes warped and the symmetry of its shape is lost. Each of the blades develops a different pitch. When it is placed on an aeroplane, such a propeller works with big *vibrations* that reduce its efficiency and thus have a detrimental action upon the solidity of the foundation of the propeller motor group adjustment.

2. Wood as material for airscrews has *not sufficient firmness* to withstand the blows of sand, small stones, mud, high grass and other such impediments during the run preceding the rise in the air; nor the impact of the drops of splashing water during the run of the seaplane. Aviation practice has shown that, owing to the above reasons, after a few months of regular work, the front trenchant sides of the blades show such deep scratches and indentations that the propeller must be replaced, because it cannot be repaired.

3. When larger stones, splinters, etcetera, enter a wooden propeller, or if it is pierced by bullets or pieces of shrapnel, splinters of wood of different sizes are broken away, due to the fragility of the material. This in turn sometimes causes such a strong vibration of the airscrew that, if it is not immediately stopped, either the propeller is shattered or the motor is torn from its base. Owing to the shifting of the centre of gravity to the rear, the aeroplane loses its balance and falls on its tail and usually shatters. Such accidents have been frequently witnessed on the battlefields during duels between aeroplanes.

4. Independently of the material with which the wooden propeller is covered, be it lacquer, varnish, wax, paint, cloth, copper binding, etc., after a certain period of work in the open air, without being taken off the machine, the action of the dampness and of the high temperature causes *the glue* with which the boards of the propeller are glued to lose its adhesive properties and the propeller falls apart along its joints. It cannot be glued again. Even in case of a barely perceptible unglueing of the joints of the propeller, the latter must be discarded, for if it is placed on a motor, the action of the axial thrust and of the centrifugal force during the rotation accompanied by unavoidable vibrations, it will come apart along the seams.

The *difficulty of preserving* wooden propellers and of handling them renders them short-lived.



Capt. V. Olhovsky of the Russian Army, a student of aeronautic engineering and mechanical flight since 1908

5. Wood as material for the building of wooden propellers has many disadvantages. It *differs widely in its qualities,* depending generally upon the *species of tree;* the quality of each species depends, moreover, upon the *condition of the soil,* and so forth. It is impossible to receive two perfectly similar planks, for the *fibres* will be laid always differently, and the density, elasticity, and strength of the wood will always differ. Differing in its structure and acting *differently in different directions,* be it the length of the fibres or across them, wood, contrary to metal, possesses purely accidental qualities that *cannot be accurately summarized.*

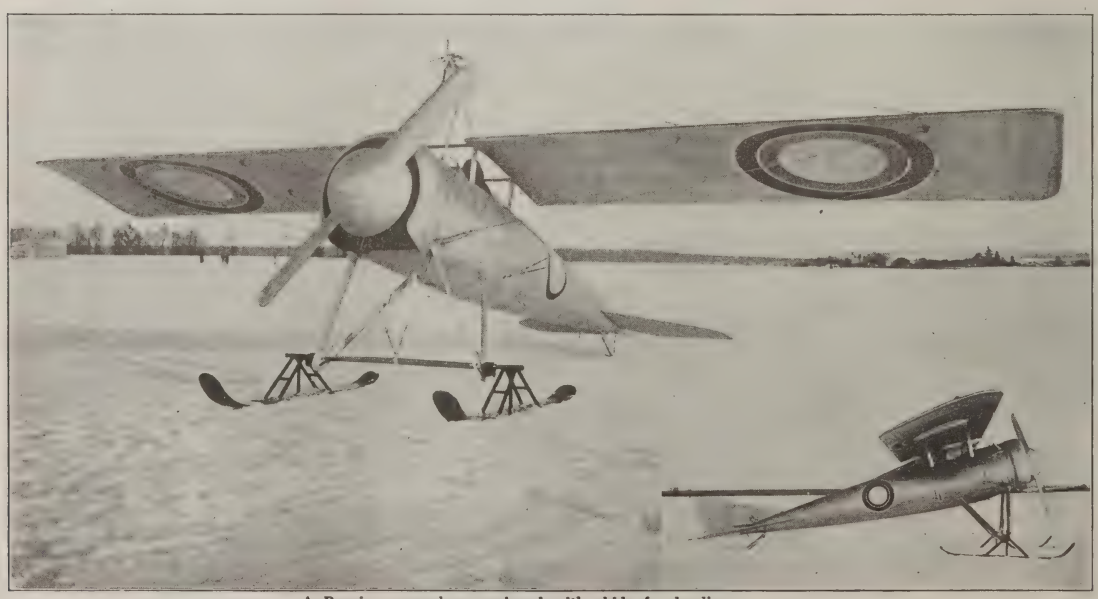
6. The high degree of *flexibility* of wood can hardly be considered a positive quality for propeller material, for in conjunction with the variety of structure of wood which results in the *deformation* of the operating propeller, it usually differs in the different blades and results in *harmful vibrations* of the revolving propeller.

7. The process itself of the *building* of the wooden propeller is quite *complicated* and gives unexpected results.

The first necessity is to have selected wood, without knots, irregular grain, or other defects, taken from a few of the rare species. It must be carefully weathered until it contains only a definite percentage of humidity. Then every plank is mathematically correctly planed and smoothed and cut according to the corresponding model. Several such planks, differing in number from 6 to 10, are first heated and then glued together to form one block, which takes a considerable time to dry. Rough planing of these blocks follows either by hand or by machine, and finally the propeller is *planed by hand* according to special moulds, sometimes fairly numerous, thus offering highly minute work. Before the final surface polish of the propeller, it is balanced, and the heavier of the blades is cut down *on sight.* As is known, the wooden propeller is always *carved* as a finishing touch and the quality of the propeller depends upon the quality of this work. But, not being built of a homogenous material, wooden propellers always differ among themselves. And *no two propellers can ever be perfectly alike and working with identical efficiency* from the point of view of aero dynamics.

Practice shows that the best propellers are made by master workers, who have a strongly developed sense of measures as well as an artistical and scientifical sense. Unfortunately, such artists are very rare.

In 1915-1916, I experimented with *aluminum propellers, made entirely* like water screws. It was established that the solid cast ariscrews were too heavy, although they operated *without vibrations, developed*



A Russian monoplane equipped with skids for landing on snow

an exceilent thrust, and rendered the motion of the motor extremely smooth, acting as a flywheel. At the same time a most interesting observation was made, indicating that *the consumption of gasoline was reduced* by 15 or 20 per cent. every time that there was placed on a motor (Salmson 150 h.p.) an aluminum propeller in place of a wooden one. This was due to the more regular motion of the motor.

The experiments led to the conclusion that it was necessary to pass to the building of *lighter metallic propellers—hollow inside.* The subsequent experiments empahsized this by indicating the great possibilities in the indicated direction. It was established that the building of a perfect metal propeller, hollow inside, was dependent upon the following three factors:

1. The *shape* of the propeller, with the gradual increase of the transverse section of the blade of the propeller from the periphery to the centre.
2. The *material* for the propeller, which must give the least weight with the greatest degree of solidity of construction.
3. The *method of building.* Exactitude, simplicity, strength, and so on.

It is easy to prove that it is possible to build an airscrew from *sheet steel, duraluminum, or acieral,* and even from *sheet aluminum,* which will be strong and yet weigh less than a wooden one.

Practice has established the empirical formula for the normal *weight W (in pounds) of the wooden propeller,* depending upon the *horse power H of the motor.*

For a *two blade propeller*

$$W_2 = 3.\sqrt{H}$$

For a *four blade propeller*

$$W_4 = 5.\sqrt{H}$$

Thus, for example:

For a *100 h.p. motor*

$W_2 = 30$ lbs.; $W_4 = 50$ lbs.

For a *400 h.p.* motor:

$W_2 = 60$ lbs.; $W_4 = 100$ lbs.

The calculation of the solidity of a metal propeller must be made according to the formula of the action of the *centrifugal force* upon the propeller.

Practice has defined *the most useful average, giving the maximum efficiency rapidity of rotation of the airscrew from 900 to 1200 revolutions per minute.* Let us take as an example the least advantageous speed for us, that of *1200* revolutions per minute. Let us suppose that the *diameter* of a two blade propeller reaches *10* feet, the average *width* of the blade being *1 foot* (which is sufficient for a *400 h.p.* motor).

The surface of the propeller, on both sides, $=$ *20 sq. feet.*

WEIGHTS OF SHEET METAL

(lbs. per sq. ft.)

Thickness (inches)	*Steel*	*Aluminum*	*Duralumin* or *Acieral*
.182	7.3	*2.53*	2.68
.128	5.2	1.78	1.88
.102	4.1	1.42	*1.51*
.081	3.3	1.12	1.18
.064	*2.6*	0.89	0.95
.051	2.1	0.71	0.76

Let us suppose that we have sheet *steel* whose thickness is .064", or *aluminum* .182", or *duraluminum and acieral* .102".

We will thus obtain the corresponding *weight of the propeller:*

In the case of *steel:*

$2.6 \times 20 = 52$ lbs.

In the case of *aluminum:*

$2.53 \times 20 = 50.6$ lbs.

In the case of *duraluminum or acieral:*

$1.51 \times 20 = 30.2$ lbs.

We thus get weights that are below the corresponding weights of wooden propellers (60-100 lbs.).

We will now prove that the *strength* of the propellers built of the above mentioned materials is quite sufficient. Late us take *the formula of centrifugal force F* acting upon a rotating airscrew:

$$F = m.\frac{v^2}{r} = \frac{w}{g}.\frac{v^2}{r} = \frac{w}{g}.\frac{(2\pi rN)^2}{r} = \frac{4\pi^2}{g}.w.r.N = 1.2 \times w \times r \times N.$$

Let me examine the average and most dangerous section of a blade by applying the formula of centrifugal force:

For a *steel and aluminum* propeller:

$w = 52:4 = 13$ lbs; $r = 10:4 = 2.5$ feet; $N = 1200:60 = 20$ rev. per sec.

Thus:

$F = 1.2 \times 13 \times 2.5 \times 20^2 = 15{,}600$ lbs.

For *duraluminum and acieral:*

$W = 30.2:4 = 7.5$ lbs.

Consequently:

$F = 1.2 \times 7.6 \times 2.5 \times 20^2 = 9{,}120$ lbs.

In the case of a *steel* propeller, the *section of the material* of the blade will be as follows:

$.064 \times 12 \times 2 = 1.54$ sq. inches.

If we take *Type "A" Chrome-Vanadium Steel,* annealed, with *Elastic Limit 61,000 lbs.* (*Elongation 34%* at the point of tensile breaking stress), it will be found that the section of the propeller blade will stand the strain, working with elasticity:

$1.54 \times 61{,}000 = 93{,}940$ lbs.

We will consequently have a safety factor of elastic resistance:

$93{,}940 : 15{,}600 = 6.$

If we take Type "A" *Chrome-Vanadium Steel* (oil tempered 900°—625°C.) with Elastic Limit *99,000 lbs.* (Elongation *30%*), we will find that the section of the blade will stand:

$1.54 \times 99{,}000 = 152{,}460$ lbs.

Consequently we have a *reserve of elastic resistance:*

$152{,}460 : 15{,}600 = 9.8$

In the case of an *aluminium* propeller the *working section* of the material of the blade:

$.182 \times 12 \times 2 = 4.37$ sq. inches.

This section will stand the breaking stress elastically:

$4.37 \times 10{,}000 = 43{,}700$ lbs.

Consequently we have a reserve of strength which equals *3.*

In the case of *duralumin or acieral* we have the *working section* of the material of the propeller blade:

$.102 \times 12 \times 2 = 2.45$ sq. inches.

The section of the blade will stand, working elastically, the following:

$2.45 \times 28{,}000 = 68{,}600$ lbs.



Consequently we have a *reserve of elastic resistance, when the propeller weighs twice as little as a wooden one:*

$68{,}600 : 9{,}120 = 7.5.$

Thus *the metallic propeller can be built with a sufficiently solid reserve of strength, although it will be lighter than the wooden one.*

Almost *all the defects of wooden propellers now in use have no place in the metal propeller.*

Thus:

1. Atmospheric conditions have no effect upon the metal propeller, such as changes of *temperature, dampness* of the air, etc.
2. The metal propeller *resists excellently the blows* from sand, grass, pieces of mud, and so on at the time of the run preliminary to the rise from the ground, as well as the drops of water that rise at the time of the run taken by a seaplane along the surface of the water.
3. The metal propeller *resists* equally well the impact of *small stones and splinters* and does not fear either *water drops* or *bullets* through the blades. The propeller that has been shot only whistles slightly.
4. Not having an adhesive foundation, such as glue, which fears dampness and so on, the metal propeller *can be preserved under any conditions.* This makes it much more durable than the wooden ones.
5. Contrary to wood, metal is a highly *homogenous material* in structure and can easily submit to the most *exact calculations.*
6. The hollow metal propeller, owing to the homogenity and sufficiently strong structure of the blades, works almost without any deformation, *without vibrations,* with the *maximum efficiency.*
7. The process of building a metal propeller gives an opportunity of obtaining *any given number of propellers* of a given type, *similar as to material, construction, quality of workmanship, strength, aerodynamic qualities, and so on.*
8. This process in *mass production* reduces itself to the building of the following: press *forms, stamping* for cutting sheet metal according to definite plans and of the *press* itself. The parts of the propeller are either silvered *soldered* or *welded* with oxygen-acetylene process, electrically welded or *riveted* among themselves.

The above leads to the conclusion that *we are now on the eve of conquering the air with the help of a new child of aviation—the metal propeller.*

709 Bomb Raids in Germany

London.—Statistics published relative to the work of the independent air forces show that during the thirteen months preceding the armistice 709 bombing raids were made by British aviators over German territory.

There were 374 raids on large German towns, 209 on German airdromes established for the defence of the Rhine and 126 on other military objectives. The list of large towns visited shows that 52 were bombed during the period.

Americans Cited By French

Paris.—Americans were among those cited in the latest issue of the official journal.

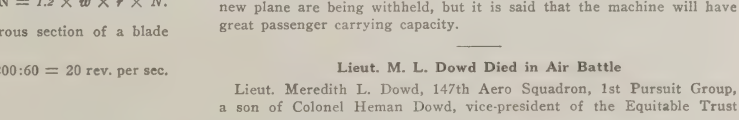
They were Lieuts. Alan Winslow and Douglas Campbell, aviators; Lieut. George Davis, Second Lieut. William Koob, Corporal Frank J. Hurrey and Private Leo Lipsie, 101st American Infantry; Privates Frank Coyle, Cyril Johns and Fred Becker, of the 102d Infantry.

Building New Plane for Overseas Flight

A new type of aeroplane for trans-Atlantic flight is being built at the plant of the Standard Aircraft Corporation at Elizabeth, N. J., it became known recently. The plane is being constructed under the direction of Charles H. Day, chief engineer of the company. Mr. Day is the inventor of the tractor type of plane in general use to-day. Details of the new plane are being withheld, but it is said that the machine will have great passenger carrying capacity.

Lieut. M. L. Dowd Died in Air Battle

Lieut. Meredith L. Dowd, 147th Aero Squadron, 1st Pursuit Group, a son of Colonel Heman Dowd, vice-president of the Equitable Trust



Company, was killed in air combat north of Verdun on October 26th. Details of his death were received by his father recently in a letter from Lieutenant Dowd's brother, Lieut. H. L. Dowd, of the Medical Corps, on duty at a place near where his brother met his death. Lieutenant Dowd started on patrol over the lines on October 26th with three other American aviators. He was delayed by engine trouble and his companions got away a few minutes ahead of him. While alone he ran into a squadron of four German machines of the famous Checkerboard Squadron. He immediately gave battle and made a good fight against great odds as other German machines appeared. He was shot down, his machine landing in a tree, and he died in a hospital later from machine-gun wounds. He was buried by the French troops near Dannevoux. Lieutenant Dowd was 23 years of age and was a member of the Class of 1918 at Princeton University.



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to Wright-Martin Corp., New Brunswick, N. J.; wire DAP, Wash.

Note 3—Report to Dir. Dist. Approvals Office, Dayton, Ohio; wire DAP, Wash.

Note 4—Report to Dist. Mangr. Aircraft Prod., N. Y., and wire DAP, Wash.

Note 5—Report to Dist. Supervisor, Los Angeles, Cal.

Note 6—Report to University of California, Los Angeles, Cal., to Com. Officer.

Note 7—Report to Standard Aircraft Corp., Elizabeth, N. J.; wire DAP, Wash.

Note 8—Report to Aviation Repair Depot, Montgomery, Ala., to Commanding Officer.

Note 9—Report to Dist. Accounting Office, Pittsburgh, Pa.; wire DAP.

Note 10—Report to Duesenberg Motors Corp., Elizabeth, N. J.; wire DAP.

Note 11—Report to Yale University, New Haven, Conn., to Commanding Officer.

Note 12—Report to Spruce Production Division, Portland, Oregon.

Note 13—Report to Henry J. Damm Field, Babylon, L. I.

Note 14—Report to Saylesville, R. I., to United States Fabric Inspection Depot.

Note 15—Report to Dist. Mangr. Aircraft Finance, 480 Lexington Ave., N. Y. C.

Note 16—Report to Wilson Body Company, Bay City, Mich., and by wire to DAP.

Note 17—Report to Aviation Repair Depot, Indianapolis, Ind.

Note 18—Report to Spruce Squadron Division, Portland, Oregon.

Special Orders Nos. 254-260 Inclusive

A

Andrews, Mark ..... AGC
Anderson, Fred C ..... FLA
Adams, Orson, Jr ..... AGC
Adams, James E ..... HHN
Alexander, Wriston C ..... FOB
Alles, Oliver W ..... RSD
Alperin, Daniel Maxwell ..... SLA
Arnold, Willard Bailey ..... SLA; RWT
Allen, William Seabury ..... SLA; AMV
Applegate, Timothy Page ..... SLA; CFT
Armstrong, William Alexander ..... SLA; CFT
Ames, Charles H ..... BST
Adams, Morton D ..... FLA

B

Babcock, Edward D ..... LHV; DMA; NOTE 1
Branson, Arthur H ..... SBI
Brown, Edward T ..... PWM
Beach, Edward Wells ..... CPA; DPA
Buckland, William E ..... FRF
Blackwell, Frazer N ..... AGC
Burke, Thomas E ..... FLA
Burrall, Hallett J ..... AGC
Birnn, Roland ..... PWM
Brooks, Earl L ..... AGC
Bergan, Knute W ..... LHV
Berndes, Walter O ..... AGC
Barry, Arthur N ..... AGC
Block, Kenwood M ..... PWM
Biglow, Joseph S., Jr ..... AGC
Bufkin, Charles C ..... FLA
Baldwin, John J ..... LHV
Butler, Frederick W ..... WFO
Bragg, Ellis J ..... CPA
Borzynski, Felix ..... AGC
Brandon, Elvis ..... LHV
Burns, David B ..... EOT
Benson, John D ..... LHV
Buck, Carl E ..... RSD
Bates, Grahame M ..... RSD
Brainerd, Fred L ..... FLA
Barbour, Forrest Atkinson ..... SLA; CRI
Bonham, John A ..... CGC
Butman, Carl Hawes ..... SLA; BMA
Berger, Andrew B ..... Note 15
Bulkley, Leavitt J ..... FLA
Brown, Robert Ingersoll ..... SLA; GLC
Burton, Louis Russell ..... SLA; KST
Bradley, William George ..... SLA; KST
Baruch, Frederick Herman ..... SLA; MAC
Brown, Robert Ely ..... SLA; CFT
Butler, Thomas Patrick ..... SLA; Note 9
Baldwin, Ernest Robert ..... SLA; DAP
Brayton, William Julius ..... SLA; VBW
Bevin, Victor Delamater ..... SLA; SBI
Braunig, Carl Francis ..... SLA; CFT
Berkowitz, Walter J ..... FLA
Boehm, Herbert Leich ..... FLA
Byfield, Ernest Lessing ..... FLA
Bocker, Leon M ..... CGC

Brown, Edwin A.....CGC
Blotter, Richard G.....CGC
Bradley, Timothy W.....CGC
Bourman, Charles A.....CGC
Busk, Stephen L.....CGC
Bartlett, Charles Drummond.....SLA; KST
Brown, Harley Rice.....SLA; DAP
Beck, John Albert.....FLA; DAP
Britt, Dwight Walter.....SLA; SBI
Booth, William Wallace.....SLA; ELA
Breese, Robert Whitlock.....SLA; BFT
Burton, Louis R.....GLC
Biehler, Paul W.....FLA
Brown, Ralph E.....CGC
Black, Ernest Bateman.....MJA
Beecher, John F.....CPA

C

Carr, Harold H.....PWM
Cronk, Corydon Patten.....SLA; DAP
Chandler, Homer B.....HHN
Chapman, Harold C.....WFO
Campbell, Cecil C.....MJA; DMA
Currie, Edward W.....UTA
Carter, Samuel O.....RSD
Calvert, Cecil B.....AGC
Coker, John J.....AGC
Cumming, Clarence W.....LHV
Clemmey, Francis W.....FLA
Clarke, Frederick W., Jr.....FLA
Cunnea, Louis J.....WFO
Clark, Milo N.....RSD
Cannon, Walter D., Jr.....LHV
Cain, Lawrence.....GLC
Cummings, Jack.....SLA; AAD
Czuleger, Charles.....FLA
Courtney, Giles L.....Note 10
Clarke, John Dunn.....SLA; DAP
Cake, Joseph Paul.....CPA
Carrol, William F.....FLA; DAP
Cunningham, John R.....CGC
Callender, Leonard.....CGC
Cohen, Ben.....SLA; DAP
Connolly, Frederick William.....SLA; Note 13
Campbell, Robert Colin.....SLA; Note 16
Crawford, Ronald Mayo.....SLA; DAP
Chamberlin, Martin Townsend.....CPA
Cutts, William Arthur.....CPA
Clark, William Dennison.....CPA
Cochrane, William Roy.....SLA; CFT
Crocker, Harrison Gage.....SLA; CFT
Courser, Harry S.....RSD
Crozier, Raymond L.....MAT
Conrad, Charles M.....CJW
Cumberpatch, James T.....RSD
Craver, Edgar A.....CGC
Cochrane, Robert S.....CGC
Copeland, Jay M.....CGC
Crearkin, Paul C.....CGC
Colburn, Ellsworth R.....RSD
Connell, Samuel Martin.....FLA
Christy, Lester W.....PFO
Cook, Rollin Edward.....FLA
Cameron, Don Russell.....FLA
Castellucci, Edmund Reginald.....FLA
Clark, Anson Luman.....CPA

D

Derham, Peter Francis.....FLA
Davis, Phillip F.....RSD
Davis, Harris Eli.....PWM
Dickinson, Henry.....FLA
Donegan, John V.....SLA; AMV
Damon, George Green.....CPA
Donahue, James J.....FLA
Downey, Russell Hugh.....SLA; DAP
de Lesdernier, Stafford Grainger.....CPA
Drinkle, Willinm Ernest.....FLA
Dyche, Justin K.....LHV
Decker, Kenneth.....DMA
Duffield, Leroy B.....WFO
Duffey, Arthur F.....FLA
Doan, Roland Eugene.....FLA
Decker, Ernest Raymond.....SLA; CFT
Dunstan, Wendell J.....Note 6
Dwyer, Maurice Kevin.....SLA; SBI
Donegan, William T.....UTA
Davis, Philip Frank.....SLA; MAT
Dawes, Irving Desmond.....SLA; Note 15
Detchemendy, John Lewis.....SLA; SBI
Donaldson, Harry Grant.....SLA; CFT
Dun, John King.....SLA; BFT
Dykema, Raymond K.....CPA
Dansard, Benjamin.....CPA
Dobie, Richard L.....CGC
Dundore, Charles H.....MAT
Dorsett, Walker C.....CGC
Davies, John Pugh.....FLA
Dunn, William J., Jr.....CPA

E

Elliott, Clifford W.....MAC
Ewing, John K. M.....FLA
Emigh, Perry.....CPA
Evans, Jay C.....PFO
Evans, Floyd W.....WFO
Eberle, Sidney S.....RSD
Evans, Edwin B.....WFO
Eagle, Aubrey Irl.....CPA
Eshleman, Jason Hanks.....SLA; SBI
Eldredge, Eli Sayre.....SLA; Note 17
Edwards, Robert N.....Note 11
English, Alexander K.....SLA;HHN
Evans, Jay Clarence.....SLA; MAT
Eustis, George Fleming.....SLA; CFT
Earle, Edward Mead.....FLA
Erdman, Milton Kinard.....PFO
Elwell, Russell Tuttle.....FLA



Lieut. Sumner Sewall, who gave a good account of himself "over there"

F

Fournier, Paul.....SLA; SMM
Frothingham, Newton S.....AGC
Flannery, James.....PWM
Fox, Robert R.....RSD
Fitzgerald, William J.....PWM
Farley, Henry C.....LHV
Frank, Norman D.....LHV
Foster, Robert H.....AGC
Fehlman, Leo G.....PWM
Forrest, Robert P.....PWM
Freck, Joseph Otto.....FLA
Fultz, David Lewis.....FLA
Foster, Traverse S.....AGC
Franklin, Mason.....FLA
Ferris, George M.....CPA
Frieman, Alfred Edward.....SLA; KST
Flaucher, Asahel John.....SLA; CFT
Frisby, Harold George.....SLA; SBI
Fuller, Alvar Wendell.....SLA; SBI
Fisher, Martin Tucker.....FLA
Fitzgerald, Joseph John.....FLA
Fletcher, Torby Glenn.....SLA; SBI
Finnell, Samuel C.....CJW
Ferguson, Philip M.....CGC
Field, Lewis H.....KST
Fuller, Enoch D.....PFO
Fernstein, Edward L.....CPA

G

Griffith, Edward C.....CGC
Geyer, Kenneth E.....SLA; TMA
Guilford, Edward H.....HHN
Gerdts, Robert Bertram.....SLA; SAG
Gilleaudeau, Raymond.....SLA; DAP
Gallaher, Charles D.....RSD
Gardner, Cyrus Basil.....SLA; KST
Golding, George W.....FLA
Gilman, Benjamin H.....FLA
Gehan, Walter Roy.....CPA
Goodrich, Augustus.....RSD
Green, Wilber A.....GLC
Gore, Frank D.....CGC
Gowan, George.....KST
Goodrich, Ernest.....KST
Greene, Lew A.....PWM
Grethen, John P.....PWM

H

Huking, Harry W.....RSD
Hamiel, Dorman E.....EOT
Houser, Paul Willard.....FLA
Holliage, Crawford H.....CAF
Hurja, Emile Edward.....FLA
Hughes, John Edward.....SLA; DAP
Hummel, Frank Kerr.....SLA; EOT
Henkel, Ralph Andrew.....SLA; PMT
Hall, John Tyler.....SLA; CRI
Hruda, Adolph Howard.....SLA; EOT
Horkan, George Augustus.....CPA
Hoddick, Alvin C.....AGC
Hyman, Walter R.....AGC
Hayward, Lawrence A.....FLA
Hosier, John H.....EOT
Hunter, William E.....RSD
Hutchinson, William T.....CAF
Hastings, Charles E., Jr.....LHV
Harris, Henry H.....AGC
Hollander, Cyril M.....AGC
Hirsh, Charles L.....LHV
Heg, Hans C.....PFO
Hayes, Martin J.....RSD
Henry, Earle Gray.....SLA; PMT
Horn, Glenn D.....AGC
Hill, Lawson T.....CAF
Holman, Frank A.....BST
Hines, Charles Gilpin.....FLA
Hume, Robert Scott.....FLA; DAP
Hanson, Oliver Benjamin.....CPA
Hawes, Curtis.....SLA; Note 3
Hall, John T.....CGC
Hamlen, Robert Cushing.....FLA
Herington, George B.....MJA
Higbie, Carlton Milo.....FLA
Haywood, George Price, Jr.....SLA; EFT

(*Continued on page 632*)



A series of Curtiss motors being tested at one of the American aviation fields

FOREIGN NEWS

Finnish Air Traffic Company

Stockholm, Sept. 29.—According to advices from Helsingfors, an air traffic company has been formed there with a share capital of two million Finnish marks.

Italian Trade Notes

The efforts of several prominent citizens of that place to enlist Naples in the aeroplane business was officially crowned with success at the end of last month when the High Commissioner for Aviation visited the city and all its various aerial businesses.

He has subsequently promised to nurse the trade there to his utmost, reclaim the stolen hands, and furnish the raw stuff for manufacturing.

Naples, as well as having three big concerns well known to those who are interested in things aviatory, has a motor works and several small firms. A flying and testing "place" is situated near the city, and a lot is being done and expected.

As well as a number of official ceremonies, the Hon. Chiesa has been visiting and presiding over several important gatherings during the last few weeks. At —— he was in the air on a new machine reputed to be of great use. Even for a modern Minister he has an inestimable gift of energy. So perhaps we shall not wait long for the new Ansaldo wonder attributed to Ing. Brezzi, of that firm.

In Sofia

The following account from Mr. G. Ward Price of his visit to Sofia on October 11th appeared in various newspapers on October 21st:

I arrived here this morning by the first British aeroplane to land here since the capitulation, the start having been delayed by bad weather. A throng of brown-clad Bulgar mechanics with a dozen of their flying officers watched the landing of the three British aeroplanes with curiosity, while two or three Germans, who must be the last of those who used to strut about this ground, the lords of all they surveyed, walked disdainfully away.

In a Bulgarian Army motor-car bearing the Royal arms blazoned a foot square I drove into the capital with a colonel of the R.A.F.

The London Enemy Aircraft Exhibition

It is announced that early next month the Exhibition of Enemy Aircraft at the Agricultural Hall, Islington, will be thrown open to the public.

The machines shown have been re-erected, so as to show not only their external features, but the details of their construction.

Amongst other machines on view may be mentioned the Gotha, Friedrichshafen, and A.E.G. bombing machines, the Halberstadt, L.V.G., D.F.W., Rumpler and Hannoveraner two-seater, the A.E.G. armored trench fighter two-seater and the Fokker (biplane and triplane), Pfalz and Albatros scouts.

There are also a number of engines and accessories, including wireless gear, machine-guns, bomb-sights, electrically-heated clothing, and innumerable aviation instruments.

2,000 Turks Captured by Aeroplanes

Aeroplanes south of Amman secured the surrender of 2,000 Turks, says Mr. W. T. Massey writing from Damascus. A pilot, catching sight of a long, drawn-out column, dropped a message, saying that if they did not surrender they would be bombed. He returned to his aerodrome with no answer. Six machines then went up with bombs. While they were circling over the troops a ground signal was laid out recalling them. The Turks raised the white flag, and came in to be taken prisoners.

Feeding Refugees by Aeroplane

It now appears that when during the Turkish advance in Northwest Persia some thousands of refugees were isolated in the Urumia region, the British succeeded in establishing communication with them by aeroplane and endeavored, though unsuccessfully, to send a relief convoy.

Damage by Enemy Air Raids in England

The British Committee on War Damage, which is not an official body, is about to present to the Government returns of casualties which have resulted from the enemy raids by aircraft and bombardment. The returns are from areas having a population of more than one and one-quarter million. Town clerks and clerks of urban and rural areas which have been attacked, and from which returns have not been received, are asked to send the returns to the honorary secretary of the committee, and it is expected shortly that there will be an official announcement of the damage done by German air raids on England.

Lord Northcliffe's Opinion

Lord Northcliffe, at a luncheon given to the American Editors at Printing House Square on October 10th, said:—

"We have to look—we who are engaged in the business of spreading public intelligence—at the effect on our own industry of some of these developments. Take flight, for example. Will flight concentrate newspaper production into one or two hands in great centers whence the newspapers may be disseminated by flying machines? Personally, I do not think it will. I know that there are provincial communities apprehensive of the destruction of their own local public opinion—one of the most valuable inspirations toward national judgment."

Mr. Handley Page's Views

Mr. Handley Page, in an article contributed to "Overseas", speaks of the future in store for aerial transport.

"The great improvements recently made in the big machines," he states, "have rendered commercial transport a practical possibility. It will be possible to carry mails and passengers at a rate which compares very favorably with railway and steamship charges. As to danger, it will be infinitesimal when war conditions are removed, and certainly no greater than when traveling either by railway, motor, or steamship." Mr. Page points out that it would be possible to deliver a letter to America by aeroplane as quickly as a deferred telegram, and that documents could also be sent for signature. The aeroplane will shorten the journey to America to one day.

[One wishes that aeronautical enthusiasts would not underrate the dangers of flying. Who would hunt, if hunting were a safe amusement?—Ed.]

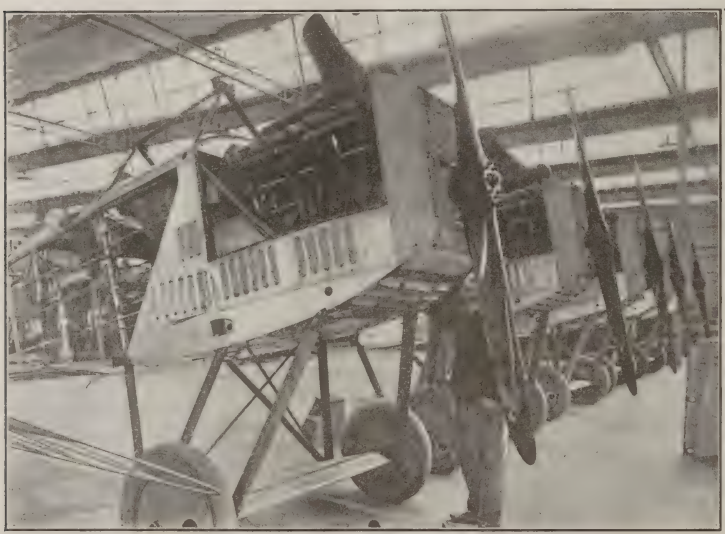
A. S. C. Aeroplanes

An incident reported in connection with the offensive in Flanders is worth chronicling as one of those examples that it may be desirable to quote later on. Certain Belgian divisions reached a point the roads behind which had become impassable, and there ran short of food. A thousand army rations were sent up and dumped by aeroplanes after having been divided up into parcels and packed in sacks of earth to break the fall. The waiting divisions prepared dumping grounds suitably marked, and here the provisions were dumped and were received without damage. In the course of a few hours thirteen tons of food were delivered in this way.

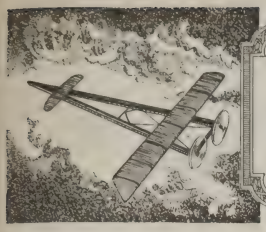
There is nothing very remarkable in all this, but it is at least an example of commonsense promptly indicating a somewhat unusual application of known powers. During the attempt to relieve Kut, food was, of course, dropped by aeroplane into the beleagured town. These afford, perhaps, the first examples of the use of aeroplanes as part of the equipment of an Army Service Corps.

The Army Service Corps may be described as the business and shopping department of the Army. It is essentially a commercial undertaking, though it is complicated by military conditions. The time may well come when aeroplanes will form part of the regular equipment of this gigantic business, and these first successful experiments may fairly be classified as temporary commercial aeroplane services.

There is a more obvious connection between ordinary commercial work and the carriage of food than between such work and the carriage of bombs.

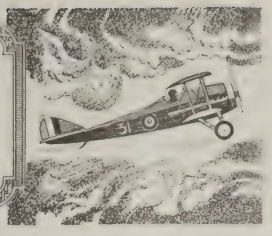


A line of French Breguet Bombing Biplanes in the Breguet factory in France. French Official Photo



ELEMENTARY AERONAUTICS and MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

CONTROL surfaces must now be considered. These differ according to the size and shape. As to size, in proportion, the same as for a wing section, the larger the surface, the greater the effect. The shape of the control will change the effect, as the efficiency varies according to the aspect ratio. For instance a flat plate with an aspect ratio of 1 or in other words as wide as it is long (square plate) would have a K_y of .00294 when placed at an angle of 30 degrees, while a plate with an aspect ratio of 9 (or nine times as long as it is wide) would have a K_y of .00210 for the same angle.

Of course, there is no comparison as to the proper shape of these plates, because when a designer dopes out a control surface, he must not only worry about the effectiveness of the section, but he must keep to a certain shape or size for constructional reasons, so a table of plates of different aspect ratios at angles from 5 to 60 degrees showing the K_y, K_x, and lift to drift at the different angles will follow.

Angle	K_y	K_x	L/D
	ASPECT RATIO = 1.		
5	.00045	.00007	6.3
10	.00097	.00019	5.1
20	.00208	.00074	2.8
30	.00294	.00173	1.7
45	.00207	.00210	.99
60	.00139	.00245	.57
	ASPECT RATIO = 2.		
6	.00074	.00010	7.5
10	.00123	.00021	5.9
20	.00247	.00091	2.7
30	.00178	.00111	1.7
40	.00169	.00146	1.2
60	.00126	.00225	.56
	ASPECT RATIO = 3.		
6	.00090	.00011	7.6
10	.00140	.00028	5.1
20	.00210	.00077	2.7
30	.00193	.00111	1.7
60	.00140	.00236	.59
	ASPECT RATIO = 6.		
6	.00109	.00018	6.3
10	.00173	.00034	5.2
20	.00199	.00074	2.7
30	.00204	.00120	1.7
60	.00141	.00244	.58
	ASPECT RATIO = 1½.		
10	.00109	.00020	5.6
20	.00215	.00070	2.8
30	.00198	.00095	1.7
40	.00183	.00152	1.2
60	.00127	.00226	.57
	ASPECT RATIO = ⅓.		
6	.00033	.00007	4.4
10	.00059	.00014	4.2
20	.00138	.00053	2.6
30	.00219	.00132	1.7
45	.00246	.00250	.98
60	.00155	.00264	.58
	ASPECT RATIO = ⅙.		
6	.00020	.00005	4.0
10	.00040	.00010	4.0
20	.00114	.00045	2.6
30	.00176	.00102	1.7
45	.00217	.00217	.99
60	.00163	.00282	.58

The method for using the above table is as follows: Suppose we are considering a rudder measuring 4 feet by 2 feet, and it was hinged along the longest side, then the aspect ratio would be 2. Now we look in the table under Aspect Ratio equals 2. We will say our rudder will be free to move so that when it reaches its farthest point it makes an angle of 30 degrees. Now the K_y at this angle is .00178 and to find the effect of this rudder at 60 M.P.H. we simply multiply .00178 by the total surface, 8 sq. ft. and this product by the velocity squared or $.00178 \times 8 \times 3600 = 51.26$ lbs.

Then this rudder will have a force of 51.26 lbs. working on it when traveling at 60 M.P.H. Now this is the force acting on the rudder but the steering effort produced is 51.26 multiplied by the distance in feet from the center of pressure of the main planes to the center of pressure of the rudder. Supposing this distance to be 12 feet, the force produced would be $12 \times 51.26 = 615.12$ lbs. Then the rudder would have a tendency to steer the machine equal to 615 lbs.

The tail plane, flaps and ailerons are also figured in this way. The effect of the ailerons being figured as acting a certain distance from the center of the machine out to the center of the ailerons instead of to the center of pressure.

The center of pressure at all angles for different aspect ratios can be found in the table below. This must be known, not only to correctly figure the force generated, but also to assist the designer in strengthening these facts properly, and which are generally strongest about this point. Again it is then possible to determine the strain on the control wires and to know just what size they must be to stand the strain.

For instance, the table says a plate aspect ratio = 3, at 17 degrees 13′ has the center of pressure located .4 of the chord from the leading edge, then a rudder 18″ wide would locate the center of pressure $18 \times .4 = 7.2$ inches from the leading edge. Supposing the rudder to have a force of 51 lbs., working on it at a distance of 7.2 inches from the leading edge when 30 degrees to the wind, and the rudder crank has a fastening for the wires 6″ from the base. Now to find the strain on the control wires we simply multiply $51 \times 7.2 = 367.2$ and divide this by 6 which gives us 61.2 lbs. pull on the controls. The factor of safety is generally regarded as 7, then by multiplying 61.2 lbs. by 7, we have 428.4 lbs. which is the strain the wire or cable is supposed to stand to be safe.

Distance of Center of Pressure from Leading Edge, Measured in Terms of Chord for Flat Plates of Various Aspect Ratios.

Aspect Ratio = 1		Aspect Ratio = 3		Aspect Ratio = 6	
Dist.	Angle	Dist.	Angle	Dist.	Angle
.12	.8	.233	5.0	.267	3.0
.16	1.0	.267	7.8	.300	8.0
.18	2.0	.300	10.0	.333	10.0
.20	2.8	.333	12.0	.367	12.2
.22	3.8	.367	13.8	.400	26.0
.24	6.5	.400	17.5	.433	54.0
.28	13.0	.433	52.8	.467	73.7
.30	15.3	.467	73.7	.500	90.0
.32	18.0	.500	90.0		
.34	21.0				
.36	25.0	Aspect Ratio = ⅓		Aspect Ratio = ⅙	
.38	28.0	Dist.	Angle	Dist.	Angle
.40	33.5	.167	3.0	.289	2.5
.42	39.0	.267	5.0	.311	7.5
.44	55.2	.283	6.8	.323	10.5
.46	73.5	.300	10.8	.334	19.0
.48	84.0	.317	17.5	.345	49.0
		.333	30.5	.356	52.0
		.350	45.0	.367	53.5
		.367	47.8	.378	56.2
		.383	50.2	.389	58.0
		.400	52.5	.400	59.5
		.417	54.3	.411	60.0
		.433	56.5	.422	63.0
		.450	65.0	.433	64.0
		.467	77.8	.444	68.5
		.483	85.8	.455	72.5
		.500	90.0	.466	80.0
				.477	84.0
				.488	87.5
				.500	90.0



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Flying over St. James's Park, a flight commander saw the band of the Guards in which he was formerly a subaltern. By dropping bolts and nuts, while nose-diving and ascending, he was able to play "God Save the King" on the kettle-drum!

* * *

They were flying over a bank of clouds, and the observer had not anything to observe at the moment. So he wrote on his pad and handed this thought to his pilot: "I wonder when this d——d old war is going to end." And the pilot, being a bit of a dog replied, "Can't tell when, but I do know where—in Berlin."

* * *

I have studied hard in the engine class,
And with math I have racked my brain,
With a penguin old I have cut the grass,
And I've ridden a practice plane.
I have taken a routine flight or two,
And may say that I'm not so bad,
But the glorious goal that I have in view
Is to pilot a combat spad.

* * *

This story is funny to most people. To one fellow in particular it is pathetic. He is a young S. C. up north who, when he saw a machine make a bad landing left wing down, swore at the occupant and told him to go upstairs again and come down properly. The pilot did as he was told, made a perfect landing, and introduced himself as General X, who flies round occasionally to aerodromes on a visit of inspection in his own 'bus.

* * *

Extract from a feuilleton by a lady novelist: "Seizing his joy-stick, Captain Fitz-Herbert waved it defiantly at the Hun in the Albatross, then, looping the loop with his Handley Page, he zoomed over his opponent and drove him into an air pocket from which there was no escape."

* * *

PILOT—No, we have no answer to correspondents column, but we don't mind obliging for once in the circumstances. When the French colonel decorates you, it is not advisable to kiss him back. He has more experience in this sort of thing than you, and you might get the worst of it. Just salute, and try to look modest, Pilot. * * *

It was his first day in a sausage, and he was not any too sure of his chances with the parachute if it came to a jump.

"Wonder where a fellow would land if he elected to stay in the car," he mused.

"Any idea, Bill?"

And Bill, with a sigh at the thought of a hundred and one similar questions already answered, spoke thusly: "Ain't yer never bin to Sunday school, then?"

* * *

"Have you heard that Muriel is anxious to be the first woman in America to become an aerial post-girl?"

Her Friend: "I quite believe it. She always was a flighty minx."

* * *

There was a young man from (deleted)
Who up in an aeroplane was seated,
His bombs he threw down
On old Mannheim town,
And its output was sadly depleted.

* * *

There was an old man of Mannheim,
Who said, "What a deuce of a time
We've been having round here,
And it fills me with fear,
For the bombs are as bad as my rhyme."

* * *

"And did the German colonel look terrified when you swooped down on him?"

"Look terrified! Why, if he'd had a single feather in his hand, he'd have flown." * * *

Georgie Washington the Second
To his airman father beckoned,
Pointed to the joy-stick broken
Rudder smashed, and by your token
Whispered "No one here to watch it,
So I tried my little hatchet."

* * *

A press photographer was induced to make his first flight in an aeroplane and took a photograph or two in the air. Asked when he came down if he looked upon the trip as a success, the naughty lad replied, "The answer is in the negative."

Great Stuff for the Kiddies

The Government has announced, sayeth the press, that all castor oil must be conserved for the use of army aeroplanes. Why couldn't it a-happened when we were young?

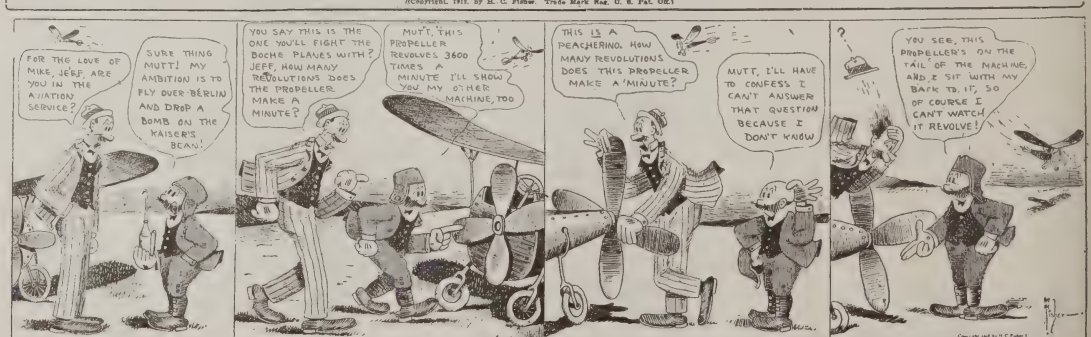
The Truth at Last

Latest news in the moving-picture world is to the effect that camera squadrons are busy taking war pictures on the Flanders and Picardy fronts in the outskirts of Los Angeles.—*Rochester Post-Express.*

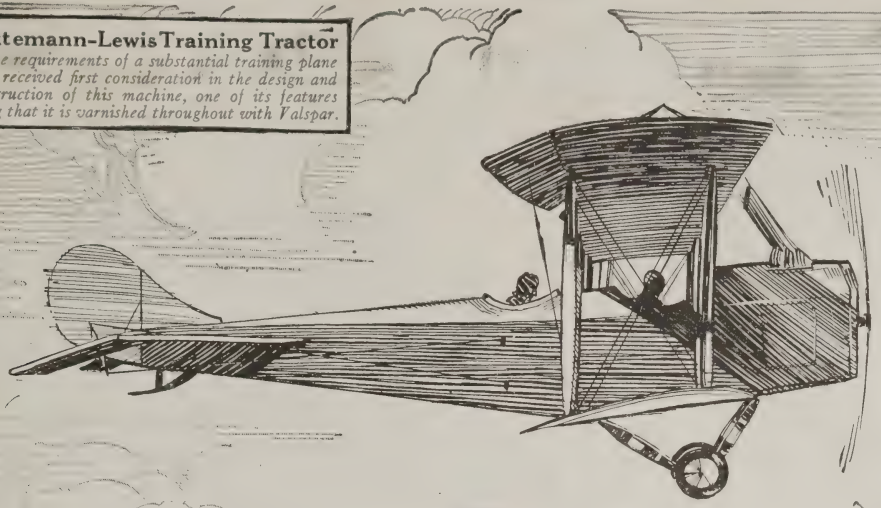
And sometimes conscientious correspondents get some thrilling battle-scenes back in the peaceful S. O. S. of France. Barnum was right.

MUTT AND JEFF—Jeff Not Only Has Good Eyesight but He's a Fast Counter . By BUD FISHER

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Treasurer.

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4. The complete official reports of the Army and Navy Air Services and published weekly together with articles by authorities on Military and Naval aeronautics, thereby insuring to the readers and advertisers a more complete representation of Army and Navy aeronautics than is afforded by any other publication in the United States.
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(*Continued from page 618*)

'On April 6 the location of the Aldis sight was removed and changed to the left hand side of the right gun; this necessitating a change of all the parts which had been made up for the old sight and which were already released to production.

'Our first instructions regarding the bomb dropping gear were to equip the DeHaviland machine with two rails similar to the English machine. Information had continually been requested on bombing apparatus but no drawings could be furnished. On January 18 we received our first information from the Ordnance Department on Bomb Gear. This was merely an unlocking device and we gave space in our drafting room for several Ordnance Department men to complete their drawings for application to the machine, they being turned over to me on February 1. On going over these drawings, it was found that they were not complete and about a week or more later more drawings were received which assisted in production of the first model gear. The delivery of this apparatus has been sadly deficient, it being necessary to ship a large number of planes without it, as some of this is built in the floor of the fuselage and must be put in during the various assembly operations. A further change on the operating mechanism of the bombing gear is coming through which will be incorporated possibly on the five hundredth machine.

"Information was requested during October, 1917, on the camera and camera mounts. We were advised at that time that the camera mount which the English DeHaviland was equipped with would also be used on the American made machine. On January 19 we received from the Signal Corps a camera which would not fit the English mount. As the English mount was already built into a number of our fuselages, it was impossible for us to change this part on our early shipments. A new design of mount was made by the Signal Corps and installed in the sample machine in our shop. On February 25 this was rejected by the Signal Corps and a new design started and drawings furnished on some May 27.

"The focusing lense retainers were designed at the direction of the Signal Corps for a 4" x 5" lense. The location of these were shifted several times and the size of the lense was changed by the Signal Corps to 5" x 6" and the drawings for retainers were furnished on April 2.

"Up to February 14, we had no information on Oxygen apparatus except that it was to be part of the equipment. As late as April 6, we had no samples of the apparatus or drawings showing installation of same. Final approval of the oxygen installed was received June 10.

"Drawings for the radio equipment and first information regarding same came to us February 1. These were recalled for changes and new set issued which were illegible. These were returned and on February 8 a new set of drawings were received for the bonding together of all metal parts on the machine; these drawings could not be followed on a production basis. The Dayton Wright Company then prepared a sample machine and drawings were made from this and accepted by the Signal Corps March 25. Radio instruments were received February 20 and installation according to Signal Corps drawings were stopped February 25 and new installation directed. The Dayton Wright Company prepared drawings for this installation and wiring according to the sample which was prepared.

"On March 28 the generator mount on the side of the fuselage was abandoned. A new installation was furnished by the Signal Corps but was found that it interfered with the landing gear strut. On April 10 the new design from the Signal Corps showing the correct location of the generator was received.

"Considerable trouble was encountered with the installation of the Holt flare lamps as there was a misunderstanding between the Dayton Wright Company and Signal Corps as to who was to furnish them. The first Holt flare lights were received on February 25.

"The first navigation light samples were received on March 20 and wiring instructions for same were delivered a few days later.

"The electric generator for lighting and heating was received on March 15. The Signal Corps drawings showed the location on the side of the fuselage. This was unsatisfactory as the generator propeller interfered with the rear flying wires of the wing structure. The Signal Corps prepared new drawings for the re-locating of this generator but these were unsatisfactory owing to the interference with the landing gear strut. On April 9 a new set of drawings were received showing the correct location of this generator.

"Radiator and water lines were approved by the Aeroplane Engineering Department, Signal Corps on November 21 after flying test. At this time, of course, there was practically no information at hand regarding the equipment of the DeHaviland plane which necessarily added considerable weight, so that the radiators which we had ordered for production were considered unsatisfactory by the Production Engineering Division. The radiators furnished by the Signal Corps were 1" deeper in the core which necessitated re-design of the shutter assembly. At a late date it was decided to make a further change on radiator design, making it 4" longer. This affected the under cowling of the motor, the forward cowling, water lines and numerous other details entailing a large amount of scrappage and re-operation of parts.

"The Signal Corps advised that they would furnish us short radiators for our first 150 ships and long radiators for the next 100, after which we were to supply our own. A shortage of 50 radiators was encountered in the first agreement which necessitated us going to the long radiator job 50 machines earlier, which caused a serious delay and complication in the shop.

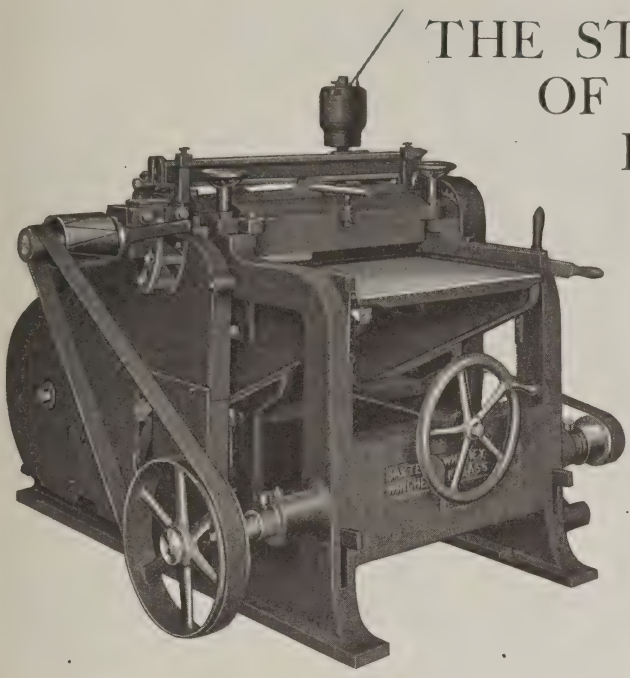
"Drawings were received from the Aeroplane Engineering Division, Signal Corps, November 21 on gas and air lines. From these drawings all parts were ordered into production. All gas and air line connections were changed by the Signal Corps and final information received on this change April 5. This necessitated scrappage of all parts on hand and a delay was occasioned in securing necessary raw material."

The delays at the plant of the Dayton Wright Aeroplane Company, due to these changes in design, also caused delay in the other plants which were to produce DeHaviland 4s, for both the Fisher Body Corporation and the Standard Aircraft Corporation were awaiting a definite design and a determination of equipment and proper drawings before proceeding to production. The Dayton Wright Aeroplane Company was in advance simply because it had the advantage of the posession of the model and it was working out the necessary drawings.

It will be observed that these changes were required in the course of production. That is, instead of proceding with production on the basis of a given equipment where changes in equipment would cause serious delay, and introducing different equipment in the planes subsequently produced, virtually the entire production was held up to accommodate the new demands. As Lt.-Col. Horner testifies, "We would go on changing this way and that way and let that change go through production, when it could be done without interfering with production, and if we had done it we would have had a thousand more planes on the French front today than we now have without any question."

It is unnecessary to review the changes in the ill-fated Bristol. They were numerous and related to the structure of the plane itself. Production was of course impossible while these changes were in progress. The real effect of the changes, however, in view of the result, was not to retard the production of a useful plane, but to cause an unnecessary expenditure.

(*To be continued*)



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(*Continued from page 625*)

Hill, Thomas R.....CUI; LHV; PWM; Note 1
Hilldale, Robert Coffin.....FLA; DAP
Heg, Hans Christian.....SLA; MAT
Harris, William Hall, Jr.....FLA; DAP
Hurd, George N.....Note 11
Hunter, William Earnest.....SLA; MAT
Howard, Albert, Jr.....CAF
Hunt, Jesse Parrent.....SLA; BFT
Hildreth, Edward E.....UTA
Hughes, Ambrose P.....LDT
Hilliard, Walter B.....CGC
Hughes, Edward Thomas.....SLA; DAP
Harris, David William.....SLA; RWT
Humason, Allan B.....CGC
Harwood, Barney M.....OSU
Hermes, Bryan Anthony.....SLA; TMA
Hopkins, Joseph Albert.....SLA; RWT
Howard, Albert, Jr.....SLA; TMA
Horning, Clare A.....GLC
Houghton, Robert A.....MAT
Houck, Jack R.....MAT
Hayner, Ellsworth G.....PFO

J

Johnston, Douglas Turner.....CPA
Johnson, Louis Bragg.....SLA; KST
Jones, John Ed.....SLA; CFT
Jones, Wilbur B.....FLA
Jones, Lucius L.....CAF
Jacquemart, Eugene A.....LHV
Johnson, Howard Henry.....SLA
Janey, Samuel MacPherson.....SLA; LHV
Johnson, Warren Forman.....SLA; CGC
Jacquith, Allen Fourestier.....SLA; DAP
Jones, Byron Q.....LTC
Jones, Montgomery O.....RSD
Joy, William P.....TFT

K

Klages, Arthur Conrad.....SLA; DAP
Kenyon, William S.....RSD
Kennedy, Carl F.....WFO
King, Benjamin.....CPA
King, Joseph G. W.....RSD
Kinney, Francis W.....LDT
Kendall, Earl Horatio.....FLA
King, Royal Wheeler.....CPA
Kessinger, Earl Rayburn.....SLA; SAG
Kendall, John D.....FLA
Kohn, Edwin Rudolph.....SLA; CFT
Kregel, Mark George.....SLA; RWT
Krewet, Louis Matthew.....CPA
Keller, Emil Harold.....SLA; AAD
Koht, Edmund Keith.....SLA; PMT
Kendall, Lyle Augustus.....SLA; PMT
Koch, Richard.....CGC
Kelso, John Claude.....SLA; KST
Kennedy, Roy Oran.....SLA; BST
Kyle, William F.....PFO

L

Lewis, Richard Charles.....SLA; SAG
Lyon, George F.....DAP
Leonard, Herbert L.....AGC
Lobdell, Warren L.....PWM
Lindley, Stacey B.....FLA
Laughlin, Richard Jenkinson.....SLA; SAG
Lewis, Robert.....LHV
Lavigne, Francis A.....GLC
Loy, Harry Clifford.....SLA; AAD
Lacklen, Edward.....AGC
Landers, Sigmund F.....GLC
Lindblad, William N.....PFO
Lee, Everett Jesse.....CPA
Lowe, Herman J.....WFO
Liles, Fred C.....PWM
Landers, Sigmund Franklin.....SLA; MAT
Lawall, George R.....GLC
Lindblad, William Nathan.....SLA; MAT
Leonard, J. Cecil.....CPA
Loewe, Otto.....SLA; SBI
Lomax, Thornton Garland, Jr.....FLA
Landrum, Alexander M.....RSD
Lavigne, Francis Anthony.....SLA; MAT
Loughhead, Joseph L.....RSD
Lincoln, Elton Page.....SLA; PMT
Lake, Harley W.....MJA
Leary, Matthew M.....CFT



Lee, Lonnie Heyward.....CPA
Lee, Charles C.....CGC
Lawson, Lawrence A.....FLA
Luchac, Carl O.....GLC

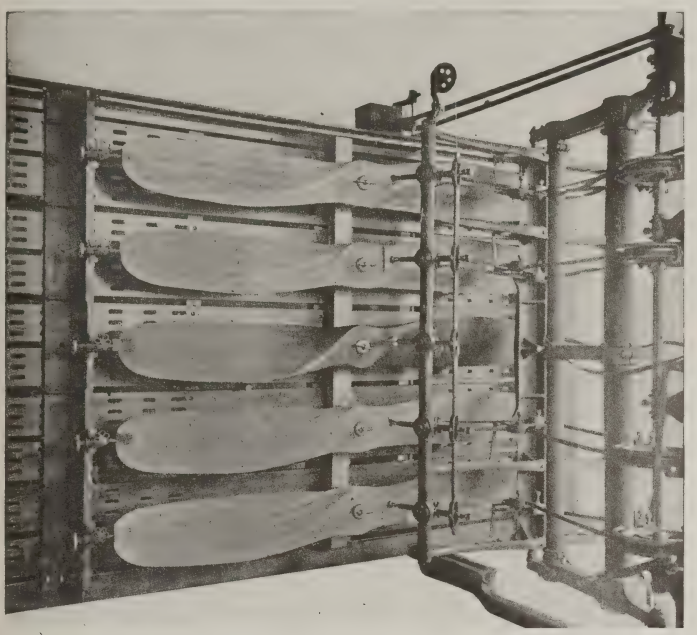
M

Morse, Herbert K.....GLC
Martin, Oliver H.....AGC
Mygatt, Leonard J., FOB; ABC; CJW; WDM; Note 1
Meany, John Wynne.....FLA
Maddock, Aubrey Lionel.....SLA; DAP
Mayer, Dudley B.....FLA; LDT
Mench, Sterling R.....WFO
Murray, Rudolph C.....RSD
Miller, Dewey H.....AGC
Moffett, George G.....LHV
Moulton, Carl J.....RSD
Maitland, Lester J.....WFO
Mabee, David W.....LHV
Moran, William King.....PWM
Murtha, John T.....FLA
Munn, John C., Jr.....AGC
Merkel, Louis J.....PWM
Mulhall, Joseph C.....FLA
Mack, Walter R.....FLA
Markham, John A.....AGC
Mainwaring, Charles Randolph.....SLA; CFT
Mills, Samuel Perham.....SLA; TMA
Meigs, Martin S.....CGC
Martin, Hugh S.....CPA
Melchior, Claude Buckley.....SLA; Note 8
Miles, Bruce Jerome.....CPA; DAP
Mornhinweg, William Frederick, Jr...SLA; GLC
Martin, Robert.....FLA
Moore, John I.....CPA
Moore, Percy S.....TFT
Mayer, Charles, Jr.....MJA
Mineham, Ralph J.....CGC
Munsell, William P.....CGC
Mills, Harold P.....CGC
Miller, Forrest J.....CGC
Miller, Francis H.....CGC
Mulvihill, Bernard H.....CRI

Mc

McCray, Charles Holliday.....SLA; CFT
McCulloch, Joseph H.....FLA
McKenzie, Robert R.....FLA
McDaneld, Edward Fletcher.....FLA
McEvers, Ernest.....PWM
McPheeters, Chester J.....AGC
MacInnis, Thomas C.....RSD
McLaren, William B.....SLA; MAT
MacDonough, Louis Raymond.....FLA; Note 4
McGrath, Edward Joseph.....CPA
Macdonald, Malcolm.....FLA

The Curtis Dreadnaught Propeller Cutting Machine, Model 55



THIS machine cuts four blades at a time, and cuts closer and more accurate than any other machine in the market.

It finishes the hub the same as all other parts of the blade.

It cuts with the grain of the wood.

It does not require a metal model; just a regular stock blade is sufficient.

It does not bump over the pattern.

It is manually operated, which gives it the advantage of the human touch required on accurate work.

The hand work required after this machine is from 3½ to 4½ hours on each blade.

It leaves just enough wood for cleaning up.

Curtis Machine Corp.
Jamestown, N. Y.

N

Newhall, Albert W....AGC
Nail, James Sanford....SLA; CFT
Negley, Richard V. W....MJA
Nash, Halsey R....GLC
Nason, George H....PWM
Names, Arthur A....PFO
Norton, Henry K....FLA
Norton, Charles B....AGC
Newhall, Roberts de Saussure....CPA
Nelson, Arthur Everett....SLA; Note 7
Neidigh, Leo....FLA
Nussbaum, Hamilton Smith....PFO

O

O'Brien, Frank E....TFT
O'Brien, Edwin D....RSD
O'Sullivan, Daniel J....AAD
O'Hearn, Francis M....LHV
Owen, Richard L....PWM
Oakleaf, Howard B....MJA
Olson, John A....LHV

P

Pierce, Edward Taber, Jr....SLA; Note 14
Pergande, Arthur George....SLA; GLC
Polhemus, Josiah A., Jr. ....DMA
Pursell, Bryson Irwin....Note 12
Parker, Reed L....FLA
Persons, Stabley Mitchell....SLA; KST
Poik, Paul G....CGC
Pennybacker, Percy V....PFO
Palmieri, Vivian Joseph....SLA; Note 2
Pierrepont, Rutherford S....FOB
Pond, Roger V....CGC
Peck, Lee H....WFO
Proctor, Carlton C....RSD
Parsons, Stanley M....RSD
Palmer, Claude N....FLA

R

Ray, Martin H....Note 5
Russell, Maurice Spencer....SLA; BFT
Roth, William....FLA; VBW
Russell, Hamilton Harris....BST
Robards, Charles M....CGC
Raube, Reinhold Henry....SLA; SBI
Rader, Ira A....EOT
Rice, William T....FLA
Ross, Wilbert Allen....SLA; KST
Roberts, George L....WFO
Rosehill, Harry R....FLA
Reap, Michael Bartholomew....FLA
Robbins, Milo Rees....FLA
Reynolds, John D....LHV
Richardson, Clesson....CAF
Robbins, Franklin....CPA
Rogers, George Henry....SLA; CFT
Rogan, James S....CGC
Richardson, Frederick S....CGC

S

Stockett, Lewis Oatman....SLA; Note 13
Schanche, Herman Garman....SLA; Note 4
Stevens, Clarence Ellsworth....SLA; KST
Sparver, Edward Chester....FLA; DAP
Stanton, Edgar Adolphus....SLA; Note 17
Steinert, Russell Lee....SLA; DAP
Smith, Walter James....SLA; DAP
Sawdon, Clifford J....DIS
Smith, Samuel Seymour....FLA; DAP
Stevens, Clifford C....KST
Smilie, Joe Housson....SLA; CFT
Smith, Charles Harper....CPA
Stoeckle, Charles Harold....SLA; KST
Stutzman, Theodore B....WFO
Sergent, Paul Oliver....FLA
Sundell, Royal D....RSD
Smith, Clement G....FLA
Stedman, Livingston B....PWM
Stoll, Hugo L....FLA
Smith, Julius Carroll....CPA
Smythe, Cyrus F....CPA
Stratton, Thomas A....AGC
Smith, Marshall C....KST
Solosth, Karl Leonard....CPA
Stallings, Obed J....FLA
Sandison, Wilbur Samuel....CPA
Schiff, Loren D....FLA
Smith, Lawrence Otis....FLA
Snyder, Franklin F....RSD
Sower, George W....CAF
Steel, George W....PFO
Sundahl, Albert H....FLA
Stinson, David R....WFO
Stribling, Thomas Martin....FLA
Schintz, Walter S....FLA
Scully, William Augustine....MJA
Snow, Lancy....RSD
Swift, Chester H....AGC
Seeley, Charles F....DAF
Strauss, Sidney H....LHV
Saunders, Edward R....PWM
Snyder, Delmar L....MAT

T

Tappan, Alan P....SLA; CGC
Trovillion, Robert A....DMA
Tarkington, Shelly Grant, Jr....SLA; KST
Traub, Sydney Robert....SLA; DAP
Thomas, William H....RSD
Telfair, John C....KST
Truello, Adam....FLA
Turnbull, William....FLA
Tyssowski, Joseph G....AGC
Taylor, William L., Jr. ....RSD
Turner, Wiley B....PWM
Twitchell, Waldo C....AGC
Truman, William H....FLA
Tooke, Roscoe C....FLA
Tuthill, Harry Nathan....FLA
Taylor, Henry Lee....FLA

V

Vaas, Emil David....SLA; CRI
Vessey, Frank V....CAF
Vandervort, Henry C....PFO
Van Orstrand, Dexter C....FLA
Van Duse, William Lafayeete....RSD

W

Webster, Charles Barclay....FLA
Wilson, France Q....RSD
Wiley, Wallace Faris....SLA; KST
Walker, Earl Doolittle....SLA; Note 19
Willis, Ray Austin....SLA; ELA
Wolfe, Leroy Marion....SLA; TMA
Whitty, James Joseph....SLA; KST
White, George Matthew....SLA; KST
Walser, Arthur C....CPA
Wells, Grant R. ....SLA; SRC
Williams, Charles B....DMA
Webster, Elmer Nelson....SLA; CFT
Walker, Clarence N....FLA
Weddington, Leonard D....WFO
Walker, William L....MAT
Wierman, Paul D....WFO
Wallenstein, Phillip N....EOT
Wright, Bidwell A....AGC
Whitacre, Philip A....FLA
Wilcox, Ralph W....PWM
Wrinkle, John S....FLA
Willis, Eppa H....BST
Wight, Stanley G....PWM
Wendell, Lay A....LHV
Warner, Leon G....GLC
Wellman, Arthur O....PWM
Weed, Frank J....PWM
Westbrook, Arthur K....CGC
Walzer, William....FLA
Wooling, Kenneth K....KST

Y

Yarrow, Harry C....AGC
Young, Lukens....FLA
Yassenoff, Leo....AGC
Youmans, Charles C....FLA
Young, Seward W....BST



(*Continued from page* 615)

the rubber cord is thus much stretched the bombs are hung in. When the upper gear wheel is now released by pulling the locking lever for bomb-dropping, the stretched rubber cord starts turning the shaft lying across in the fuselage as well as the camshafts of the bomb stores, so that all bombs are released by one revolution. To enable a timing of the bomb-dropping a glycerine brake cylinder, with adjustable throttle valve, is mounted in the chain drive leading upwards. Being connected with the inner bomb pairs and fixed to both sides of the seat two special cables make the dropping of these four bombs possible independently of the rest.

One aeroplane has further had a hanging provision for two large bombs mounted inside the cockpit to right of the seat of the pilot. The cables run to the observer.

The aiming arrangement is mounted inside the observer's cockpit on a swivelling arm on the left body side.

The empty weight of the aeroplane was fixed at 1,215 kg. A notice on the rudder gives the weight of the fuel at 216 kg., that of the normal useful load to 514 kg. and the maximum useful load at 614 kg. Reckoning with the normal load the total weight of the aeroplane loaded is thus 1,915 kg., corresponding with a load on the plans of 40 kg. per sq. m., as well as a performance load of 300 h.p. of 6½ kg. per h.p.

Characteristic Features

Beside the usual backwards stagger to be found on other aeroplanes the following features should be emphasized; the high fuselage with the right-angled rudder and forward sharp rounded keel fin, the landing gear with three pairs of struts and a right-angled cutting of the streamlining of the shafts, the small arrow-shape of the trapeze-shaped planes with the sharp and large cuttings, the bomb stores projecting forwards in front of the planes, the triangular-fixed tail plane, the divided elevator, with cornered balance, as well as the dihedral upper planes and horizontal lower ones.

(*Continued from page* 634)

the electrode froze to the work without releasing, at the same time operated easily for voluntary release.

The tool which resulted from these studies is shown in the accompanying illustration. The welding current enters at the rear end of the composition shank, passes along the shank to the head of the tool, and from there directly into the electrode. It will be noted that there are no joints in this tool except where the cable is soldered into the shank. Therefore, heating due to contact resistances cannot occur. There is a relatively large contact surface between the electrode and the holding head, which precludes any possible heating at this point. The electrode is clamped by a spiral segment operated by a lever. The lever is thrown to the widest open position and the electrode inserted, when the lever is turnd in the opposite direction as far as it will go. Any attempt to pull out the electrode results in tightening the grip of the segment which is made of case-hardened steel. This welding tool is covered by patents.

The trigger is intended for remote control employed with the closed-circuit system, manufactured by the Arc Welding Machine Company, Inc. Whenever this holder is used on other systems, the trigger is omitted, otherwise it is the same.

Aviators to Thread Needle of Liberty

According to a despatch to the New York *Sun*, "Threading the Needle of Liberty" is now a practice problem for aviators who expect to participate in the grand military procession in Paris in the near future and which will pass through the famous Arc de Triomphe de l'Etoile, from which twelve great boulevards radiate.

The space connecting the Avenue de la Grande Armee with the Champs Elysees is only ninety feet high and forty-five feet wide and the birdmen's tests are being made at a distant aviation field between and under wooden posts with specially constructed planes that have a diminished spread of wings.

The aviators intend to pass through the arch the same as the infantry and artillery.

Aeroplane Prize Authorized

Major General William L. Kenly, Director of Military Aeronautics, issued an order recently permitting the Aero Club of America to award to Sergeant M. F. Coombs, winner of the aeroplane race about the Statue of Liberty on October 26, the $100 Liberty Bond offered as a prize in the event.

A Novel Idea

The War Department authorizes the following:

Potato races in the air are being used by instructors at flying fields in teaching cadets accuracy and quickness in flights. In a potato race each team consists of a pilot and a mechanic. They are assigned to a plane and fly from the main landing field of a school to each of the outlying fields in turn, making a landing at each field to pick up a potato and returning to the main landing field to deposite it. At each of the outlying fields is a whitewashed mark on the ground before which each of the ships in the contest must land. If the pilot taxies over this mark before he stops he must take the air, come back and try it over again. Rules of the contest also require the mechanic to climb out of the ship at each mark, pick up his potato and climb back into the ship. In a recent potato race at one of the fields in Texas the distance traveled was twenty-four miles, the planes flying to three outlying fields and back each time to the main field. The winning plane covered the distance, made its landings successfully, picked up all its potatoes and deposited them in exactly forty minutes.

Aeronautics.

AERIAL AGE WEEKLY

Vol. 8, No. 13 DECEMBER 9, 1918 10 CENTS A COPY



Twin-motored Flying Boat, Curtiss type, constructed at the Naval Aircraft Factory at Philadelphia

Navy Plans Ninety Air Stations for Coast Defense

New York Police Department Creates Aviation Section

...ISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
...ription: Domestic, $4. Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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VOL. VIII DECEMBER 9, 1918 No. 13

TABLE OF CONTENTS

	PAGE
Welcome Home!	653
Ninety Air Stations Navy Plan for Coast Defence	654
New York Police Department Creates Aviation Section	654
First Thanksgiving Dinner in an Aeroplane	655
The News of the Week	656
The Aircraft Trade Review	658
U. S. Aerial Mail	659
Lateral Stability in Aeroplanes	660
Aeronautical Inventions	660
The Warner Duplex Stick Control	661
Outline of History of Aviation Engine Production	662
Activities at the Philadelphia Naval Aircraft Factory	666
The Hughes Aircraft Report	671
The Shotwell Electric Weather Vane	672
Naval and Military Aeronautics	674
Foreign News	676
Elementary Aeronautics and Model Notes	677
Aeronitis	678

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Dec. 9, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, DECEMBER 9, 1918 NO. 13

WELCOME HOME!

THE first troops to return to the United States were aero squadrons from France and England.

They received a hearty welcome from the nation as a whole and especially from the aeronautic authorities who would have entertained the members of the returning aero squadrons extensively and made them feel how thoroughly their work overseas had been appreciated had it not been for the restrictions placed by the medical authorities, who very wisely decided on measures intended to protect the public health.

The Aero Club of America, Aerial League of America, and the Aerial Mail Services joined in welcoming the returned aero squadrons. A wireless message was sent to them while the ship was on the way welcoming them back home and extending to them the hospitality of the Aero Club of America, at the same time making known the possibilities of many of the aviators finding positions in the aerial mail service.

On the morning of December 2nd, when the Mauretania arrived, the first boat to reach her was that carrying the Aero Club of America, Aerial League of America, and Aerial Mail authorities. The reception committee included Alan R. Hawley, president of the club; Rear Admiral Bradley A. Fiske, Henry Woodhouse, Capt. Benj. C. Lipsner, first superintendent Aerial Mail Service; Henry A. Wise Wood, Col. Jefferson DeMont Thompson, head of the aviation section of the New York Police Department; Hon. Murray Hurlburt, Commissioner of Docks in New York City; K. M. Turner, G. Douglas Wardrop, managing editor of AERIAL AGE; Mrs. Allen H. Bartlett, chairman of the aviation committee of the National Special Aid Society; Mrs. Henry A. Wise Wood, Capt. Robert A. Bartlett, W. W. Miller, Charles Jerome Edwards, Augustus Post, Evan J. David, business manager of *Flying;* Major J. C. McCoy, Miss Harriet C. Wirth, Mr. LeRoy B. Gulotta, Harry B. Childs, N. J. McNulty, Lieut. M. B. Downs. They received a very hearty reception. The upper decks of the Mauretania were alive with uniforms and as the boat drew near and the aviators learned that the officials of the Aero Club of America, the Aerial League of America and the Aerial Mail Service were on board the cheering was lusty and prolonged.

One by one the aeronautic authorities were introduced by megaphone and each time the returning aero squadrons cheered. Then at the first blow a number of voices from the Mauretania shouted "Is New York still wet?" With one voice those on the boat shouted "Yes," and the cheering which followed showed that the aero squadrons had not been living in France in vain.

The next query was: "Is there plenty to eat?" to which Mr. Augustus Post answered "Yes, and if you don't believe it come to the Aero Club of America and find out for yourself." This was received with a roar of approval. Mr. Post explained further that the invitation would be good for many months to come. If they wanted to go home upon their release from the service they were welcome to take advantage of the invitation at any time subsequent that was convenient.

Another cheerful announcement greeted with applause was the announcement of Captain Lipsner, the first superintendent of the Aerial Mail, advising the aero squadron units that there would be many positions in the aerial mail service opening for them. Prolonged cheering followed this announcement and showed that many of the members had been worrying over the prospects of remaining in the movement.

At about this time the second boat carrying the officials of the city of New York arrived. There was renewed cheering. The official boat contained many other members of the Aero Club of America. The city committee included the following:

Mayor Hylan, Mrs. Hylan, Acting Police Commissioner John A. Leach, Rodman Wanamaker, Commissioner of Charities Bird S. Coler, Grover Whalen, Secretary to the Mayor; Michael Cosgrove, Deputy Commissioner of Docks and Ferries, and other city officials.

The various units on the Mauretania were as follows:

156th Aero Squadron—Second Lieut. Arthur A. Sack, Second Lieut. John A. Bryan, Second Lieut. Richard M. Harris.

167th Aero Squadron—First Lieut. Barlar Thompson, Second Lieut. Arthur J. Wheeler.

187th Aeo Squadron—First Lieut. Loren B. Roberts, Second Lieut. Richard C. Philblad, Second Lieut. Richard M. Ferrill.

188th Aero Squadron—Second Lieut. Lock W. Redd, Second Lieut. Herman W. Berning.

216th Aero Squadron—First Lieut. Thomas B. Lyons, Second Lieut. Joseph P. Chapman, Second Lieut. George E. Fenderson.

225th Aero Squadron—Second Lieut. Brooks Dudley, Second Lieut. William B. Alexander.

226th Aero Squadron—First Lieut. R. Julian R. Speyers, Second Lieut. Philander P. Scroggs, Second Lieut. Leo C. Watson, Second Lieut. Max A. Montgomery.

228th Aero Squadron—First Lieut. James R. Ashley, Second Lieut. Wilson G. Fleming, Second Lieut. George P. Kirby.

262nd Aero Squadron—First Lieut. Walter A. Lorah, Second Lieut. Otis H. Castle, Second Lieut. Einer L. Rolfson.

267th Aero Squadron—First Lieut. F. W. Bedcher, Second Lieut. Lester E. Cadman, Second Lieut. Bethell Edrington.

268th Aero Squadron—Second Lieut. Peter V. O. Barkelow, Second Lieut. James F. Callahan.

308th Aero Squadron—Capt. Frederick R. Randall, First Lieut. Kirby Fitzpatrick, First Lieut. Alexander H. Clarke, Second Lieut. Julius H. Nussbaum, Second Lieut. Garner K. Birdseye.

309th Aero Squadron—Capt. Cecil Van Auber, Capt. Ralph R. Bush, First Lieut. James W. Tinsley.

310th Aero Squadron—Capt. Alfred J. Hayhurst, First Lieut. Edmund Easters.

315th Aero Squadron—First Lieut. Harold H. Healy, Second Lieut. Walter A. Crowe.

316th Aero Squadron—First Lieut. William F. Le Baron, Second Lieut. Victor A. Le Noir, Second Lieut. Leo N. Sinner.

317th Aero Squadron—First Lieut. Ray T. Morgan, First Lieut. Eugene Ferry Smith.

319th Aero Squadron—First Lieut. Arthur M. Beach, First Lieut. Arthur D. Farquhar, Second Lieut. John Sunderland, Jr.

321st Aero Squadron—First Lieut. Malcolm Lucas, Second Lieut. Thomas J. Carroll, Second Lieut. John Q. Cunning.

325th Aero Squadron—First Lieut. Richard A. Smith, Second Lieut. William E. Karns, Second Lieut. Roy D. Wilcox.

329th Aero Squadron—First Lieut. Cornelius N. Caddagan, Second Lieut. Martin B. Kugler, Second Lieut. Walter T. Hubbard, Jr., Second Lieut. Otto L. Weidmann.

330th Aero Squadron—First Lieut. Clarence J. Gilbert, Second Lieut. Leslie C. McClelland.

331st Aero Squadron—First Lieut. Taylor H. Stukes, Second Lieut. William P. Boyd.

333rd Aero Squadron—First Lieut. Willis K. Zachery, Second Lieut. Paul T. Putnam, Second Lieut. Walter W. Longstreth.

5th Construction Bricklayers' Company—First Lieut. Bernard J. O'Rourke, Second Lieut. Mitchell Allen, Second Lieut. Ralph Bryan.

Radio Mechanics Detachments—Second Lieut. Stephen M. Lee.

All efforts are being made by the Aerial League of America, in cooperation with the Aero Club of America and the Post Office, to secure positions for those of the aviators who may be leaving the service in the near future. The Aerial League has established an employment bureau at 297 Madison Avnue, New York City, where special blanks and information may be secured by aviators desiring to enter either the industrial end of the service or the Postal Mail Service.

NINETY AIR STATIONS NAVY PLAN FOR COAST DEFENSE

AERIAL defense of the American coast line is an important part of the plans of the Navy Department the House Naval Affairs Committee was informed to-day by Capt. Steele, U. S. N. Air Service, and Rear Admiral Taylor, chief of the Bureau of Construction and Repair.

It is planned to have ninety stations, distributed between the Atlantic and Pacific coasts and including Panama, Hawaii, Guam, Alaska and the Philippines, where triplanes, which can develop 160 miles an hour, and dirigibles, some of the Zeppelin type, will base. The cost is estimated at $85,769,300 for the next fiscal year. The fleet of dirigibles would include four huge ships of the rigid type, costing $1,500,000 each, twelve smaller balloons to cost about $250,000 each and a number of still smaller type costing $75,000 each.

Cost of Operating Stations

The operation of the coastal stations would cost about $8,000,000 Captain Steele said. Training stations would require $3,000,000 more, and experimental stations another $3,000,000. Captain Steele gave the following list of stations established or planned and the number of planes each would require:

Chatham, Mass., 24; Narragansett Bay, R. I., 24; Rockaway Beach, 24; Cape May, N. J., 18; Hampton Roads, Va., 24; Cape Lookout, N. C., 12; Brunswick, Ga., 18; Miami, Fla., 12; Key West, Fla., 24; Galveston, Tex., 24; Panama Canal Zone, 24; St. Thomas, W. I., 12; San Francisco, 24; San Diego, Cal., 24; Seward, Alaska, 6; Pearl Harbor, Hawaii, 24; Hilo, Hawaii, 12; Guam, 12; Cavite, P. I., 12.

Besides these, Fort Angelus, Wash., and the mouth of the Columbia River are in mind as possible stations.

The Navy Department's original estimate for air service had been $225,000,000, but the signing of the armistice resulted in the cut. Captain Steele insisted that the air estimates were based on a peace, not war, plan.

The Navy Department, Captain Steele intimated, is certain that protecting the Pacific coast will not now be misconstrued by Japan. In addition to the bases on that coast it is planned to have twenty-five "rest stations" for the storage of aircraft fuel and supplies and to provide landing places.

The amount asked by the navy in its revised estimates for aeroplanes is $8,162,000, Admiral Taylor said.

The value of the Zeppelin type of aircraft was questioned by members of the committee. Admiral Taylor said that a German machine of this type had flown during the war from Berlin to German East Africa. He predicted intercontinental flights in the near future of such craft.

"When the war started we were far behind on aircraft," the Admiral said. "During the war we were able to catch up to some extent. The general board feels that we should continue with our preparations."

The extremely fast, big triplane the navy wants is known as the Curtiss-Kirkham, because it uses an engine of that name instead of the Liberty motor. It is proposed to construct 108 fighting escort planes alone at a cost of $10,000 each.

NEW YORK POLICE DEPARTMENT TAKES PIONEER STEP CREATING AVIATION SECTION

THE creation of an Aviation Section in the New York Police Department and the appointment by Police Commissioner Richard Enright of Colonel Jefferson DeMont Thompson as head of this new Section, became known today through an impromptu luncheon given to Col. Thompson at the Aero Club of America by Messrs. Alan R. Hawley, President of the Aero Club of America, Henry Woodhouse, Rear Admiral Fiske, Henry A. Wise Wood, Augustus Post, and Captain Robert A. Bartlett, the famous explorer.

Mr. Hawley pointed out the importance of this step in the following statement:

"We fully agree with both Commissioner Enright, Special Deputy Police Commissioner Rodman Wanamaker, Inspector Dwyer, Special Deputy Police Commissioner Allan A. Ryan and the other progressive police authorities, that with this very progressive step of Police Commissioner Enright New York City gains the distinction of being the first city in the world to have an Aviation Section connected with its police department.

"The fundamental importance of the Aviation Section is quickly appreciated when the many duties of the Police Department are considered. The work of the aviators in connection with directing the protection of communities surrounding Morgan, New Jersey, during the recent catastrophe, when the fire threatened to set on fire tons of TNT, which might have caused the destruction of the subways and buildings even in New York City, emphasized the necessity of having aviators available for such emergencies.

"The work of policing the rivers, Harbor and Bay is also of tremendous importance and the problems connected with same will be easily solved by the employment of aircraft."

These are only two of the various uses to which aircraft can be put in connection with the Police Department, but they are sufficient to indicate the importance of the newly created Aviation Section of the Police Department.

The appointment of Jefferson DeMont Thompson as head of the Aviation Section of the New York Police Department was made on Saturday by Police Commissioner Enright.

All the high police authorities are known to be greatly interested in aviation. Police Commissioner Enright has also shown a keen interest in aviation. Special Deputy Police Commissioner Rodman Wanamaker, it will be recalled, has been a veteran supporter of aeronautics. His interest dates back to 1909, when he purchased and brought to the United States a Bleauriot monoplane of the type in which Louis Bleauriot, the famous French pioneer, flew across the English Channel.

Mr. Wanamaker also acquired one of the first balloons purchased in the United States. Later, in 1914, Mr. Wanamaker ordered the first transatlantic seaplane and organized the transatlantic flight, which was prevented by the war.

In 1915 he presented to the Aero Club of America, of which he has been a member and officer since 1909, a large balloon, which was later used to train the first United States Army balloon pilots to go overseas.

It is understood that the idea of establishing an Aviation Section for the New York Police originated with Deputy Commissioner Wanamaker and had the prompt approval of Commissioner Enright.

Special Deputy Commissioner Allan A. Ryan, also is a veteran of the aeronautic movement. He has been a Life Member of the Aero Club of America since 1910, and was President of the Club in 1910-1911, and was in charge of the organization of the first International Aviation Meet at Belmont Park in 1910, at which time Mr. Thomas F. Ryan gave a prize of $10,000 for the race to the Statue of Liberty.

Inspector Edwin F. Dwyer, Special Deputy Commissioner Wallat, Dr. John A. Harris, Special Traffic Commissioner, and other officials of the Police Department and city authorities are also keenly interested in aeronautics.

Colonel Jefferson DeMont Thompson's interest in aeronautics dates back to 1905, when the Aero Club of America was founded. He was one of the Founder Members, just as he had been a Founder Member of the Automobile Club of America. He studied aeronautics and officiated in aeronautic meetings in Europe before the war. He also was a pioneer in the automobile movement, being the chairman of the Vander-

bilt Cup Commission from the date of its organization and for a number of years thereafter.

Colonel Thompson has gained national reputation as a traffic expert and was a member of the Traffic Committee under Mayor Mitchell and was appointed Vice Chairman of the Traffic Committee by Mayor Hylan.

He is president of the Broadway Association, a Founder Member of the Aero Club of America and the Automobile Club of America, a member of the Union League Club, and other clubs and associations.

He was Chairman of the committee having charge of aeronautic events in the different city ceremonies and events, including the Liberty Loans and Fourth of July Parade, when over 100 military aroplanes flew over the city dropping prospectus.

The appointment of Colonel Thompson in charge of the Aviation Section of the New York Police received an enthusiastic reception at the Aero Club of America and Colonel Thompson was heartily congratulated by the officials and members of the Club and of the Aerial League of America, including Messrs. Alan R. Hawley, President, Robert E. Peary, President of the Aerial League of America and discoverer of the North Pole, Major J. C. McCoy, Dock Commissioner Murray Hulbert; Messrs. Charles Jerome Edwards, Henry A. Wise Wood, Rear Admiral Bradley A. Fiske, Henry Woodhouse, W. W. Miller and John Hays Hammond, Jr., members of the Board of Governors of the Aero Club of America, Capt. Benjamin B. Lipsner, first Superintendent of the Aerial Mail Service, and Captain Robert A. Bartlett, the famous explorer, and Mr. Augustus Post, Secretary of the Club.

The Aero Club officials and Captain Benjamin B. Lipsner, first Superintendent of the Aerial Mail Service, assured Colonel Thompson of the hearty co-operation of the Club and the Post Office, respectively.

FIRST THANKSGIVING DINNER IN AN AEROPLANE

THE first Thanksgiving ceremony and dinner ever held on board of an aeroplane was held on November 28, at one o'clock on board of the large three-ton Handley Page belonging to the Post Office, and to be used early in December in the New York-Chicago aerial mail line.

This event took place at Elizabeth, New Jersey, the newly established aerial mail center. Those who had luncheon on board of the Handley Page were:

Alan R. Hawley, President, Aero Club of America; Captain Benjamin B. Lipsner, Superintendent, Aerial Mail Service; Henry Woodhouse, Editor of AERIAL AGE; Augustus Post, Secretary, Aerial League of America; E. S. Pennewill, Vice-President, Standard Aircraft Corporation; Mr. Meyrick, Standard Aircraft Corporation; Leroy B. Gulotta, Editor of *Air Power*.

The following telegram was written on board of the huge aerial mail plane:

"We who are having Thanksgiving ceremony and dinner on board of the three-ton Handley Page postoffice mail aeroplane, extend our heartiest congratulations on inauguration of the Aerial Age by the postoffice department. A new epoch has dawned for the commerce of America and of the whole world. We all join in Thanksgiving for the stupendous victory achieved and for the realization of our hopes, which we confidently believe will be soon followed by results of the utmost benefit to civilization when the marvelous develpments in military aeronautics are turned to utilitarian purposes and aerial mail service is established throughout the United States."

The above telegram was sent to President Wilson, Secretary Baker, Secretary Daniels, General William L. Kenly, Director of Military Aeronautics, Washington; Postmaster-

(*Continued on page* 673)



The Handley Page that housed the group of aeronautic enthusiasts on the above historic occasion.



THE NEWS OF THE WEEK



Seaplane Carries Fifty Passengers

A record in this country for the number of passengers carried was broken on November 27 at the naval aero station at Rockaway, when the NC-1, the largest seaplane in the world, made a flight carrying fifty passengers. In the test flight the pilot was Lieutenant David H. McCullough, Naval Reserve Flying Corps, a veteran who was in charge of Aerial Coast Patrol Unit 1, and trained F. Trubee Davison and H. P. Davison, Jr., and other aviators who afterward won reputation in the service.

No special modifications of the plane were made for the flight, which was made to demonstrate the machine's lifting power. The NC-1 is the first American tri-motored seaplane. She is of the flying boat type with wings that have a spread of 126 feet, and is equipped with three low compression Liberty motors of 385 horse power each, giving her a speed of about 80 miles an hour. With the weight of fifty passengers this speed was cut down to 72 miles an hour.

It was designed and construtced by the Curtiss Engineering Corporation at Garden City.

The test was witnessed by a crowd, and, according to a report of the Aero Club, the NC-1, with her great weight, was able to leave the water within 1,000 feet at a speed of forty-five knots, and rose to a height of thirty-five feet. The record, it was said, was all the more remarkable because it was made in a seaplane of a type that is usually 10 per cent heavier than land aeroplanes.

"The flight, which was made at Rockaway Beach," said Alan R. Hawley, President of the Aero Club of America, "was witnessed by an official of the Aero Club of America, and the record will come up for homolgation at the regular meeting of the Executive Committee next Wednesday. When this is done it will be sent to the Aero Clubs of all the European and Latin-American countries, which are affiliated with the International Aeronautic Federation and the Pan American Aeronautic Federation, and, therefore, it will be considered official all over the world. This is a splendid achievement, and the Navy Department is to be congratulated for it."

Henry Woodhouse: "This is the first passenger-carrying record in which more than twenty-five passengers have been carried, officially observed, that has been made since the beginning of the war. The first world record, carrying twenty-one passengers, was made in Great Britain in 1918, when a land Handley Page carrying twenty-one passengers flew to a height of more than 7,000 feet, piloted by Clifford B. Prodger, an American pilot. In September, 1917, a Caproni triplane carried thirty-two passengers. This flight was made under military supervision, but the record was not submitted to the International Aeronautic Federation for homolgation. We have not as yet been advised as to whether the records made recently in England and France, in which forty and thirty-five passengers were carried respectively, were observed by official observers of the Aero Club of the United Kingdom and the Aero Club of France which would be necessary to have the records accepted by the International Aeronautic Federation and the Pan American Aeronautic Federation."



Major L. Falchi of the Italian Aviation Mission



Lieutenant Colonel Henry L. Watson, one of the few junior military aviators in the U. S. Air Service

Flew 550 Miles in 250 Minutes

Washington—C. F. Kettering, Vice President and Chief Engineer of the Dayton-Wright Airplane Company, and Howard M. Rinehart, premier pilot of the same concern, flew 550 miles, from Dayton, Ohio, to New York, November 30 in 4 hours and 10 minutes. December 1, in the same machine, they flew from New York to Washington in 2 hours and 5 minutes. The trip was made in a standard De Haviland-4 army plane, equipped with a twelve-cylinder, 400-horse-power Liberty motor, the same type of machine as that used during the last four months of the war by American airmen attached to General Pershing's expedition.

The men who made the flight called up New York City from Dayton by long-distance telephone at 10 o'clock yesterday morning, made an engagement for dinner, and the theatre that evening, and arrived in time to keep both engagements, landing at the Mineola flying field. A speed of 132 miles an hour was averaged for the trip. When the Mineola field was reached there was enough oil and gasoline left in the tanks to carry the machine back to Dayton. Mr. Rinehart said it was feasible to make a 1,000-mile nonstop trip with that type of aeroplane.

Our Naval Forces Abroad Are Being Rapidly Reduced

Paris.—The American naval establishment in European ports and waters is being reduced rapidly since the armistice. It is intended to order home soon all small craft, destroyers and submarines used principally as convoys, except for a limited number for patrol and escort duty.

The American naval base at Brest, however, will not be abandoned but will be used as a repair station. The general installations there will be enlarged somewhat in order to take care of the steady stream of transports which will carry the American troops back.

Other bases along the coast, including balloon and aeroplane sheds and branch repair plants, no longer are required, and a considerable part of the naval personnel already has started homeward.

Thaw Now Lieut.-Colonel

Major William Thaw, American "ace," with the 103d United States Aero Squadron in France, has been promoted to a lieutenant-colonelcy, according to advices received here to-day by Alan R. Hawley, president of the Aero Club of America.

Lieut.-Col. Thaw is 28 years old, one of the youngest officers of that rank in the American or Allied armies. He received recently the United States Distinguished Service Cross with two citations by Gen. Pershing and had previously been similarly honored by the French Government.

Lieut. Miller Makes Flight from Dayton to Pittsburgh

Pittsburgh.—Lieutenant Charles Miller, of the United States Army Aviation Corps, test pilot at Wright Field, Dayton, Ohio, landed in Schenley Park, having covered the ninety-one miles between Deninson, O., and Pittsburgh in fifty minutes.

Washington to Schenectady for Thanksgiving Dinner

Schenectady.—To pass Thanksgiving Day with his friend Miss Frances Zeiser, daughter of Mr. and Mrs. Julius Zeiser, of this city, Lieut. Philip W. Lucas flew in an army scout machine from Washington to Schenectady.

Returning Airman Will Go to Mills

Plans have been completed at Camp Mills by Col. C. H. Smith, camp quartermaster, and Col. Moose, of the Mitchel Aviation Field, for the reception of the first detachment of troops from England.

Aerial detachments from England will be the first to arrive. They all probably will be sent to Camp Mills for disinfection of their clothing and then lined up for review and marched to Mitchel Field, which adjoins this camp.

Camp Mills can take care of 10,000 troops in addition to those already there; at Mitchel Field 16,000 can be put in barracks.

It is planned to examine and muster the men out as quickly as possible. From one to two thousand will be mustered out daily and will be sent in detachments to their homes. They probably will be homeward bound within a week after their arrival.

American Airmen Get British D. F. C.

Eleven enemy aeroplanes and one hostile balloon were brought down by American aviators brigaded with the British during the period from September 9 to September 22, inclusive, and five American aviators were awarded the British distinguished flying cross, according to the latest Royal Flying Corps communiques just received here.

Special mention was made as follows:

"Lt. G. A. Vaughn, while on offensive patrol, was engaged by about fifteen enemy aeroplanes, one of which was attacking a flight of our machines, he dived on and shot down in flames. He then attacked another, which he followed down to 2,000 feet. This enemy aeroplane was seen to crash by another pilot."

The distinguished flying cross was awarded to:



Lt. Col. Americo Pio, the famous Italian Ace here with the Italian Mission

Lt. G. A. Vaughn, George A. Vaughn, father, 441 Washington Ave., Brooklyn, N. Y.; Lt. T. J. Herbert, John T. Herbert, father, 1644 East 86th St., Cleveland, Ohio; Lt. M. L. Campbell, Charles L. Campbell, father, Wakeman, Ohio; Lt. L. A. Hamilton, 49 Bartlett Ave., Pittsfield, Mass.; Lt. J. A. Keating, 5748 Peoria St., Chicago, Ill., Mrs. James A. Keating, wife, 2232 West 109th St., Chicago, Ill.

Enemy aeroplanes were brought down by: Lt. H. C. Knotts, Edward C. Knotts, father, Carlinville, Ill.; Lt. H. L. Bair, 111 West 111th St., New York, N. Y.; Lt. W. W. Lauer, (Willard W. Lauer, Mrs. W. J. Lauer, 3422 Park View Ave., Pittsburg, Pa.); Lt. F. E. Luff, H. J. Luff, father, 3046 Lincoln Blvd., Cleveland Heights, O.; Lt. T. L. Moore, 617 Chestnut St., Kewanee, Ill.; Lt. J. O. Creech, 6614 Harlan Place, Takoma Park, Washington, D. C.; Lt. W. Clements, Gloucester, Va.; Lt. F. E. Kindley, Uther Caliahan, cousin, Gravette, Ark.; 2d Lt. H. Burdick, 174 Remsen St., Brooklyn, N. Y.; Lt. E. W. Springs, Leroy Springs, father, Lancaster, Pa.; Lt. G. D. Wicks, Mrs. Lucie C. Wicks, mother, Sanquoit, N. Y.

A hostile balloon was brought down by 2d Lt. A. F. Diamond, Mrs. Emma J. Adams, Baltimore and Rose Sts., Mobile, Ala.

Downs 3 German Planes

Lieut. Gordon V. Moy of the American aviation service has been credited officially with downing three German planes, according to a letter received from him.

Lieut. Moy was reported missing September 26. He showed up later, having been separated from his squadron. He is a graduate of Pennsylvania State College.

Details of Lieut. Ross's Death, First U. S. Balloon Fatality

An official communication received at the Division of Military Aeronautics confirms the death of Lieut. C. J. Ross, of the American Expeditionary Forces Balloon Corps. Eye witnesses of the action in which he was killed, arrived by the same steamship that brought the communication. From them it was learned that the American balloons were in use on a special mission on this occasion, which was a day of overcast skies.

Suddenly during an intense bombardment by the American Artillery, which was being directed by Lieut. Ross, a German air squadron appeared out of a cloud bank, dived for the balloon carrying this efficient observer, and one of the planes reached it, setting it on fire.

Lieut. Ross's companion had some trouble in getting out of the basket, thus involving a delay, and the observer remained to see him safely clear before he jumped himself. His delay proved fatal, since his parachute in its slow flight was overtaken and ignited by burning wreckage from the balloon, and he was killed instantly by the resulting fall.

This is the first death in the American balloon corps since it has been on the lines. From the report it appears that the Germans were willing to sacrifice squadron of planes to stop the devastating artillery fire which hinged on the work of the observer.

One of the new balloon fields that are now being established in the South will be named after Lieut. Ross, the first of the American balloon observers to die in action. Lieut. Ross was appointed from Pennsylvania. He graduated from the Officers' Training School at Fort Niagara, was transferred to the Balloon Corps, and his balloon training was completed at the American Balloon School at Bordeaux, France.

Official Confirmation of Lieut. Campbell's Looping Record

We reported in our last issue the report that Lieut. W. T. Campbell had succeeded in breaking the world's looping record, and we are now glad to publish the official confirmation herewith:

PROCEEDINGS OF A BOARD OF OFFICERS CONVENED AT LOVE FIELD, DALLAS, TEXAS, NOVEMBER 13, 1918

To whom it may concern:

The following officers composed a board to count the number of successive loops made by First Lieut. Wm. T. Campbell, A. S. A., on Tuesday, November 12, 1918. This board finds that Lieut. Campbell has succeeded in breaking the world's record by looping the loop 151 consecutive times.

(Signed) MAURICE A. SHARP,
1st Lieut. Maurice A. Sharpe, A. S. A.
President (Rich Field).

(Signed) DUDLEY B. MAYER,
1st Lieut. Dudley B. Mayer, A. S. A.
Member (Love Field).

(Signed) JOSEPH BORDEN,
2d Lieut. Joseph Borden, A. S. A.
Recorder (Taliaferro Field).

Cadet Fliers Have Choice

All cadet aviators now in training in the United States will be given the option of immediate discharge. Cadets who elect to complete their training will be discharged when they finish the course and given commissions as second lieutenants in the Officers' Reserve Corps.

Candidates for commissions at balloon schools also will be given an opportunity to complete their training, after which they will be commissioned in the Officers' Reserve Corps.

Orders have been issued for the closing of Selfridge Field, Mount Clemens, Mich.; Chanute Field, Rantoul, Ill., and Scott Field, Belleville, Ill., and for the abandonment of the air service mechanics' school at St. Paul, Minn.



The final inspection room of the Renault Motor Co. in France

The Story of Guynemer

Georges Guynemer: born in Paris December 24, 1894, of a historic soldier family, has entered the ranks of the proudest chivalry of earth, the warriors of France. In his youth, his passionate fury of combat, his impetuous nervous vitality, there was an echo of the very pulse of France. His life spoke to the heart of the nation. Honoring him, she honored her own instincts, her own truest ideals. He was her eaglet, her imp of glory.

Henry Bordeaux, in this just published book, "Guynemer, Knight of the Air," obtainable at the Aeronautic Library, Inc., No. 299 Madison Avenue, New York City. Price $1.60.

Aviation School at Princeton Closed

Washington — The Government closed the School of Military Aeronautics at Princeton Nov. 23. Of the flying cadets remaining in the school 110 desired to finish the course and were transferred to the ground school at Austin, Texas. The others were discharged from the service at their own request.

The buildings which have been occupied by the school are to be turned over to the university within a few days. Officers stationed at the school will remain in Princeton for the present, to close up the offices and return the equipment to the Government arsenals.

Princeton was a pioneer in training aviators for the war. Several months before the United States entered the conflict the Princeton Flying School was established as a voluntary effort on the part of the Princeton students and alumni, and the fliers trained in this school were among the first to get overseas after America entered the war.

This early movement led to the establishment of the United States School of Military Aeronautics at Princeton, the university authorities turning over to the Government several buildings for the instruction of aviators. The school was opened July 3, 1917, and soon became one of the best in the country.

The first class was graduated eight weeks after the opening, and a new class started each week, so that aviators were turned out rapidly, a class being graduated each week after the first eight weeks. The course was changed to twelve weeks, after the demand for aviators became less pressing. Since the establishment of the school more than 3,000 aviators completed the course at Princeton. Many of these men won distinction at the front, and a considerable number gave their lives in the service. Several have won citations and decorations.

City College to Continue Aeroplane Classes

The evening classes in aeroplane mechanics which the City College started as a war measure are going to continue without interruption after the return of peace. The only change will be the emphasis on the informational and vocational aspects of the subject, rather than the military point of view.

"We started these classes last summer," says Dr. Frederick B. Robinson, Director of Vocational Courses at the College, "in order to train young men as aircraft mechanics to aid in the construction and in the flying of America's great air fleet. With the passing of war conditions, there still remains a pressing need for courses of this character in order to train men for the engineering and construction departments of aeroplane factories. The aeroplane industry, representing an investment of over two billion dollars, is here to stay. It offers a large future to men who are properly equipped and we are ready to supply this training to all young men who are ambitious in this direction."

The evening courses offered at the College include Aeroplane Mechanics, Advanced Aeroplane Mechanics and Aeroplane Design. In these classes, which are open to any resident of the City, the construction of aeroplanes and engines is studied and laboratory work is given in the operations of assembling, adjustment and repair. With the cooperation of the United States Government, and of many manufacturers of aeronautic equipment, the College has secured for its laboratory a large number of aeroplanes and aeroplane engines which are used by the students for their practice work.

The aviation classes are in charge of Professor D. B. Steinman of the Engineering Department of the College, with a number of assistants who are specialists in the different branches of the work. Over four hundred students have already been graduated from these courses. New classes are opening in December and those who are interested can secure full information by writing or calling at the College any evening this week.



Major J. E. H. Stevenot, who is gathering data for the organization of the Philippines Air Service, Lieut. W. L. Kenly and Lieut. H. C. Kenly, sons of Major-General William L. Kenly

The AIRCRAFT TRADE REVIEW

Invention Board Appointed

Cols. Charles R. Alley and Daniel I. Sultan, general staff, and Maj. Kingsley Twining, air service, have been constituted a board to investigate all questions concerning the development of certain secret appliances with a view to their transference to the proper agency of the War Department for further development of the inventions and the construction and test of full-sized models.

Abandon Two-Stop Flight

Tucson, Ariz.—The two-stop flight of the Loughead biplane from Santa Barbara, Cal., to Washington, D. C., was abandoned November 26 following a fall at Gila Bend, Ariz., in which Pilot O. S. T. Myerhoffer was slightly hurt and his mechanician, Leo F. Flint, was severly injured. The machine was badly damaged. The flight started last Saturday from Santa Barbara.

Parachute Drops Thrill Washington

Washington was thrilled by a performance in the air by two naval aeronauts. While circling high over the heart of the city, they swung their feet over the edges of two naval planes and started downward on ten-minute trips to the capital with twenty-foot-wide parachutes swaying above them.

In private life these parachute artists are Gunner John L. McCoy and Sergt. Thomas A. Holland, members of the balloon detachment of the United States Marine Corps, stationed at Quantico. Both the men had made similar previous leaps, but the performance was a brand-new one to Washington.

The men were announced to try to land on the ellipse as a public surprise just as the head of the "free milk for France" parade was passing that point. Their planes, however, did not appear until after 4:30 o'clock, and neither jumper came within a half mile of the designated spot.

Jamieson in Charge of Equipment Disposition

Washington, Nov. 23—Disposition of all manufacturing materials, equipment and buildings which will now or later become the property of the United States as a result of contract cancellations by the Ordnance Department will be in charge of a board headed by Brig.-Gen. C. C. Jamieson, which will decide their sale or storage.

5,000th Packard-Liberty Shipped

Detroit, Nov. 26—The Packard Motor Car Co. shipped its 5,000th Liberty engine on Nov. 21, practically one year after the first engine of this kind to be produced by the company. It was on Thanksgiving Day, 1917, that actual production was started. Production on the original order for 6,000 will be completed in less than 30 days at the present rate of output.

Substitute for Gasoline Tested by Bureau of Standards

Washington, Nov. 26—The Bureau of Standards has recently completed a series of tests of a substitute for gasoline which is said to be satisfactory in every respect, to cost less than gasoline, to be available in ample quantities and to give more power than gasoline.

The fuel is the result of experiments of Capt. E. C. Weisgerber, and the formula is a secret. A deal has been completed to commercialize the product and place it on the market.

The substitute is in liquid form manufactured by a still process, composed of commodities which are now a drug on the market and which are plentiful enough to assure supplies to meet the future demands. The formula is a secret in the hands of the General Engineering Depot and the inventor. The cost of manufacture is said to be 40 per cent lower than that of making gasoline.

The substitute, which is known as Liberty fuel, is the direct result of experiments by Capt. E. C. Weisgerber, an oil and gas engineer, who was first connected with the Engineering Corps and has lately been working at the Bureau of Standards. He was ordered to conduct the experiments by his commanding officer for the purpose of securing a fuel other than gasoline and more powerful and economical if possible.

The substitute is described as scentless, tasteless and without gasification scent. It is said that its products of combustion are cooler than gasoline. It is reported to be non-corrosive. It does not give out soot or carbon, according to the reports, and starts easier than gasoline.

The quality and specific gravity are changeable at will, it is stated, and the substitute shows no ill effect on the lubricating oil. It will ignite only from spark or flame. No special apparatus is required either in the engine or carbureter or in the manufacture of the fuel.

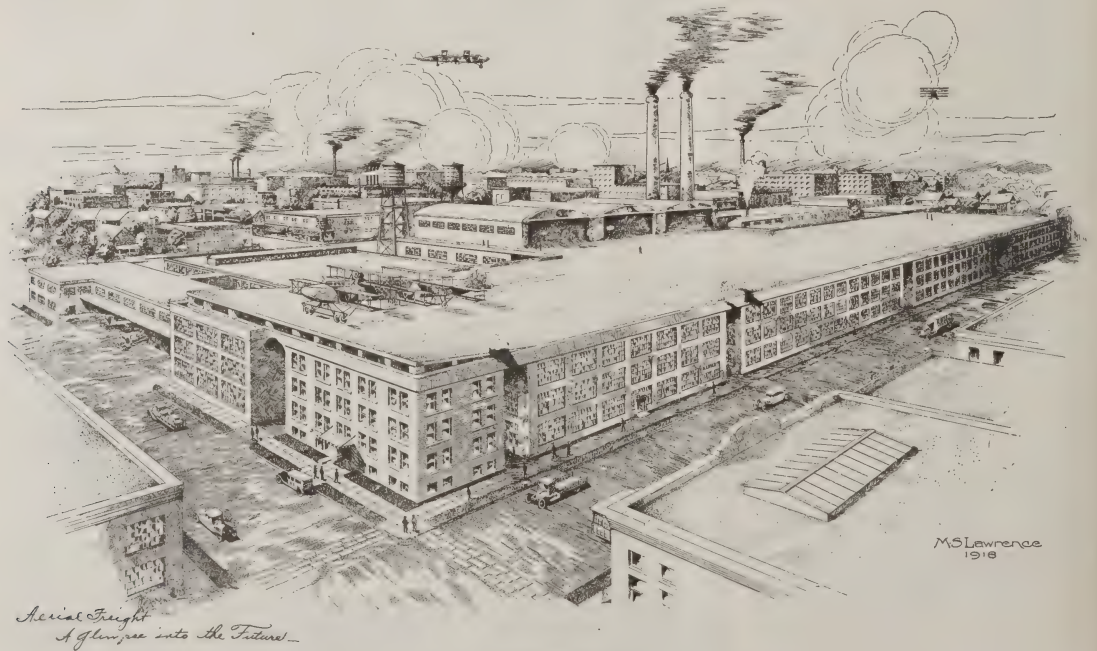
Tests were held at the Naval Air Station and at Anacostia Flying Field, D. C., in comparison with special "X" quality of gasoline in which the water used with the Liberty fuel remained below 160 deg. Fahr. and the oil below 130 deg. Fahr.

In the tests by Army officers, mainly conducted by Captain Weisgerber, the new fuel was used in a passenger car, motorcycle, aeroplane, tractor and truck in comparison with gasoline. In the tests by the Bureau of Standards at the laboratories it was used in a Class B truck engine and a 150 h.p. Hispano-Suiza aeroplane engine in comparison with gasoline.

Used on a passenger car the fuel drove the car 17½ miles to the gallon as against 9 m.p.g. on gasoline, and increased the speed from 47 m.p.h. to 69 m.p.h.

Nash On Job Again at Kenosha Plant

With satisfaction over a duty well done but with unbounded enthusiasm over his return to the active participation in his own enterprise and with unlimited optimism over the immediate future of the motor car and aeronautic industries, President C. W. Nash of the Nash Motors Company returned to Kenosha last week and announced the relinquishment of his Government position as chief in charge of production and engineering in the reorganized aircraft department of the Government under Assistant Secretary of War Ryan. Four months ago, at the urgent request of Mr. Ryan, Mr. Nash took over the active management of production and engineering in the aircraft division of the Government war work, and those on the inside award to Mr. Nash's great ability as a production expert a large share of the credit for the wonderfully rapid improvement in conditions in 'plane production and delivery under the Ryan regime.



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A suggestion by the Weger Aeronautical Motor Co., of Cleveland, for utilizing factory roof space for a landing ground

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
Captain Benjamin B. Lipsner, Superintendent Aerial Mail Division



AERIAL MAIL PILOTS

Max Miller
Maurice A. Newton
Robert Shank
Ed. V. Gardner
C. D. De Hart
Louis Gertson
R. Smith

AERIAL MAIL MECHANICS

Henry Wacker
E. N. Angle
A. F. Cryder
Ed. C. Radel
Wm. C. Read
W. O. Beatty
Chas. King
J. A. Darneille
August Thiele
Herman E. Fremming
Frank Tower

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Frank Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

New York-Chicago Aero Mail Dec. 15 at Reduced Rate

WITH the inauguration of daily aeroplane mail between New York and Chicago on December 15th, a change has been made in the rate of postage, fixing the rate at 6 cents an ounce or fraction thereof instead of 16 cents for the first ounce and 6 cents for each succeeding ounce. This applies to sealed parcels, not exceeding 30 inches in length and girth combined, as well as to letters. The old rate of 16 cents on the first ounce allowed 10 cents for special delivery service. Under the new rate it is left optional to the sender of a letter whether he desires to place a special delivery stamp on his aeroplane mail. This places the aeroplane rate on the same basis as all other letter mail.

On the New York-Chicago route all mail stops are made in ample time to catch the regular carrier delivery, insuring the delivery of the letter that day and making it unnecessary to apply special delivery unless the sender desires immediate expedition of the letter upon its arrival in the city of address. Faster machines, beginning December 15th, will also be placed on the New York-Washington route, insuring arrival of the mail for the regular carrier delivery in Washington and New York on the day of arrival.

Special aeroplane postage stamps or ordinary postage stamps may be used. When ordinary postage stamps are used the mail should be endorsed "By Aeroplane." If special delivery service is desired a special delivery stamp or its equivalent in ordinary postage stamps must be placed on the mail in addition to the 6 cents air postage. If ordinary postage stamps are used in place of the special delivery stamp the mail should be endorsed "Special Delivery."

Aero Mail Sets New Cost Figures

The cost figures just announced for September by the United States Post Office Department, shows that a new cost record was made for the month by a Standard Mailplane No. 1, manufactured by the Standard Aircraft Corporation of Elizabeth, New Jersey, which carried the mail 3,243 miles during the month at a cost of 35¾c. per mile.

This figure includes every expense, such as gasoline, oil, salaries, rent, repairs, officer- overhead, interest on investigation, etc.

The average cost of the mail service per mile during September was slightly in excess of 63 cents per mile.

The Standard Mailplane No. 1, which set the new cost record, had the added distinction of traveling almost twice as far during the month as any of the other planes.

Aero Mail in Snowstorm

The Aero Mail between Washington and New York got its first touch of winter flying on November 4, when Ed. Gardner left New York in a cold rain and flew for 40 minutes through a snowstorm at an altitude of 7,000 feet. The snow was so dense that he could not see the ends of the wings of the machine. He suffered no inconvenience save the chill.

The Aero Mail Service has made all preparations to combat the elements for winter flying. Electrically heated clothing has been ordered and individual heating plants for each plane have been installed. These plants keep the motor warm in the hangars over night through the coldest weather and will enable an immediate start regardless of the degree of cold. Arrangements have also been completed to keep a well packed landing and taking-off area in the snow, and equipment has been devised for control of the plane on sleet and ice on the ground.

On the New York-Chicago route, construction has begun on a $15,000 hangar at Chicago, donated by the business men of that city, and hangars are already in course of construction at Cleveland and Bryan, Ohio. Work on the hangars at Clarion, Bellefonte and Lehighton, Pa., will be begun next week. All the aeroplanes on the New York-Chicago route will be equipped with wireless and everything that can be done to insure a perfect daily service between the cities on the air mail, regardless of weather conditions, has been provided for.

Aero Mail Developments in Great Britain

It is interesting to note that two companies have been formed in London with a view to establishing aerial conveyance lines between various places. The nominal nature of the capital leads one to believe that the companies were formed chiefly to acquire their names.

The Anglo-American Aerial Services, Ltd., is formed to establish, maintain, and work lines of aerial conveyance between Britain, America, Canada, and Central and South America, and between the continents of North and South America, and the various States and Provinces thereof and other places, and to carry on the business of manufacturers of and dealers in aircraft, hangar and aerodrome proprietors, tourist agents, contractors, etc.

The London and Provincial Aerial Services, Ltd., has been formed with the object denoted by the name.

The subscribers are the same persons in both companies.

UNITED STATES POST OFFICE AERO MAIL SERVICE

Monthly Report of Operation and Maintenance

OCTOBER, 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	PILOTS	MECHANICS AND HELPERS		Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST					
							Actual time	On plane	Shop time					Gallons of Gasoline	Total time run	Total miles run	Miles run per gal. gas.	Cost per hour	Cost per mile
															hr. mi.				
1	$130.23	$26.75	$39.50	$31.33	$39.55	$61.25	$241.55	$187.61	$40.88	$64.40	$101.97	$113.49	$1078.51	411	36 33	2630	6.39	$29.50	$.4100
2	137.00	44.31	39.50	31.32	39.55	61.26	252.50	191.63	40.88	79.93	101.97	113.49	1133.34	451	38 13	2954	6.54	29.65	.3836
4	148.38	37.87	39.50	31.32	39.55	61.26	263.28	195.80	40.88	194.35	101.97	113.49	1267.65	488	39 51	2964	6.07	31.81	.4276
5	53.00	12.21	39.50	31.32	39.55	61.26	162.30	207.30	40.88	203.00	101.98	113.49	1065.79	175	24 34	894	5.10	43.38	1.1921
6	90.05	22.19	39.50	31.32	39.56	61.26	137.25	163.37	40.88	137.55	101.98	113.49	978.40	295	20 46	1452	4.92	47.11	.6738
38262	5.58	2.20	39.50	31.32	39.56	61.26	.....	72.56	40.87	730.36	101.98	113.48	1238.67	18	.. ..	.....	.....	.....	.....
38274	73.46	14.82	39.50	31.32	39.56	61.26	117.85	140.41	40.87	27.99	101.98	113.48	802.50	241	17 50	1190	4.93	45.00	.6743
38275	13.50	2.61	39.50	31.32	39.56	61.26	14.25	114.25	40.87	72.31	101.98	113.48	644.89	45	2 09	180	4.002	299.95	3.5827
38278	12.87	5.36	39.50	31.32	39.56	61.26	20.75	130.31	40.87	5.00	101.98	113.48	602.26	42	3 08	320	7.61	192.21	1.8820
39365	19.50	.....	39.50	31.32	39.56	61.26	.....	12.40	40.87	14.49	101.98	113.48	474.36	60	.. ..	.....	.....	.....	.....
39366	20.10	.....	39.50	31.32	39.56	61.26	6.40	64.67	40.87	36.25	101.98	113.48	555.39	67*	0 58	87	1.29	574.54	6.3837
Total	$703.67	$168.32	$434.50	$344.53	$435.12	$673.85	$1216.13	$1480.31	$449.62	$1565.63	$1121.75	$1248.33	$9841.76	2293	184 02	12671	5.52	$53.48	$.7767

*Leakage

OTTO PRAEGER, Second Assistant Postmaster General.

LATERAL STABILITY IN AEROPLANES

By C. LEVICK

THE stability of an aeroplane as built to-day is almost in the hands of the pilot. By governing the controls he alters the aerofoils, rudder and elevators in such a manner as to cause forces to come into play which neutralise those created by the wind and the varying density of the air.

Apart from special machines designed to be automatically stable, such as the Dunne biplane, of the original Fokker monoplane, there are remarkably few devices invented which tend to give stability. One of the best known and most used methods of gaining lateral stability is the practice of setting the aerofoils at an angle—called the dihedral angle—to the horizontal. This angle is as a rule very small, varying from 2° to 5°, but in spite of this has a great effect on the behaviour of the machine. It has stood the test of time well, having been employed constantly since the early days of aviation, when it was one of the distinctive points of both the Antoinette and Blackburn monoplanes.

It is interesting to note the effect of a roll on a machine with wings constructed as explained above, the dihedral angle being ϕ degrees.

Fig. 1 shows how part of the normal reaction of the air on the wings is lost, so that one of the disadvantages of the dihedral angle is that it decreases the efficiency of the aerofoil. This effect, however, is very small, amounting to something less than 1 per cent. for an angle of 3 degrees, and is therefore almost negligible.

Fig. 2 shows a machine having been canted through an angle θ degrees by some force, and indicates the vertical thrusts on the wings. It will be seen that the lower wing has moved through a smaller angle than the higher one in relation to the horizontal plane, and is therefore giving a greater vertical lift.

The trust on the lower wing is $r Cos (\theta - \phi)$ and on the high $r Cos (\theta + \phi)$, or on the left and right respectively, presuming the machine to be moving forward perpendicularly to the plane of the paper.

One of the effects of this unequal lift on the wings is to set up a couple, which tends to bring the planes back to their original position. An analogy is the action of the see-saw, the loaded end of which, having been displaced, is being brought back to a level position by a force which is automatically getting less and less, but is zero only when the board is horizontal.

It is difficult to find the dimensions of the couple that may be relied upon, but the result worked out below is probably a normal example. Viz.:—

Let S = span of each wing in feet.
C = chord of each wing in feet.
A = area of each wing in square feet.

Then A = SC square feet.

If the velocity of the machine is such as to cause a lift of 5 lbs. per square foot and r is the total lift or thrust in lbs. normal to wing surface.

Then $r = 5$ SC lbs.

If S = 18 feet and C = 6 feet.

$r = 5 \times 18 \times 6 = 540$ lbs.

If the dihedral angle $\phi = 3°$.

Then vertical lift for each wing in Fig. 1—

$r = r Cos \phi = 540 \times .9986 = 539$ lbs.

Now in Fig. 2, suppose $\theta = 30°$,

Then vertical lifts for left wing—

$r = r Cos (\theta + \phi)$.
$= 540 \; Cos \; 33° = 540 \times .8387$.
$= 452$ lbs.

And for right wing—

$r = r Cos (\theta - \phi) = r Cos \; 27°$.
$= 540 \times .8910$.
$= 481$ lbs.

Showing a difference of 28 lbs.

From the above results it is an easy matter to find the resultant of these two unequal-like parallel forces, and thus to find the couple. The best method is to draw a diagram, such as Fig. 3, but to a very large scale, and thus measure the distances AC and AB.

Those given, however, were calculated and are more exact, although of no more value than an approximate result found by taking AB equal to 18 ft., owing to the very small variation for small and practical value of θ. The couple is 934 $\times$ .2385 lbs. ft. or 223 lbs. ft. It should be noticed that the total vertical thrust when the machine is not level is less than when in the normal position, and also that in the example given the centre of gravity of the machine was supposed to be at the intersection of the wings, whereas in practice it is rather lower down.

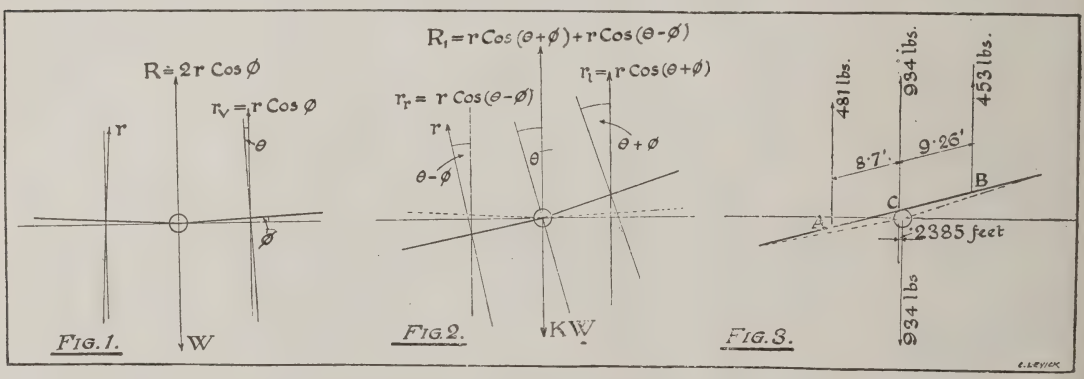


FIG. 1. FIG. 2. FIG. 3.

AERONAUTICAL INVENTIONS

THE National Advisory Committee for Aeronautics, whose duties concerning aeronautical inventions are similar to those of the British Air Inventions Committee, beg to call attention to the following recent public statement made by the latter.

The Air Ministry wishes it to be known that the Air Inventions Committee, which was formed about nine months ago, has now received and examined upwards of 5,000 inventions and suggestions relating to the Air Service.

It is regretted that, owing to war conditions, a detailed account of their investigations cannot be published, but the experience of the Committee indicates that it may be possible to publish certain information which will facilitate the work both of the inventors and of the Committee.

The following statement has been drawn up with this object in view, but it is realized that it is incomplete for the reason just given. It is appreciated also that inventors are placed at great disadvantages in present circumstances, for, unless immediately connected either with the Air Services or with aircraft manufacture it is almost impossible that they should be acquainted with the most recent developments; so rapid has been the recent rate of progress that it is difficult, even for those in close contact with the Royal Air Force, to keep abreast of all the latest improvements. Again, it is practically useless for inventors at the present time to submit inventions which would necessarily take a long time to develop, the requirements of war and the conditions of labor and material making it impossible for the Committee to support proposals of this nature.

Generally speaking, and as far as the period of the war is concerned, no very startling change in the present type of aircraft is anticipated, although improvements in parts and also in details are always possible and may produce very important results.

The stage of development in construction which has now been reached is such that major improvements can only be expected from those possessing the requisite scientific and mechanical knowledge, skill and experience. Thus, radical changes in the shape of the wings of aeroplane, the body, and the propellers are only possible after long and patient research carried out in aeronautical laboratories.

Again, many inventors have forwarded proposals for helicopters and aircraft of this nature which, if an efficient design can be produced, would possess certain advantages, (but probably not so great as was once imagined); others have suggested flapping wings and rotatory planes. Such schemes do not give any promise of being developed for use during this war, and in any case would require some years of experiment before they could be regarded as practical proposals.

As regards minor improvements, inventors should bear in mind that many details, such as turnbuckles, clips, etc., are now standardized, and a change would only be justified by some very marked superiority.

Safety devices for preventing crashing of the

machine and the pilot form a numerous class. The chief of these is the parachute, either applied by a harness to the pilot or directly attached to the machine. Those who have seen a passenger dropped by a parachute from an aeroplane for exhibition purposes often fail to realize the conditions under which a parachute may have to be used as a safety appliance. Then the machine may be out of control, dropping at a velocity of 150 to 200 miles per hour, or spinning downwards in flames. Many other safety devices, such as automatic stabilizers, wind brakes, etc., have been proposed at various times. The additional weight entailed by the use of any of the suggested safety appliances must remain a very serious factor for so long as war conditions prevail.

The engine is the heart of the aeroplane, and on its reliability depends the safety of the pilot. Persons acquainted only with motor car engine practice sometimes do not realize the exacting conditions under which an aeroplane engine must work. The engine must be capable of running for the whole of the time of flight at its maximum power. The lubrication and ignition must be perfect, and the engine must not become overheated.

The rating applied to aeroplane engines is its weight per horsepower, and engines are now being produced which show surprising results in this respect. Inventions which differ radically from present day practice (such as the internal combustion turbine) have small possibilities of being adopted, for successive design and reconstruction entailing probably several years' work are necessary before satisfactory results can be hoped for. In view of the shortages of materials and labor at the present time no new type can be embarked on unless it is demonstrably superior to existing types and possessed of definite and immediate advantages over them.

A subject which is intimately connected with the power plant is its noise. This constitutes one of the disadvantages of an aeroplane. For night flying a method by which it would be possible to hear from one aeroplane, the approach of another, would be of great advantage. The engine can be silenced without serious disadvantages, but the noise of the propeller and the hum of the wires are so great that silencing the engine is not sufficient.

Many proposals for the projection of bombs and grenades of flame and of poisonous gases have been received.

The trailing bomb or grapnel for attacking enemy aircraft and submarines is a favorite suggestion from inventors. This device was tested before the war and at various times since, but has been abandoned in favor of more effective methods.

Instruments

Many hundred of inventions and suggestions for inclinometers and instruments for straight flying and accurate bomb-dropping have been investigated. Efficient and well designed instruments for these purposes have been available for some time past, but it is quite possible that improved forms may be produced, though it is scarcely likely that this can be done by anyone who does not possess the necessary scientific and mechanical knowledge required for an investigation of this nature.

Some inventors entirely disregard the action of centrifugal force upon pendulum and spirit level devices.

A large number of gyroscopic instruments have been proposed which show insufficient knowledge of the correct application and limitations of a gyroscope.

Anti-aircraft devices of various kinds are constantly suggested, but now contain very little new matter for consideration, as such proposals have received the careful attention of the authorities for a long time past and have been the subject of much trial and experiment.

Any proposals of a practical nature which contain features of novelty and may be of utility are discussed with the assistance of the Air Service.

The Committee fully appreciate the genuinely patriotic motives which inspire most of the communications which they have received, and it is with the object of encouraging the submission of useful and well-considered proposals that this statement is issued. Inventors should, however, bear in mind that the somewhat obvious proposals which might have been useful in an earlier stage of the war, are now no longer serviceable.

By following the general tenor of the above suggestions, inventors will greatly assist the Committee in the execution of their responsible duties.

The Status of the Industry When Peace Came

At the time the armistice was signed contracts had been signed for the manufacture of 95,993 aeroplane motors, of which number 31,814 had been actually manufactured. Of this number 15,131 were Liberty motors. In October 5,603 motors were turned out with a contemplated production of 8,000 in January, 1919, and 10,000 a month for the following four months. In addition to this, 12,000 aeroplanes and 700 kite balloons were manufactured.

These figures and others as interesting in connection with the production of aircraft were made public at an exhibition of aeroplane material held in the State, War and Navy building, Washington, on November 28, before Secretary of War Baker and a gathering of newspaper men.

A DeHaviland Four bombing plane was used as a model to illustrate the strides made in aeronautics. Officials who spoke to the gathering declared that the machine shown was typical of more than five hundred which were awaiting shipment overseas when the armistice was signed. The statement was also made that 38,000 of the type of Marlin machine gun mounted on the DeHaviland had been produced in the past twelve months in addition to 30,000 of the Lewis type.

The names of the concerns engaged in the manufacture of Liberty engines and the number produced by each were announced. The Packard Motor Car Co. made 6,000; the Lincoln Motors Company, 6,000; Ford Motor Company, 5,000; Nordyke and Marman, 3,000; General Motors Corporation, Buick and Cadillac companies, 2,000 each; and the Trego Motors Corporation, 500.

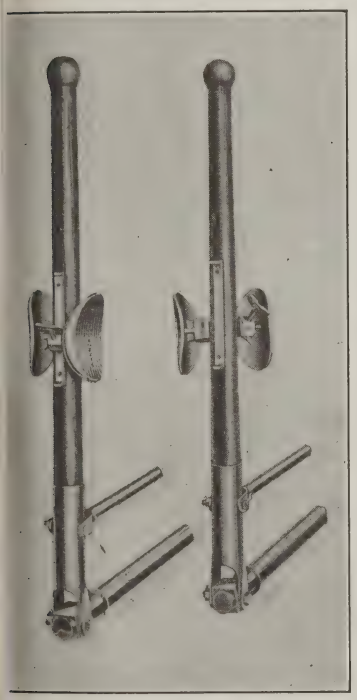
On the subject of spruce and linen some interesting statements were made. It was said that to the United States fell the task of supplying the spruce for the aeronautical programme of the Allies as well as its own. In October of last year 5,000,000 feet a month was demanded while the maximum production only totaled 2,500,000 feet. In the same months of this year the requirements were 20,000,000 feet a month, which was met with a production of 25,000,000. To procure this amount of spruce 30,000 men were employed in the Northwest. To supply sufficient quantity cotton fabric as a substitute for Irish linen, 2,500 looms were manufacturing 1,200,000 yards a month when the armstice was signed. Up to that date more than 13,000,000 yards of fabric had been delivered to the government.

The Warner Duplex Stick Control

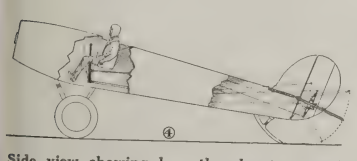
As will be readily seen by those familiar with the stick control, the "Warner Duplex" differs in that both hand and knee grips are provided for the use of the pilot.

When the pilot requires the use of his hands in case of an emergency that might arise, or for operating a machine-gun, or other device, the knee grip at once comes into use. Using the knees, the pilot has full aileron control and all the elevator control necessary for straight flying. It will be seen that the knee control also acts as an effective elevator lock, as the knee plates are formed with vertical corrugations which prevent slippage.

The knee element is so formed that it allows full sweep to the stick when hand operated.



The Warner duplex stick control showing the adjustable knee plates



Side view showing how the elevator can be held in any position by holding the stick between the knees

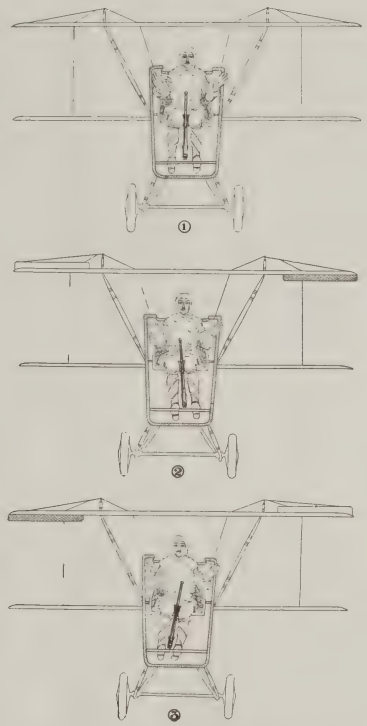


Figure 1.—Stick in neutral position. Figure 2.—Stick moved to the right. Figure 3.—Stick moved to left

The knee grip is made of aluminum and is adjustable to suit the pilot. Adjustment is made on the ground while warning up the engine, after which no further attention is necessary.

Captain R. W. Schroeder, holder of the World's altitude record of 28,900 feet, was one of the first government officers to demonstrate the value of the knee control in a flight from Dayton, Ohio, to Rantoul, Ill., 250 miles, in a training plane so equipped. During this flight he made sketches and notes, having the free use of both hands but at the same time firm hold of the stick by means of the knee-grip feature.

The value of this control for cross-country flying is brought out very forcefully by reports from many of the government aviation fields where it is in use.

In the Aerial Mail Service between New York and Washington, the Warner control has been in use for some months and as an unusual instance of its possibilities, U S. Aerial Mail Pilot Robert Shank reports that he eats his lunch while in flight between New York and Philadelphia as a regular matter of course. Such feats are made possible only by the employment of the knee-grip control.

OUTLINE OF HISTORY OF AVIATION ENGINE PRODUCTION

By Lieut. H. H. EMMONS, U. S. N., R. F., A. S. A. P.

Chief of the Engine Production Department

General Engine Situation

I.

At about the time of the declaration of war, Mr. Coffin, and soon thereafter, Mr. Deeds, were called upon to organize the production of aviation equipment. Naturally, the first point to be determined was what was to be produced. Limited to the engines, it became clear that three courses were open to them:

1. To send a commission of experts abroad to study the engines used by the Allies.
2. To encourage the production in this country of such suitable foreign engines as had already been put in production in the United States.
3. To develop a suitable engine from the talent and facilities available in this country in automobile and allied industries.

Action was taken along each of these three lines.

A commission, comprising Major Howard C. Marmon, Lieut. Col. V. E. Clark and others, was sent abroad and made extensive investigation. The result of this appeared to be that the two best high powered foreign engines were the Rolls Royce and Loraine Dietrich. The Rolls Royce does not adapt itself to American methods of manufacture and the Loraine Dietrich was not at that time completely demonstrated or accepted.

In the United States the General Vehicle Company was attempting, in a very small way for the Allies, to produce the Gnome 100 horsepower rotary engine. Production, however, had not yet started, and facilities and talent for the production of a rotary engine did not exist in this country.

The Wright-Martin Aircraft Corporation was beginning, in a small way, the production of Hispano-Suiza 150 horsepower engines for the Allies. Production had not yet started and the power of this engine was so small that it was apparent that it would soon be obsolete for for fighting purposes.

Both companies, however, were assured of business from the United States Government as soon as they had finished their foreign contracts.

It was clearly apparent that the speediest and most satisfactory method of handling the engine situation would be to develop a distinctive American engine which would adapt itself to American methods of manufacture. Numerous experimental engines had been made by various companies, none of which were adapted to war requirements.

The Hall-Scott Company at Berkley, California, had for several years been manufacturing aviation equipment for use by foreign governments, chiefly in the Orient, and Mr. E. J. Hall, of that company, had traveled in Europe at about the beginning of the war and had inspected the engines made both by the Allies and the Germans.

The Packard Motor Car Company had, for approximately two years, been working on the development of an aviation engine of the 200 horsepower class. This engine had not been flown in a plane but had been successfully used in racing cars. It was, however, too heavy for war purposes, but represented the furtherest advance in this country toward the development of an aviation engine. Mr. J. G. Vincent, chief of the engineering forces of the Packard Company, had, by reason of this development and of his study of the subject, acquired a large understanding of aviation engines.

Mr. Deeds, therefore, called Vincent and Hall into conference in Washington in May, 1917, and on May 29th these two men started the design of an American aviation engine to develop approximately 200 horsepower with 8 cylinders and 300 horsepower with 12 cylinders. They organized a large force of draftsmen and as rapidly as they completed drawings, they were hurried to the Packard Motor Car Company in Detroit, and in its tool room corresponding parts were made. This work was expedited so rapidly that on July 4th, 1917, a complete 8 cylinder engine was delivered in Washington. It was set up at the Bureau of Standards and ran successfully. The development of the engine was pushed rapidly, both at the Bureau of Standards and at the Packard Motor Car Company in Detroit, and the development work on 8 and 12 cylinder engines was hurried forward by a large corps of expert engineers and mechanics.

II.

In August, 1917, the production of aviation equipment was constituted in the Equipment Division of the Signal Corps, and the Engine Production Department was created as a portion of that Division. On that date the writer was put in charge of the Engine Production Department and the real work of producing engines was begun. Engines required fell naturally into three classes:

1. Elementary training,
2. Advance training,
3. Combat.

Elementary Training Engines

As to the elementary training, there were available the following engines:

Curtiss OX, of approximately 90 horsepower,

A-7-A, 4 cylinder engines of approximately 100 horsepower,

Hall-Scott.

Orders were consummated for the production of these engines as promptly as possible.

Advanced Training Engines.—For advanced training, there were available the Gnome 110 horsepower, the LeRhone 80 horsepower, and the Hispano-Suiza 150 horsepower. The General Vehicle Company proceeded with the production of the 110 horsepower Gnome.

The Union Switch & Signal Company have been persuaded to take the contract for the production of the 2,500 LeRhone engines, 80 horsepower type. Their contract has been continued and the Union Swith & Signal Company have delivered up to this date approximately 1,200 of these engines. We have had the assistance of Georges Guillot, the engineer of the French Gnome and LeRhone factories, who pronounces the engine built for the Union Switch & Signal Company to be the best rotary engine ever constructed.

We arranged with the Wright-Martin Company to increase their facilities for the production of the 150 horsepower Hispano type, and their work had such good results that in May, 1918, that company delivered 530 of these engines in one month.

Combat Engines.—As to combat engines, it was clear that the only one available for our manufacturing purposes would be the Liberty, and the test made of it in the months of July and August showed that it functioned properly, and was a satisfactory engine. We therefore started production of it. It was estimated that we would require 22,500 of these engines to take care of the requirements of our Navy and Army. We therefore made contracts as follows:

Packard Motor Car Company—6,000
Lincoln Motors Company—6,000
Ford Motor Company—5,000
Nordyke & Marmon—3,000
General Motors Corporation—Buick—Cadillac—2,000
Trego Motors Corporation—500

The first of these contracts were signed in August, 1917, and production work started immediately.

Difficulties attending production in general grouped themselves as follows:

(a) Machinery—None of the existing motor plants had machinery of sufficient size to handle the parts of the Liberty engines.

(b) Small tools, fixtures and equipment—To produce every part of the Liberty engine requires between 2,500 and 3,000 of such small tools, jigs and fixtures.

(c) Labor—It was soon found that men who were able to make the comparatively simple automobile motors, did not have the skill required to machine parts of Liberty engines.

(d) Unfriendly influence—Some of them were the result of pro-German influence.

(e) Governmental activities—Every Department of the Government was anxious to secure for its special work a large number of tool makers and skilled mechanics.

(f) The Draft—This took a great many men out of this employment.

(g) Materials—The materials required for the engines were of a much higher grade than corresponding material in automobile motors, and work was required to secure proper production of materials.

(h) Transportation and Coal—During the Winter of 1917-

18 the difficulties of transportation and of securing fuel were at times almost insurmountable.

III.

Development of Liberty 12

The Liberty 12 cylinder engine as originally designed was of the 300 horse power class, producing approximately 330 horse power. All the parts of the engine were designed to stand the stresses incident to this horse power. An Aviation Engine is required to have the lightest possible weight with the maximum of power developed; therefore, each part is strained almost to its limit.

When we had succeeded in getting tools and equipment to build this 330 horse power type and had produced approximately 300 of them, we were advised by authorities in France that higher horse power would be required. By readjustment of the parts the engineers stepped up the horse power of this engine to 375, with the result that certain of the parts would not stand this strain, notably the crankshaft, and it was necessary to stop productive efforts and increase these parts to stand this additional power requirement. After several weeks' work this was accomplished and when we had produced approximately 500 of this type we were again notified that an increase in power would be required and that what would be needed for the Summer of 1918 would be 400 horse power or over. We, therefore, again delayed production while the engineers re-arranged the engine parts so that the engine would develop approximately 440 horse power. The resulting strain placed on all the parts of the engine was too great. We were obliged to enlarge and strengthen crankshafts, connecting rods, bearings, etc., etc. together with all the adjacent parts. It became necessary to change the metallurgical specifications, which resulted in changes in the methods of the steel mills. In increasing the size of the parts all of the jigs, tools and fixtures in the machine building plants, the parts factories, forging shops, etc., were rendered obsolete and we had to construct new equipment to meet all these conditions, in order to meet the requirements as given to us by our Aviation authorities in France.

The extent and magnitude of these changes so required is illustrated by the fact that the engine, when competent to develop 330 horse power weighed 765 pounds without water or oil, while, when it was competent to develop 440 horse power, it weighed 860 pounds.

In spite of this difficulty, on May 29, 1918, one year after the first scratch of the pencil toward the design of the engine was made, we had produced and delivered into Service 1,100 Liberty 12 cylinder engines. This is an accomplishment which has not been equalled heretofore in this or any similar industry, either in this country or elsewhere.

IV.

Much agitation had centered about the assertion that thousands of changes were made in this engine. This agitation is entirely incorrect and unfounded. The changes arranged themselves in three groups:

(a) Design
(b) Increase of power
(c) Manufacturing limits

(a) As to design—there have been but two changes in the design in this engine since it was first laid out in May, 1917. One of these was to change the oil system from the so-called scupper feed to forced feed. Either system worked properly on the engine, but the latter system is fool-proof while the former is not. We, therefore, substituted the latter system. The other design change was an alteration in one part of the connecting rod to alllow the rod to have sufficient play without cracking.

(b) The changes due to increasing the horse power twice are covered by the foregoing subdivision. These were the results solely of the demands of our Aviation authorities that the power be increased.

(c) In manufacturing—As the engine was used in Service and as the manufacturing progressed, it became evident that some of these limits should be changed and this action has been followed. This is the common practice in all manufacturing establishments. It has always been so on automobile motors and will always be so on any manufactured product. As new manufacturing processes are developed and as experience is gained manufacturing changes are always expected and are always made.

Therefore, the agitation about changes in the engines, when examined and understood, is unfounded.

V.

The writer procured an order from the head of the Equipment Division looking up the development of this engine in the Detroit District in charge of Major Heaslet, formerly Vice-President of the Studebaker Corporation; Major Hall and a committee of manufacturers composed of:

H. M. Leland, of the Lincoln Motors Company,
C. Harold Wills, of the Ford Motor Company, and
Messrs. Bell and Roberts, of the Packard Motor Car Company.

No abler men on engines and motors exist in the industry and it was clear that by devoting their entire time solely to this engine and by avoiding interferences with their efforts, we were adopting the very best possible method of securing quick and reliable results. Resulting production, which will be hereinafter detailed, demonstrates that this course of action was the proper one to be followed.

VI.

The same method of concentrating authority was applied to other engines, including:

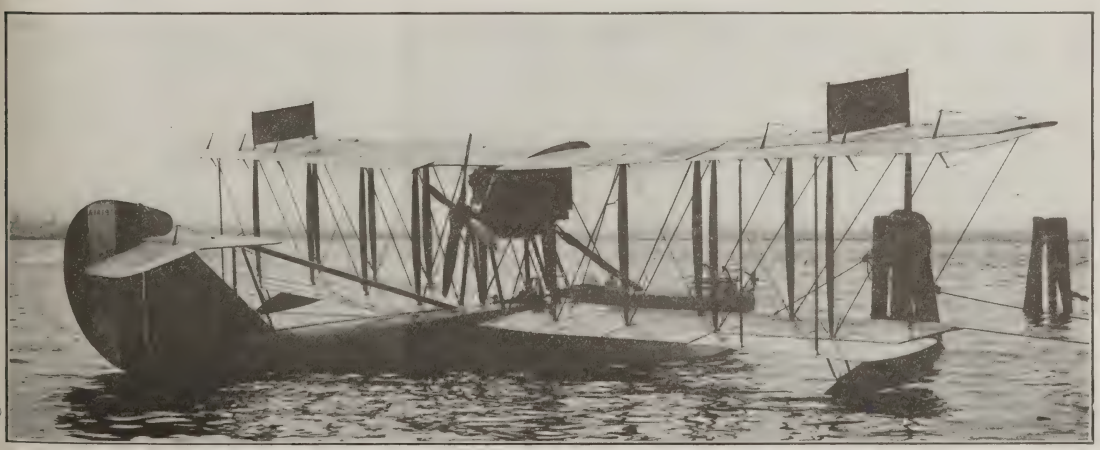
Hispano-Suiza	150 H.P.
Hispano-Suiza	180 H.P.
Hispano-Suiza	300 H.P.
LeRhone	80 H.P.

VII.

Productive Results.—During July, 1917, the Signal Corps had purchased a miscellaneous assortment of small engines which could be secured in this country, none of which proved of any substantial benefit.

Real production began in August, 1917. The following table shows the total production of engines by months from that date to the present time:

1917—July	66
Aug.	139
Sept.	190
Oct.	276



The Model H. S. 2 L. Flying Boat, constructed by the Standard Aircraft Corporation

	Nov.	638
	Dec.	595
1918—	Jan.	705
	Feb.	1,004
	March	1,686
	April	2,214
	May	2,517
	June	2,604
	July	3,151
	Aug.	3,625
	Sept.	3,801
	Oct.	5,297
	Nov.	3,305
	Total	31,813

VIII.

The production of engines as to types is as follows:

OX-5	8,412
Hispano-Suiza	4,101
LeRhone	1,178
Lawrence	451
Gnome	280
A-7-A	2,250
Bugatti	11
Liberty	15,131
Total	31,814

The total amount of horsepower produced up to November 22, 1918, is as follows:

OX-5	757,080
A-7-A	225,000
LeRhone	94,240
Hispano-Suiza 150	532,350
Hispano-Suiza 180	97,920
Hispano-Suiza 300	2,400
Liberty	6,052,400
Bugatti	4,400
Lawrence	10,824
Gnome	30,800
Total	7,807,414 H.P.

The results achieved by the Liberty Engine were so satisfactory to the Allies that commencing in June, 1918, they were very insistent in placing with us large orders for engines. It has become apparent that we would need additional sources of engine supply over and above the 22,500 which was originally planned for our own Army and Navy. We, therefore, increased the number of manufacturers by adding the three plants of the Willys-Overland Company at Elmira, Elyria and Toledo, and also the Olds Motor Company at Lansing, Mich., to the list of Liberty Producers. We also placed orders for 8,000 8-cylinder Liberty engines with Willys-Overland and the Buick Motor Company at Flint, Mich. When this was completed we had placed orders for engines as follows:

IX.

OX-5	9,450
A-7-A	2,250
Gnome	342
LeRhone	3,900
Lawrence	451
Hispano-Suiza 150	4,000
Hispano-Suiza 180	4,500
Hispano-Suiza 300	10,000
Bugatti	2,000
Liberty 12	51,100
Liberty 8	8,000
Total	95,993

Our production of engines of all types during October was 5,603, of which 3,878 were Liberty 12-cylinder. Under the above increased contracts we would have produced during January, 1919, 8,000 engines per month, which would have increased during the succeeding four months to a production of 10,000 engines per month.

X.

The best-known engine which is comparable to the Liberty is the Rolls-Royce, which is the most prominent English engine. Our advice last summer from the English authorities was that the largest weekly production of Rolls-Royce engines had been 59, and that the average weekly production was 45 engines. It will be noted that during the month of October we were producing over 150 Liberty 12-cylinder engines per working day.

The Rolls-Royce engine develops approximately 100 horsepower less than the Liberty and weighs approximately 100 horsepower more than the Liberty.



Major Booth, who flew from Selfridge Field to Mineola

During the month of October we produced of all types of engines a total of 5,603. This is more than the total production of France and England during one month during the four years of the war.

XI.

By following the foregoing method of production, we have achieved the following results:

1. Designed, developed and put into production during one year a 400-horsepower type of perfectly satisfactory performances.
2. Designed, developed and produced within 18 months over 15,000 of these engines.
3. Produced during 18 months engines of all types totalling 31,814.

XII.

No production of a foreign type of engine would have produced any corresponding result. The difficulties, troubles and delays would have at least equaled those experienced on the Liberty, and the result would have been much less satisfactory.

That the result has been satisfactory is apparent from the entire course of aviation during the past few months, which is illustrated by the three following incidents:

1. The English aviation authorities cabled in June, 1918, that the Liberty engine test had shown it to be a satisfactory aviation engine, and that it was America's greatest contribution to the aviation activities of the war.

2. Count Poiniatowski, who is the official representative in this country of the Hispano-Suiza Company, stated that Mr. Birkight, who is one of the leading French aviation engineers, after examining the first three Liberty engines sent by us to France, stated that they excelled any engine of that type or size which had been developed in France.

3. The experience of the aviators on the front and their opinion of the Liberty engine as given to us by Major Brett on his return from France, is that it is the most satisfactory engine to operate, that was available to them.

XIII.

The foregoing, except the numerical portions, has been dictated hurriedly and without oportunity for revision and correction. It is believed that all statements contained in it are correct, but slight alterations might be required upon a more careful revision.

Bureau of Aircraft Production Statement Regarding Aircraft Program

The Bureau of Aircraft Production is charged with the design, purchase, production and inspection of all material special to the Air Service.

There have been produced in this country during the period of the present emergency in excess of 12,000 airplanes, 30,000 aviation motors and 700 kite balloons, together with a vast variety and quantity of accessories therefor.

In arranging this exhibit it was evidently impossible to illustrate all of the products involved. The exhibit, therefore, is concentrated on the DeHaviland Four Plane, which is an observation machine of advanced type, and is the American built plane which has been extensively used over the front in France.

The front half of the fuselage shown is one of over 500 machines lying at port awaiting shipment overseas when the armistice was declared; it is a regular stock machine and is in no way especially prepared for this exhibition.

The accessories shown around the room are all parts of the equipment of the same DeHaviland Four Plane. At no time are all of these accessories installed on the plane at the same time, the particular installation depending on the service required. Nevertheless, all of the accessories must be furnished, and the machine must be designed to take each and every one of these accessories when required. Your particular attention is called to the wide variety of technical and manufacturing resources required to complete a fighting airplane.

In the production of airplanes, the limit has always been the possibility of engine production. Consideration of the vast investment in factory and machine tools, and the extremely high character of the workmen required, the reason why this is so is indicated.

It is felt that the second limiting point lies in the accessories, including instruments, armament, bombing equipment, radio equipment, photographic equipment, oxygen apparatus and the special clothing and personal equipment of the aviator.

The actual construction of the airplane is less difficult, as the investment in machinery and tools is much less, and the labor involved relatively less skilled.

The special raw materials for aeroplanes have involved vast industrial operations, examples of which are:

Spruce

It fell to the United States to supply the spruce for the entire air program of the Allies and the United States. In October, 1917, these requirements were 5,000,000 feet per month, with only 2,500,000 feet per month being produced. In October 1918, the requirements were 20,000,000 feet per month with over 25,000,000 feet being produced.

These operations involved 30,000 men in the Northwest. It should be borne in mind that lumber actually usable in the airplanes is a relatively small percentage of even the best logs.

Fabric

Early in the war it was evident that the Irish supply of linen would fail. Cotton fabric for aeroplane use was developed in this country and at the time of the signing of the armistice, about 2,500 looms were producing about 1,200,000 yards per month of aeroplane fabric. There had been delivered up to that date a total of over 13,000,000 yards of aeroplane fabric.

The balloon cloth is of finer weave and 3,200 looms were required to produce about 720,000 yards per month.

Armament

1. The guns on an aeroplane consist of fixed machine gun in front which are aimed by pointing the entire plane and, in case of a two-place machine like the DeHaviland-4, the gunner in the rear has flexible machine guns which he can aim in almost any way.

2. These guns are special, different from other machine guns, and to a large extent require special ammunition. There is almost no part of the entire armament equipment of an aeroplane that is not special.

3. After the declaration of war, the only quickly available arm for the fixed forward gun was the Marlin type. The Browning had not yet been developed, therefore, the Marlin was adopted and has been eminently satisfactory, and, in fact, equals the very best on the front.

4. The synchronizing of the gun, that is to say timing the shots from the engine, so that the shot would fire through the propeller without striking blade of the propeller, is a problem never before solved for the Marlin gun and it was necessary to develop the synchronizing device, which permits firing the shots through a propeller revolving, its speed varying from 600 to 1,650 revolutions per minute.

5. The mounting of the Marlin gun, including provisions for ammunition, discharge of the empty shells and discharge of the disintergrading steel belt, was in itself a complicated problem.

6. For the flexible gun shown on the rear cock-pit of the DeHaviland-4, the Lewis gun, the only machine gun not using a belt, was adopted. This involves re-designing the gun taking United States ammunition, increasing ammunition capacity 47 to 97 rounds per container, is part of the problem as was the flexible mounting which is before you.

7. The gun sights involved special lenses, previously made in Germany. The development of optical glass in this country, is a story by itself.

8. The greatest credit is due to the engineers of the ordnance department of the Savage Arms Corporation and of the Marlin-Rockwell Corporation for the wholehearted way in which they at their own expense as far as the latter two are concerned, conducted experiments night and day to solve these problems.

9. Production question involved to develop from nothing on two types of aircraft machine guns to actual shipments in less than twelve months of about 30,000 Lewis flexible type and 25,000 Marlin fixed type, is worthy of note.

10. The fact that special ammunition is required for aircraft service should be remembered. The special cartridges, including armor-piercing, incendiary bullets and tracer bullets, the latter showing a trail of smoke in the air indicating to the gunner the direction of fire.

Bombs

Much public discussion is heard of bombing from airplanes. The DeHaviland Four Machine shown may be used as a day bomber. The various bombs and bomb dropping devices are shown at the side of the room.

Demolition bombs used to destroy permanent structures are made in sizes varying from 50 pounds to 1,000 pounds.

Fragmentation bombs for use against troops. They are bombs that explode just above the ground and send small fragments in all directions.

Incendiary bombs are made in two forms: one to scatter small burning particles over a large area, the other for a more concentrated flame.

Parachute flares are a form of bomb to light the target in night bombing. They are interesting as they contain a complete parachute which supports a flare to drop slowly

(*Continued on page* 679)

ACTIVITIES AT THE PHILADELPHIA NAVAL AIRCRAFT FACTORY

WE are enabled to present this week an exclusive and unusual group of pictures, illustrating the work being done at the Naval Aircraft Factory at Philadelphia.

The work at this establishment was covered in a recent report from the Office of Naval Operations, which stated in part:

Previous to the declaration of war the Navy had maintained but one air station. This was a small but complete and active station at Pensacola, Fla., which was used for instruction and experimental work. The personnel of aviation at this time consisted of about 30 line officers of the Navy, Marine Corps, and Coast Guard, who were trained as aviators, and 300 men. The aircraft in use consisted of a variety of American and foreign types which had been purchased by the department. Owing to the limited facilities and small appropriations, the results of these activities were not very extensive.

The Naval Reserve Flying Corps, was established by law in 1916, but it was not until February, 1917, that a definite interpretation was placed on this law and that enrollments in the Naval Reserve Flying Corps actually began. The officers who received training in aviation had been regarded as having been detailed for special duty in connection with aviation. The law passed by Congress in 1916, authorizing the Naval Reserve, included not only a reserve to be attached to the fleet but the Naval Reserve Flying Corps. Accordingly when war was declared steps were taken to enroll and train a large number of men for ultimate qualification as pilots. In addition, facilities were provided for the training of a large number of men specialized in the various functions pertaining to aviation, and at the present time schools are in operation for the training of pilots, mechanics, gas-engine experts, communication officers, etc.

On October 2, 1918, the total strength of naval aviation was approximately 40,383 officers and men. Of this number, 16,621 are now abroad and actively engaged in operations against the enemy. This increase in the aviation personnel of the Navy since the beginning of the war has called for an enormous expansion of training facilities. When the training program was first put into operation there was but one ground school. This school provided at that time training facilities for about 300 men. At the present time this number has been increased to 1,200, and, in addition, schools have been established in the Central West and near the Pacific Coast. For the training of airship pilots a school was established in Ohio, and the department is now contemplating the establishment of an additional school.

It was evident to naval authorities that one of the most important ways of assisting the allies was to engage immediately in the anti-submarine warfare. In order to bring the United States to the point where the most good could be accomplished with the facilities immediately available, various methods of combating the submarine were carefully considered. As a result, it was decided to establish coastal patrol stations, both in this country and abroad.



Commander Coburn in charge of the Naval Aircraft Factory at Philadelphia

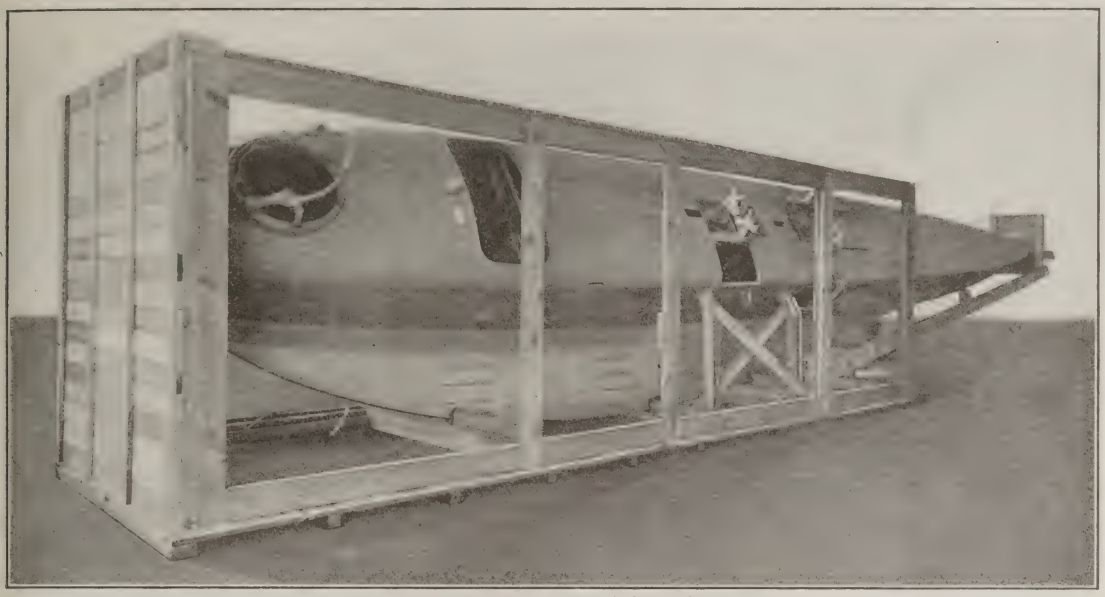
Construction of stations in the United States was started immediately, and today practically the entire eastern Atlantic coast is being patrolled by naval aircraft, and the Navy Department is prepared to extend these operations along the Gulf and Pacific coasts. In addition to seaplane-patrol stations, airship and kite balloon stations have been put into operation, and, in order to attain the greatest possible efficiency and cruising radius for seaplanes, rest and supply stations are being located in the most advantageous points.

The increase in the number of stations abroad has been fully as great. The month following the declaration of war 5 naval aviators and 100 enlisted men were sent abroad, and these forces were the first forces of the United States to land in France for service against the enemy. The bodies of three of these men are now buried in France, and two others were killed in seaplane accidents. Since the arrival of this first expedition abroad, stations have been established not only in France, but in England, Ireland, and Italy as well. In order to appreciate more fully the magnitude of this achievement, it may be said that it has been necessary to ship from the United States practically all the material for these stations, which includes, hangars, machinery, and, in a word, everything that will eventually be used at these points.

During the month of September, 1918, aircraft engaged in patrol flights in the United States covered a total distance of 404,775 miles. Aircraft engaged in training flights covered a total of 1,317,460 miles during the same period. It is not considered advisable to give out actual figures regarding the operations at foreign stations. The work abroad has gone forward steadily, and the results obtained are becoming more and more important. A recent announcement by the Navy Department to the effect that American naval aircraft successfully attacked and destroyed a German submarine, is only one illustration of the work that is being done over there. The stations, in addition to carrying out active anti-submarine patrols, have been engaged in assisting vessels of



Completing flying boat hulls in one of the sections of the Naval Aircraft factory



Crating a hull for shipment—one of the smaller types

the fleet in convoying troops and merchant ships.

On April 27, 1918, an American airship abroad made a continuous flight for 25 hours and 43 minutes, during the course of which three convoys were escorted for 13 hours and 50 minutes in a zone which was mined and patrolled. In recognition of this accomplishment the French Minister of the Marine officially complimented the American forces, saying that "such an ascension of 25 hours and 43 minutes, which constitutes by its duration a remarkable performance, gives us proof of the most excellent qualities of endurance, of energy, of sangfroid, and of technical ability of the American forces."

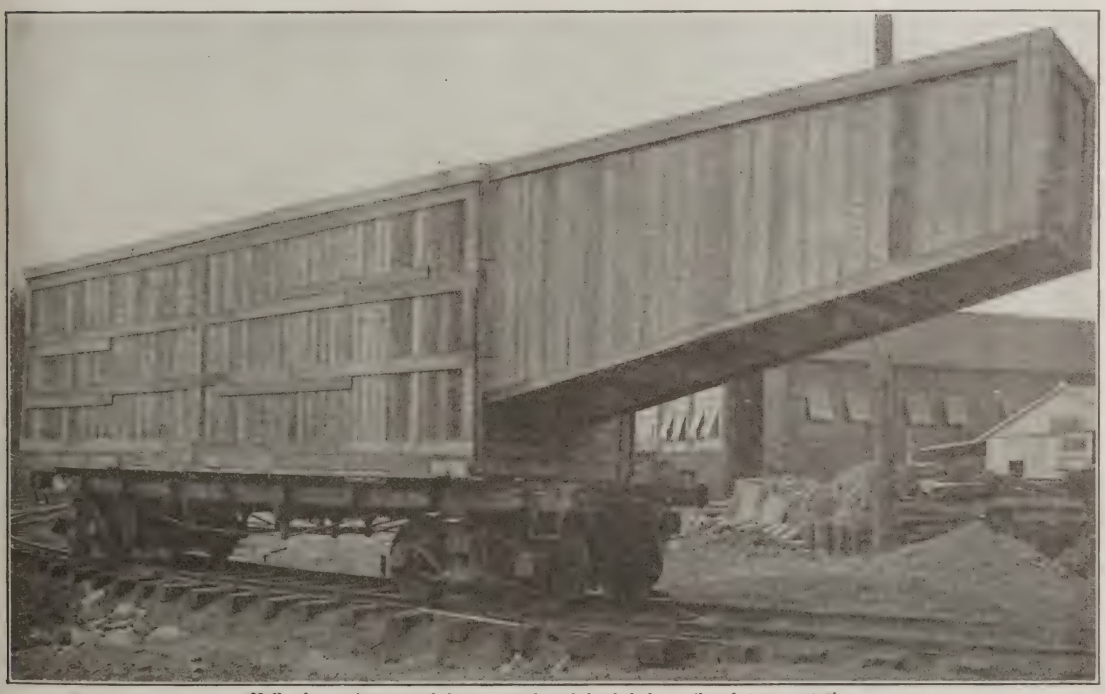
In addition to the activities mentioned above, the Navy Department decided to organize an expedition to destroy enemy submarine and naval bases. The personnel and material of this expedition was organized in the United States and later sent abroad. On August 15, 1918, it was announced that operations had been started by bombing and destroying enemy bases in Belgium. The scope of the activities of the expedition have since been increased and the original forces augmented from time to time.

When war was declared on April 6, 1917, 93 heavier-than-air seaplanes had previously been delivered to the Navy and 135 were on order. Of the number that had previously been delivered, only 21 were in use, the remainder having been worn out or lost. The seaplanes were of the N-9 and R-6 types, which are now considered as training seaplanes.

After eliminating types which had been tried and found unsuitable, the department fixed upon two sizes for war purposes which had been perfected in the United States in anticipation of the development of a high-powered engine. The engine developed is the Liberty. The flying boat, which, at the present time, is strongly favored, is an American conception, and it has not been found necessary to copy foreign patterns to insure our flyers being supplied with the best. With this development of the heavier-than-air craft came the development of airships and kite balloons.

With the development of suitable planes and

(*Continued on page* 681)



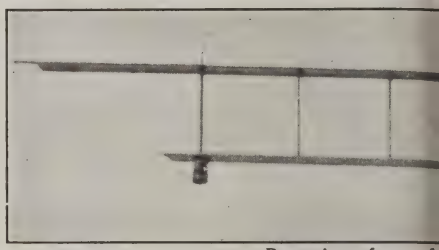
Hull of a twin-motored boat crated and loaded for railroad transportation

ACTIVITIES AT THE NAVAL



The keel of a 5LA Flying Boat

The photographs on this page bear excellent testimony to work of Naval Constructor Coburn, who has had charge of the Naval Aircraft Factory at Philadelphia and of Lieut. Com. R. B. Macdonald and the other efficient members of the manufacturing and engineering staff

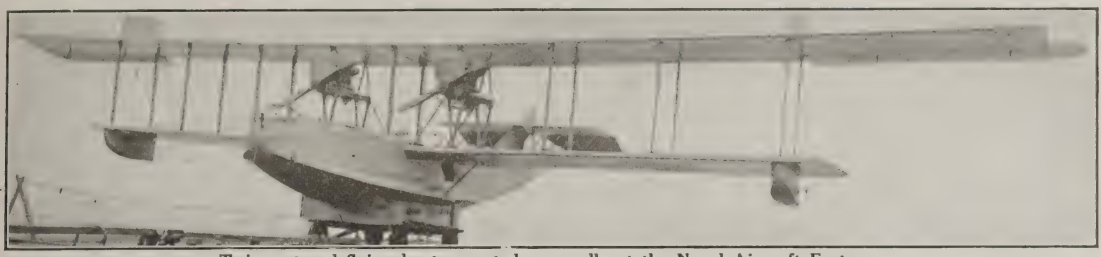


Rear view of one of

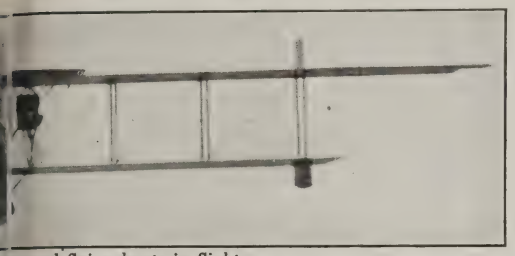


Assembly room of the Naval Aircraft Facto

'T FACTORY AT PHILADELPHIA



Twin-motored flying boat mounted on cradle at the Naval Aircraft Factory



-otored flying boats in flight

Through the energies of the Naval Aircraft Factory executives over 400 seaplanes were shipped abroad and 500 were put in Naval Air Service stations in America. The majority of the overseas boats were used off the coast of Ireland



forty twin-motored flying boats being assembled

THE HUGHES AIRCRAFT REPORT

(*Continued from last issue*)

Fifth: Conditions in Manufacturing Plants

The conditions in certain plants engaged in the manufacture of aeroplanes were unfavorable to production, not only because of lack of experience and the absence of mechanics trained in that class of work but because of defective organization and want of efficiency. The Dayton Wright Aeroplane Company had the difficulties inherent in a new organization, but in view of the changes that were required in the course of production it would be impossible to define to what extent, if any, production was retarded by reason of the fact that the organization was a new one. The lack of competent organization at the North Elmwood plant (Buffalo) of the Curtiss Aeroplane and Motor Corporation is commented upon later (*post*, pp. 150, 156), but in view of the cancellation of the Bristol order it need not be considered here. Whatever delay there was, was in the course of an atempt to make an impossible plane. At the plant of the Standard Aircraft Corporation conditions were also far from satisfactory, but for the same reason, so far as service planes are concerned, its capacity for production was not put to a proper test. It should be added that at this plant the first Handley-Page was assembled and successfully flown within ninety days after the company had been given full charge of the matter.

There have not been lacking indications of sinister influences at various plants. The opportunities of workmen at aircraft plants to retard production or to injure material and product are quite obvious and the necessity of keeping the plants free of enemy influences is emphasized in another part of this report. But, so far as the delays in production of service planes are concerned, it is impossible in view of interrupted work and changing plans to attribute the delays in any definite measure to such a cause.

Sixth: Changes in the Liberty Engine

In any proper estimate of what should have been accomplished in carrying out the aircraft program it is necessary that regard should be had to the development of the Liberty motor. The aeroplane must have its motor, and it was inevitable that in the development of a new high-power aeroplane engine, with the object of securing higher power with a lower weight per unit of power, that changes would be found necessary. Needed improvements were constantly suggested by experimentation, and the number of changes looms very large in the testimony of the experienced engineers who were endeavoring to get into quantity production. It is unnecessary to attempt a review of these numerous changes, for whether time could have been saved by greater expertness is a matter of opinion, and in view of the time that has frequently been spent in the development of new types of motors, there is slight ground for criticism by reason of loss of time in perfecting the Liberty motor. The difficulties were inherent in the task and the task itself was worth while. As has been said, there was no reason why the development of the Liberty motors should have stood in the way of the production of other motors, such as the Hispano-Suiza for use in single-seater pursuit planes to which the Liberty engine was not adapted. But, so far as the heavier observation and bombing planes are concerned, the weight of opinion is that it would have taken about as long to put any other high-power motor into successful quantity production in this country, according to our methods of manufacture, as it has taken to develop the Liberty motor. The attempt to secure planes and motors through foreign production for service pending this development has already been reviewed. By pursuing different methods it is possible, as testified by Lt.-Col. Hall, that there might have been a small preliminary production of Liberty motors two or three months earlier, but, making due allowances for the inevitable course of experimentation, the Liberty motor could not have been put into large production much earlier than it was. What has been called the "immaturity" of the Liberty motor placed a time limitation upon the program for the planes that were made to take this motor, but it may be observed that by May 4, 1918, 778 Liberty motors (U.S. 12s) had ben made, of which 390 were taken by the Army, and only 36 DeH-4s had at that time been delivered, and no other Army planes to take this motor were available. It can hardly be said that unnecessary delays in service-plane production, caused by bad organization and lack of a settled design, were excused by unforeseen difficulties in the development of the Liberty engine; and it should also be observed that if, in the light of general experience in motor building, delay in the development of the Liberty engine was to be feared, there was the greater reason for making sure, to the full extent of ability, of the immediate production of single-seater pursuit planes for which other engines could be provided.

Eighth: Contractor's Profits

Under the various fixed-price contracts, it is probable that large profits have been gained, but definite information as to their extent would not be available without a survey in detail of manufacturing conditions and costs in a considerable number of plants,—an undertaking which would have been wholly impracticable in this inquiry. The profits allowed by the cost-plus contracts present a distinct question.

The justification for cost-plus contracts was found in the fact that the undertakings were novel and that the manufacturers did not have accurate data upon which to make a satisfactory estimate of the cost of production. This was conspicuously true in the case of aeroplanes of types with which manufacturers in this country had been unacquainted previously. For production in large quantity either new plants or greatly enlarged facilities at existing plants, as well as special tools, would be required to meet an exigency of uncertain duration, and it would also be necessary to procure the requisite labor and materials for the new undertakings in a rising market and to provide working capital for long periods. And, while motors had been manufactured here upon a large scale, the newly-designed engines for the service aeroplanes required such a reduced weight per horse power and such delicacy of construction that it was felt that the enterprise had many elements of uncertainty. In these circumstances, it was not an unreasonable conclusion that if contracts for the new types of aeroplanes and for the new engine were offered solely on a fixed-price basis, either manufacturers would not undertake the work or would insist upon high prices as a safeguard against the chances of ultimate loss. It was deemed inexpedient for the Government to undertake the manufacture directly, and it was decided to adopt the alternative of an assumption by the Government of the cost of manufacture through contracts upon a cost-plus basis. This practice, however, could not properly outlast the reasons which may have justified it at the outset. Contracts of this sort lead to waste, foster abuses, and impose an almost intolerable burden of cost accounting, in itself a hindrance to rapid production. Early in this inquiry it was abundantly shown that it was highly important to establish reasonable fixed prices whenever experience afforded a fair basis for estimates.

The principal features of the cost-plus contracts for aeroplanes and engines may be said to be these:

(1) The payment by the Government of the contractor's outlays for labor and materials and for the overhead charges incident to the work;

(2) The payment by the Government for special tools and certain 'increased facilities' located in the contractor's plant, but owned by the Government;

(3) Reimbursement by the Governor for depreciation;

(4) A fixed price to the contractor; and

(5) The fixing of an estimated cost, or 'bogey,' and a division of whatever saving was effected under this estimate so as to give 25 per cent. of this saving to the contractor as additional profit.

It will be observed that by this method the contractor is assured not only the payment of the cost of labor and material used in the process of manufacture, but of administrative outlays for management and supervision, and an allowance for depreciation of plant. To the extent that these payments are made promptly and at short intervals, the working capital required would be reduced. Provision has also been made for the supply of needed assistance by means of advances through the War Credits Board where these are deemed to be justified. The contractor is guaranteed a certain profit regardless of cost. This is called the 'fixed profit.' And finally, the fixing of a 'bogey' cost—was designed to counteract the temptation to wastefulness by giving the contractor a substantial share in the fruits of economy. And it may here be noted that, the popular impression that under this form of contract, the contractors receive the same amount of profit, however wasteful they may be, and have no incentive to avoid unnecessary outlays, is without foundation. The bogey costs were in all cases placed so high that the contractor had every reason to expect that the actual cost would be much less and that through its share in this saving the contractor would be able to derive an increased profit from economical management. It is apparent, however, that with a large fixed profit guaranteed the incentive to economy is not as strong as when the entire venture is at the contractor's risk. And particularly when interruption of work and changes in design vex production managers, and it is difficult to maintain economical methods, there may easily be bred an indifference to an excessive cost where its burden falls upon the Government. At least this is to be inferred from conditions in certain plants, and the conclusion is unescapable that the cost-plus system of contracts for the manufacture of commodities, as distinguished from such contracts for mere service, is a vicious system and is to be tolerated only during such period as it is found to be absolutely necessary to secure immediate production.

The fact, however, that a cost-plus system is deemed advisable for a time does not justify an exorbitant fixed profit. It has already been pointed out in the case of the Dayton Wright Aeroplane Company that the contract for DeHaviland-4s originally called for a fixed profit of $875 per plane. This was arrived at on the basis of 12½ per cent. of the bogey cost of $7,000. This, however, was not an actual cost, and, as the event has shown, was very far above the actual cost. If it had been thought fair that there should be a profit of 12½ per cent. per unit produced, it would have been a simple matter to have given this percentage of the actual cost, as the actual cost was to be ascertained in the course of the accounting, and provide for payments from time to time on account. There is no conceivable reason for giving a percentage of the bogey cost, if the object were merely to assure the contractor a profit equivalent to a given percentage of cost. The actual cost of the DeHaviland-4s at the plant of the Dayton Wright Aeroplane Company, despite all the difficulties of production and the enhanced cost of the first lot of machines produced during a period of many changes in design, is understood to be under $4,400. A fixed profit of 12½ per cents on the actual cost of each machine would have been about $550, instead of the $875 which was fixed by making the calculation on the bogey cost.

Again, in a contract for manufacturing articles at the contractor's plant, the agreed profit upon a cost-plus basis should have a proper relation to the contractor's actual investment and risk. The contractor is not only reimbursed for his outlays for labor and material but for expenses of management included in overhead charges,—including such reasonable salaries of officers, managers, etc., as may properly be allocated to the Government work. There is no sacred formula by which the Government is bound to pay a profit per unit of production regardless of the time in which capital is turned over. The extent to which the Government supplies the needed working capital, either by payments on account of work and materials supplied or through advances, should also be considered. A percentage of outlays, or of a bogey cost, although small in itself, may give an exorbitant profit as applied to each unit of a large production.

Service Aeroplane Contracts.

In the case of the Dayton Wright Aeroplane Company the paid in capital was $1,000,000, invested in plant. Advances by the Government to the extent of $2,500,000 were authorized and in December and January last advances of $1,000,000 were actually made. These were followed by additional advances, and the balance of total advances on June 30, 1918, was $1,405,222.57. Approximately $750,000 of the money thus borrowed from the Government at interest is represented by investment in fixed assets. The plant is exclusively devoted to Government work and outlays for labor, materials and overhead, as provided in the contract, are met by the Government.

The operations of this Company relating to production may be said to have begun about August 1, 1917. The total fixed profit on the 400 Standard-J planes was $620 per plane and the fixed profit on the 4000 DeHaviland-4s was $875 per plane, making a total of $3,748,000. With the saving as now estimated of approximately $2600 under the original bogey cost of $7000 the additional profit of 25 per cent. of this saving would amount to $650 per plane, making the total profits on the DeHaviland contract about $1525 per plane. At the present rate of deliveries the contract for 4000 DeH-4s will be completed before March 1st next. The total profits on the 4000 DeH-4s would have amounted to upwards of $6,100,000, and it is safe to say that including the profit on the Standard-J planes, the Company would have earned a profit of more than $6,350,000 under the original contract. This does not include whatever profits would have been made on its experimental contract or on the spares for DeH-4s. It should also be added that under its contract it was provided, in substance, that at the completion or cancellation of its contract the Government should pay the difference between the cost of its plant, including real estate, building, machinery and appliances built or otherwise acquired for the performance of the contract, less what was found to be the fair market

value at the time when the contract was completed or cancelled, and that in determining (through a board of appraisers) this fair market value, the need or requirement of such a plant in the neighborhood and the probability of securing a tenant promptly, or having an established business available, should be considered as one of the important factors.

In the case of the Fisher Body Corporation, which had the other large order for De-Haviland-4 (4000), as well as an order for 400 Standard-Js, the profits would certainly not have been less. Instead of establishing a new plant, as did the Dayton Wright Company, the Fisher Body Corporation had already effected a highly efficient organization and had an established plant which required, however, a considerable expansion of plant facilities and special equipment. The net investment in fixed assets, including building, land and machinery, which was made by the Fisher Body Corporation for the Government work amounted, to May 31, 1918, to $860,849.05. The Corporation was aided by an advance through the War Credits Board of $2,000,000, made last December. Waiting for the necessary drawings, it got into production later than the Dayton Wright Company and up to October 11, 1918, had only delivered 452 planes. But it should complete its production of the entire 4000 within the next six months.

As already stated, in accordance with letters obtained at the time the contracts were made with the Dayton Wright Airplane Company and the Fisher Body Corporation, which promised an equitable readjustment if it was found that the bogey cost was too high, it appears that contracts are now being negotiated for the reduction of the bogey cost of the DeH-4s to $5000 and the fixed profit to $625 per plane. The total profit per plane with the percentage of saving (exclusive of profit on spare parts) under the new contract would amount to about $775 per plane, or $3,100,000 in all, which with the profits on spare parts would make the total profit on the DeHavilands not less than $3,500,000.

Liberty Engine Contracts

The bogey cost, as first fixed in the contracts for Liberty engines was $6087. This was approved by Mr. R. H. White, of Cleveland, and Mr. Henry May, of Buffalo, to whom the propriety of the estimate had been submitted by the Secretary of War. The fixed profit as originally stipulated was 15 per cent. of this bogey cost, or $913.05 per engine. Lieut.-Col. Hall (who had had large experience in engine manufacture) testifies that he made an estimate about the time that contracts were being let, and told Colonel Deeds, that $2400 would cover the cost of labor and materials for the Liberty engines, without overhead charges.

In December 1917, the bogey or estimated cost was reduced to $5000 and the fixed profit put at 12½ per cent. of this sum, or $625 per engine, and the contracts with the Packard, Lincoln, and Nordyke & Marmon Companies were modified accordingly. This was in consideration of further allowances for depreciation and provision for advances by the Government. In last May, the contract with the Ford Motor Company was modified by the same reduction of the bogey cost and fixed profit. The contracts with the General Motors Company were put upon the same basis.

Even at this reduced bogey and percentage, the profits allowed were very large.

By September 6, 1918, that is within a year from the date of the contract, the Packing Company had delivered (according to the Government's report) 3100 Liberty-12s, and the agreed fixed profit on these amounted to $1,937,500. In the following month it produced 560 and it should complete its deliveries of the 6000, first contracted for, not later than January, 1919, and on these 6000 engines the agreed fixed profits would be $3,750,000. This profit it would earn within seventeen months after it received the contract, and if it could have completed the deliveries as contemplated when the contract was made, that is according to contract schedule, the profit would have been earned in eleven months. Only the fixed profit has been mentioned as this was definitely guaranteed, but in addition to this the Company was entitled to 25 per cent. of its saving under the bogey of $5000. The Government's estimate is that the actual cost of the first 600 Liberty engines produced at the Packard plant was $3873 per engine, and that the average cost of the first twelve hundred motors was thus $3442 per engine. It would seem that the actual cost of the entire 6000 is likely to be somewhat under $3200 per engine. But on the basis of $3200 there would be an additional profit, through the contractor's percentage of saving, of $450 en engine, which would make $2,700,000 additional profit, or with the fixed profit of $3,750,000 a total profit of approximately $6,450,000 earned on the 6,000 engines, within a year and five months, despite delays in production. To this there should still be added a considerable amount for profits on spare parts on the 6000 engines which may be estimated at upwards of $1,500,000, and thus the aggregate profits on the Liberty engine (exclusive of the original development work) would reach about $8,000,000. The Packard Company estimated that on May 31, 1918, from the standpoint of plant values, the total investment exclusively for aircraft motor work was $11,808,404.47. This included, however, advances by the Government for working capital amounting to $2,145,568, and inventory and other items which would be represented in the cost of labor and material ultimately defrayed by the Government. The proportion of its plant, less depreciation, employed on aircraft work was estimated by the Company at $5,500,000. It should also be noted that in the contract reducing the bogey cost and fixed profit, it was provided that on the termination of the contract the Government should pay for depreciation upon the heat-treating building and equipment erected by the contractor for the purpose of carrying out the contract, the difference between their cost and "the value thereof to the contractor for use in its business," as determined by a board of appraisers; and that in determining this value the appraisers should be guided by the use the contractor "shall have for said building and equipment at the termination of said contract, in the ordinary operation of its business of manufacturing motor cars and trucks, and shall not include the value, if any, which the same may have to the contractor in the manufacture of further aviation motors." The Government was also to pay the full cost of facilities for testing and inspecting the engines, including the building and equipment erected by the contractor therefor, and should also reimburse the contractor for the machine tools purchased especially for the construction of aviation engines, to be used by the contractor without rental but to remain the property of the Government.

The contract with the Ford Motor Company was for 5000 Liberty engines. The Company did not begin its deliveries until the 14th of June. It was estimated by its officers that deliveries would reach 1500 in October, and that the entire contract would be completed by the first of December. It is behind in its schedule, but between September 6th and October 4th it delivered, according to the Government's records, 768, and it may be expected that it will complete its contract for 5000 by the end of January, 1919. Under the original contract it would then be entitled to fixed profits on the 5000 engines of $3,125,000. and the additional percentage of the saving under the bogey cost of $5000. With its well-known efficiency, and in view of the fact that by beginning later it did not have as much difficulty as the Packard Company had experienced, it may be assumed that the actual cost of the 5000 engines at the plant of the Ford Company will be less than $3200 per engine and at the rate of $450 an engine (that is 25% of the difference betwen $3200 and $5000) its additional profits would amount to $2,250,000, or its aggregate profits on the 5000 engines, would be $5,375,000, earned by January, 1919. The plant investment required for this production certainly can not be regarded as any greater than that on the part of the Packard Company. The Ford Company has not received advances from the Government. The Ford Company also has a contract for 400,000 cylinder forgings for the Liberty engine, on a fixed price basis of $8.25 each; these are supplied to the other manufacturers. The contract with the Ford Company for the Liberty engines provides that there shall be allowed for depreciation on the machinery and buildings especially acquired for the performance of the contract, in addition to the facilities already owned by the contractor, the difference between the fair cost and the fair market value as determined by appraisers at the time of the completion or cancellation of the contract.

The Lincoln Motor Company has its special feature in that it was a new organization and established a new plant which is devoted exclusively to the manufacture of Liberty engines for the Government. It was a highly expert organization, with Mr. Henry M. Leland at the head. When the bogey or estimated cost was reduced from $6087 per engine, with a fixed profit of 15 per cent., to $5000 per engine, with a fixed profit of 12½ per cent., the Government made a special agreement with reference to depreciation, which is thus summarized in a resolution of the Aircraft Board:

"That the Government make an allowance for depreciation of the Company's heat treating plant equal to the difference between the cost thereof and the value to the Company of the business at the termination of the contract; further, that the cost of the Company's testing plant be allowed as a part of the production cost of the engines to be manufactured; further that the machinery and equipment used by the Company in the performance of the contract be depreciated 40 per cent. over the term of the contract."

The Government made advances during the last fiscal year to the extent of $6,500,000; additional advances were made in July and August of $4,300,000, in order to discharge obligations and maintain a capacity of 1500 engines a month, making the total sum advanced by the Government of $10,800,000.

The Lincoln Motor Company has delivered, according to the Government's report, only 580 motors by the end of June, but it had reached a production of over 600 per month by October 4, and doubtless will soon be at full capacity so that the first 6000 motors will probably be delivered before the end of January. For the first 600 motors the cost of production at the plant of the Lincoln Motor Company was $3583, which was nearly $300 per motor less than that of the Packard Motor Car Company, and it may be assumed that its average cost for the entire $6000 will not be much, if any, more than $3000. That is the figure which appears in the Company's estimate of profit. But on the basis of an actual cost of $3200 per motor the Lincoln Motor Company would have earned by January, 1919, (through fixed profits, and percentage of saving) on the delivery of the 6000 motors, about $6,450,000. There would also be profits on spare parts, which are estimated at upwards of $1,500,000 more, making an aggregate profit of about $8,000,000. This would be exclusive of allowances by way of depreciation. The investment in real estate, buildings, machinery and equipment (exclusive of the special tools to be paid for by the Government, and the cost of testing and inspection facilities on which there is to be a depreciation allowance of 100 per cent.) amounts to approximately $7,150,000, of which $3,460,000 is the cost of machinery, tools and equipment (to July 31, 1918) on which the Government is to pay a depreciation allowance of 40 per cent., in addition to profits. The entire paid-in capital of the Company amounts to $850,000. At the outset, the Company obtained on the credit of its officers about $2,000,000 which served its purposes until it obtained the amounts needed for its plant, equipment and working capital, through advances by the Government. It is pointed out very clearly that the resent only an equity in its plant without any assured business, as it has been devoted exclusively to Government work. On the other hand, it may be said that there is a very liberal flat depreciation allowance on machinery, tools and equipment; that the plant is a permanent one, admirably designed for commercial work, and not merely for a temporary exigency, and that there is every prospect that it can be successfully utilized. It should also be said that from the standpoint of the Government it was free to make arrangements with existing plants, and the amount of the profits it should allow should be determined accordingly.

It is unnecessary to review the original contract with the Nordyke & Marmon Company, which is very far behind in its deliveries, and with the General Motors Company (Cadilac and Buick plants). The profit allowed per engine was the same as in the other contracts, but the contracts were for fewer engines, 3000 in the case of the Nordyke & Marmon Company, and 2000 in that of the General Motors Company. The Nordyke & Marmon Company received advances of $2,000,000. There were no advances to the General Motors Company.

The large percentage of the contractors' profits which will be taken by the Government in taxation is strongly emphasized and, of course, what the Government takes back through taxation should fairly be taken into account. But the contemplated tax does not justify an extravagant scale of profits which, even after payment of taxes, would permit an excessive return upon the capital invested, in view of the greatly reduced risks of the contractor under the cost-plus contracts. Company has provided an excellent plant for the manufacture of Liberty engines and that ultimately its profit, after paying taxes, will rep-

Revised Contracts for Liberty Engines

What has been said above relates to the original contracts for Liberty engines. During a recent period the contracts with the Lincoln Motor Company, the Packard Motor Car Company and the Nordyke & Marmon Company have been revised and put upon a fixed-price basis of $4000 an engine.

The revised contract with the Lincoln Motor Company is dated July 31, 1918. The former contract for 6000 engines is cancelled and superseded and the new contract provides for 9000 U. S.-12s and necessary spare parts, with an option to the Government to require the production of 8000 additional engines and spare parts. The schedule of deliveries provided for in the new contract is as follows:

Previous to August 1, 1918	1,000
August	750
September	1,000
October	1,500
November	1,500
December	1,500
January, 1919	1,500
February	250

The price is $4000 an engine. The spare parts are to be delivered on a schedule basis corresponding to a total price of $4000 for a

completed engine. The contract provides for payments by the Government, by way of amortization upon a basis of 100 per cent., of the actual cost of all testing and inspecting facilities provided by the contractor with the approval of the Government; for payment by the Government, by way of amortization upon a basis of 40 per cent., of the actual cost of the heat-treating building and equipment theretofore provided by the contractor; and payment by the Government, by way of amortization upon a basis of 40 per cent., of the actual cost of all machinery, tools and other items furnished by the contractor. It is further agreed that in case the Government shall not order from the contractor the 8000 additional engines for which it has an option, or the contractor is prevented by termination of the contract from manufacturing and delivering the 9000 engines contracted for and the 8000 additional engines, the Government shall pay to the contractor a sum equal to 40 per cent. of the difference between the actual cost of its plant, including real estate, buildings, machinery and equipment built or otherwise acquired by it for the purpose of performing the contract, (exclusive of any allowance of interest) and any and all payments previously made by the Government on account of depreciation or amortization. While the new contract is on a fixed-price basis, provision is made for payments by the Government within ten days of the termination of the various items, on account of the cost of direct materials, supplies and labor, and also for the payment monthly of amounts equal to proper ordinary depreciation, and other proper items of overhead expense not previously paid by the Government. It is also provided that in case the actual cost of manufacture shall be increased or decreased by reason of any changes in specifications or in the rates of labor, material, supplies or equipment, varying from the rates in force at the date of the revised contract, upon satisfactory proof, the contractor shall be paid the total amount of such increases, in addition to the fixed price, or in case of a decrease the fixed price shall be reduced accordingly.

Up to October 4th the Lincoln Company had delivered, according to the Government's report, 2,566 engines, instead of the 2,750 required by the schedule to October 1st, and it is likely to be somewhat behind its schedule in the total deliveries, but its deliveries of 9000 should be completed by March next. It may be assumed, as the Company assumes in its own estimate, that the 9000 motors can be produced on an average cost of $3000 each, which would leave $1000 profit per engine, exclusive of the spare parts, making a profit on the engines of $9,000,000 earned, it may be expected, by April 1st; and assuming that the profit on spare parts will be 25 per cent. of the profit on the motors, there would be an additional profit of $2,250,000. On this basis the entire profits earned by the Company on the Liberty contract would be $11,250,000.

The new contract with the Nordyke & Marmon Company was made under date of August 31, 1918. The former contract for 3000 Liberty engines is cancelled and the substitute contract calls for 5000 U.S.-12s and spare parts, with the option of the Government to order 2000 additional. The schedule of deliveries is as follows:

1918					1919							
Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May	June	July	Aug.
50	70	250	300	400	400	475	500	500	500	500	500	500

The contract is on the basis of a fixed-price of $4000 per engine, with a provision for increase or decrease in case of a change in the actual cost of manufacture, similar to that contained in the revised contract with the Lincoln Company. The contract also contains a provision for special depreciation which is somewhat involved, and need not be set forth.

The revised conract with the Packard Motor Car Company was made under date of September 2, 1918. It supersedes the original contract and provides for 12,000 U.S.-12s at a fixed price of $4000 per engine, and spare parts on the basis of this price for a completed engine. It contains provision as to an increase or decrease of price in case of a change of the cost of manufacture similar to that found in the other revised contracts above mentioned. The Packard Company agrees to deliver the articles at the rate of 600 engines a month, beginning with September 2, 1918. As the Packard Company had delivered 2660 engines up to October 4, 1918, the entire 12,000 will be delivered approximately by December, 1919. It is likely that the cost, distributed over the 12,000 engines, will not be more than $3000 an engine, and at this rate the profit on the 12,000 engines will amount to $12,000,000, with probably $3,000,000 more as the profit on spares, making about $15,000,000 in all.

Under the original cost-plus contracts for the Liberty engines, that is, with the bogey cost of $5000, a fixed profit of 12½ per cent. thereon, and an additional profit of 25 per cent. of the savings under the bogey cost, the total profits per engine would amount to $1075 on the basis of an actual average cost of $3200 per engine, or to $1125 on the basis of an actual average cost of $3000 an engine. It will thus be seen that the change from the cost-plus contracts to the fixed-price contracts saves the Government from about $75 to $125 (or possibly a little more) per engine, on the fixed-profit allowance, and also whatever expense may be saved by the reduced requiremnts of cost supervision and accounting and in connection with material. Upon the new fixed-price contracts the contractor's profits, though reduced, still remain very liberal.

It is understood that it has been arranged that similar revised contracts on a fixed-price basis will be made with the Ford Motor Company and the General Motors Company, but these had not yet been executed according to the latest information received.

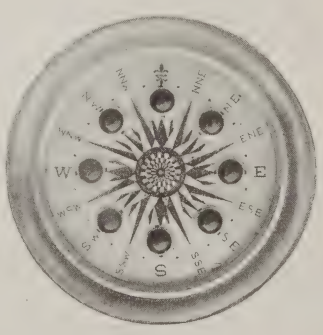
THE SHOTWELL ELECTRIC WEATHER VANE FOR AERODROMES AND POSTMASTER'S OFFICE

Gives Wind Directions Far and Near

THE Shotwell Electric Weather Vane, patented and made by the Shotwell Weather Vane Company, of 299 Madison Avenue, New York City, is a very useful article for aerodromes, for the offices of field superintendents, postmasters, commanding officers and flying officers of Army, Navy and Marine Corps aerodromes—and anybody interested in aeronautics, boating, motoring, meteorology, etc., etc.

It is a simple device consisting of a vane and a dial which permits a person in his office or home to know when the wind changes near or far. When he wants to know the direction of the wind over his building—or twenty-five or fifty miles away—he presses a button, and the light on the dial shows the direction of the prevailing wind wherever the vane is located.

The Second Asistant Postmaster General and the Superintendent of the Aerial Mail, who have charge of the Aerial Mail Service in Washington, can, by pressing a button, see the exact direction of the wind at any point on any of the Aerial Mail routes. Knowing the direction of the wind they know whether the aviator has a head wind or a following wind or a cross wind, and can estimate whether he will arrive late or ahead of time.



From the changes in wind directions they will also know whether rain or fair weather is to be expected.

Prevents Loss of Equipment Through Sudden Storms

The Commanding Officer or the flying officer or superintendent at an aerodrome can see the changes of the wind from his desk and can order the direction and landing arrows moved, so the landing aviators will know the direction of the prevailing wind, and will land against the wind.

The change in wind direction also warns of approaching storms, in which case the field must be cleared of aeroplanes and equipment and preparations must be made, where electricity is generated by a local plant, to prepare for the approaching darkness.

Passing aviators are warned of the approaching storm by ground signals or lights, so they can land and house their machines until the storm is over.

The Shotwell Electric Weather Vane records the exact direction of the wind at any time, regardless of the distance from the vane to the dial. As many dials may be used in conjunction with one vane as may be desired, so that the commanding officer, the flying officer and the chief of squadron can all get the wind directions from one single vane. If a very accurate reading of the wind is desired, the dial may be so arranged as to give thirty-two directions. This is much closer than the eye can read.

The Shotwell Weather Vane also permits the scientific study of wind



currents. Six vanes installed on different points between New York and Washington will permit the authorities to know the exact wind conditions prevailing at any point along the aerial mail route at any time. By making the records of the changes of wind currents over a given route a valuable contribution can be made to science.

The dials are of a very neat design, either in nachomez or brass shells about eight inches in diameter. They are generally installed on a sidewall, so that the wires leading from the vane will be concealed, or on a desk. The light can be kept on, so that the direction of the wind can be seen at a glance without pressing the button. The installation is simple and the vane can be installed equally as well on a skyscraper as it can on a hangar or country home.

People who fly for sport or travel and need not fly unless the weather is favorable, can save themselves the trouble of preparing for a flight—or for an automobile or yacht ride, for that matter—by getting the direction of the wind from the Shotwell Weather Vane.

(*Continued from page* 655)

General Burleson, Washington; Second Assistant Postmaster-General Otto Praeger, Washington; Rear Admiral Robert E. Peary, President, Aerial League of America, Washington, and the presidents of various aero clubs throughout the country and other authorities and the magazines *Flying* and AERIAL AGE, which have been foremost in urging and making possible the establishment of Aerial Mail Service.

To celebrate Thanksgiving Day and the fact that hundreds of aeroplanes have been turned over to the Post Office Department to extend the Air Mail Service under the direction of Captain Benjamin B. Lipsner, Superintendent of the Service, and thereby provide an immediate opportunity to utilize the valuable services of military aviators who have served their country in time of war, the officials of the Aero Club of America, the Aerial League of America, and a few aeronautic authorities, accepted the invitation of Captain Lipsner to eat their Thanksgiving dinner in the air on board of one of the giant Handley Page machines that have just been turnd over to the Post Office Department at the new flying field opened at Elizabeth, New Jersey. From this field the first flight with mail to Washington left during the ceremonies and contributed a business-like touch to this epoch-making event in the history of the "Cloudland Mail."

Prior to the banquet, Mr. Alan R. Hawley, Vice-President of the Aerial League of America, conferred honorary membership in the League upon Captain Lipsner and presented him with the bold button emblematic of this signal distinction.

The various stages in the rapid development of the Air Mail Service were graphically shown when the three aeroplanes, representing each stage of advancement, were lined up on the field; the first type was a military training plane used before the Post Office Department secured its own machines built for them by the Standard Air Craft Corporation and delivered on August 6, 1918; the second type was one of these Post Office Department machines which was flown by Pilot Max Miller, and a rousing send-off was given to him when he left the field carrying the mail sacks for Washington and disappeared in the thick haze hanging over the field. The third type was the giant Handley Page which will carry a ton and a half of mail between New York and Chicago on the second permanent air mail route to be established.

A typical Thanksgiving turkey-dinner was spread out in preparation for the aerial banquet which was to follow in the cabin on the board the Handley Page. Mr. E. W. Pennewill, Vice-President of the Standard Company, and his wife; Captain Waller of the Royal Air Force, and his wife; Mr. and Mrs. Charles H. Day, Mr. Meyrick and the Postmaster of Elizabeth, joined in with Mr. Alan R. Hawley, Captain Lipsner, Mr. Henry Woodhouse, Mr. Leroy B. Gulotta and Mr. Augustus Post, who were going to dine in the aeroplane piloted by Captain Waller, and drank a toast to the globe trotters of the future who would have all the luxuries of travel in the dining compartment de luxe of their earth circling flying craft.

As a fitting tribute to the proud meaning of this National Day of Thanks and the momentous occasion when aerial navigation was passing from the limited state of transporting mail alone to general passenger travel, and as a natural expression of the thought uppermost in the mind and throb in the heart of all Americans, a few words were spoken in harmony with the spirit of the occasion and those assembled bowed their heads for a moment. Mr. Augustus Post, Secretary of the Aerial League of America, said:

"We are here to celebrate a historic moment in the annals of American achievement. A splendid victory has been won for the cause of Freedom, Justice and Humanity.

"We cannot give thanks for all our blessings without contributing a thought to the sacred memory which we all have for the brave and heroic men who have given their lives for the cause for which our Country and our Allies have been fighting.

"A bigger work is now before the world—to perfect the 'Pacts of Peace', to extend the principles of Freedom, to follow up our glorious victory and make a lasting state of harmony among the people of the earth and a permanent League of Nations.

"The areoplane will bear a great part in bringing about the glorious result and in uniting all the peoples of the globe."

November 28, 1918.

President Woodrow Wilson, Washington, D. C.

We, who are having Thanksgiving ceremony and dinner on board of the three-ton Handley Page post office mail aeroplane, extend our heartiest congratulations on inauguration of the Aerial Age by the Post Office Department. A nw epoch has dawned for the commerce of America and of the whole world. We all join in Thanksgiving for the stupendous victory achieved and for the realization of our hopes which we confidently believe will soon be followed by results of the utmost benefit to civilization when the marvelous developments in military aeronautics are turned to utilitarian purposes and aerial mail service is established throughout the United States.

(*Continued on page* 682)



The passengers who enjoyed their Thanksgiving Dinner in a Handley Page Biplane. Left to right: Henry Woodhouse, Capt. Lipsner, first Superintendent of the Aerial Mail Service, Alan R. Hawley, a British aviator, Augustus Post, Charles H. Day, J. M. Meyrich and Leroy B. Gullotta

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.

Note 2—Report to Commanding Officer, Middletown, Pa.

Note 3—Report to Dis. Mgr. Aircraft Prod., Pittsburgh, Pa., and by wire to DAP.

Note 4—Report to Director Aircraft Prod., Detroit, Mich., and by wire to DAP—Washington.

Note 5—Report to Dis. Mgr. Aircraft Prod., Chicago, Ill., and by wire to DAP—Washington.

Note 6—Report to Aviation Exam. Board, 210 East Ohio Street, Chicago, Ill.

Note 7—Report to Dis. Mgr. Prod., Buffalo, N. Y., and by wire to DAP—Washington.

Note 8—Report to Curtiss Aeroplane Corp., Buffalo, N. Y., and by wire to DAP.

Note 9—Report to University of the South, Sewanee, Tenn., to Commanding Officer.

Note 10—Report to Aviation General Supply Depot, Los Angeles, Cal.

Note 11—Report to 7th Aero Squadron, France Field, Coco Walk, Canal Zone, Panama.

Note 12—Report to Spruce Production Division, Portland, Oregon, to Commanding Officer.

Note 13—Report to Finance Division, New York, N. Y., and by wire to DAP—Washington.

Note 14—Report to Aviation Repair Depot, Speedway, Indianapolis, Ind.

Note 15—Report to Henry J. Damm Field, Babylon, L. I., to Commanding Officer.

Special Orders Nos. 261-270 Inc.

A

Ashe, Sam ..... SLA; AAD
Allen, John Edward ..... SLA; SBI
Anderson, Werner ..... CGC
Aird, Alancon Wilcox ..... SLA; DMA
Anderson, Ralh Earl ..... SLA; RWT
Armstrong, Russell B. ..... PWM
Allen, Truman W. ..... CGC
Ames, Harold T. ..... TFT
Austin, Carter H. ..... CGC
Ables, Willard Clinton ..... SLA; MAT
Archer, Cecil E. ..... SRC
Alcorn, Kent A. ..... AGC
Andrews, Frank M. ..... TMA
Armstrong, Orland K. ..... KST

B

Baker, Quin K. ..... PWM
Bass, Alfred ..... SLA; ABC
Brownstein, Maxwell ..... TFT
Bailey, Theodore Harbour, Jr. ..... FLA
Beymer, Harold S. ..... PWM
Bates, Charles William ..... SLA; CFT
Barker, Hugh Hatfield ..... SLA; CFT
Bunce, Ralph L. ..... TFT
Beasley, Henry C. ..... PWM
Barone, Tony ..... TFT
Berkeley, Scott B. ..... LHV
Benson, Matthew M. ..... TFT
Burt, John I. ..... TFT
Boylston, Joseph E. ..... PWM
Budd, Thomas G. ..... PWM
Butterworth, Benjamin F. ..... PWM
Borntraeger, Carl Herman ..... FLA; Note 13
Burns, John James ..... SLA; BFT
Bourgoine, Joseph John ..... KST
Bailey, Augustus O. ..... CGC
Billiter, Earl D. ..... CGC
Brock, Harry ..... CGC
Burkhardt, Harry L. ..... CGC
Banta, George H. ..... AGC
Blair, James L. ..... AGC
Bronez, Frank L. ..... AGC
Bushman, Francis L. ..... AGC
Bosler, Barrett C. ..... PWM
Bissonnet, George H. ..... PWM
Barbour, Forest A. ..... RSD
Barnes, James G. ..... DMA
Beall, Henry I. ..... PMT
Burtt, Harold E. ..... UCB
Bumbart, Edward H., Jr. ..... RSD
Beck, Vernon S. ..... CAF
Brumback, Jefferson U. ..... WFO
Brown, Roy S. ..... CSO
Bokhof, David H. ..... KST
Barrett, James T. ..... LHV
Baxter, Walter T. ..... BFT
Baker, David R. ..... RSD
Bonsal, Stephen, Jr. ..... CGC
Booth, William W. ..... PFO
Barb, Martin B. ..... AGC
Bonnell, Harry M. ..... AGC
Benbow, Ceborn A. ..... RSD
Barker, John De Forest ..... CGC
Brown, George H. ..... AGC
Baker, Russell I. ..... PWM
Bockaus, Edward ..... SLA
Belting, John T. ..... CGC

C

Caldwell, Ralph C. ..... CLA
Caldwell, Alanson Trigg ..... SLA; PMT
Chapman, Alvin Luther ..... SLA; MAT
Carroll, Arthur William ..... SLA; DAP

Chandler, Clyde Emmett .....SLA; MAC
Christy, Lester Wynne .....SLA; PMT
Craig, Laureston .....SLA; BFT
Carruthers, William H. ....RSD; DMA; Note 1
Cobel, Iwan Lawrence .....SLA; MAT
Coulter, John Lee .....MJA; DAP
Campbell, Alexander Colin .....FLA; DAP
Conner, Edward Starke .....SLA; PMT
Carlberk, Don P. .....TFT
Charlton, Howard Comstock .....TFT
Cooley, Arthur B. .....CGC
Coggins, Charles P. .....RSD
Cook, Horace L. .....PWM
Conway, James V. .....TFT
Collins, Kenneth Roger .....TFT
Crocker, Clarke W. .....PFO
Christeleson, Frank .....PWM
Clark, Roy E. .....CGC
Cook, Horace L. .....CGC
Craig, Robert M. .....CGC
Cagney, John A. .....PWM
Clough, Charles E. .....PWM
Cobb, Fred A. .....KST
Courie, Wadie F. .....KST
Connor, Edward S. .....AGC
Carr, John P. .....CGC
Culbertson, Robert A. .....CGC
Connell, David E. .....AGC
Craig, Britt .....AGC
Chandler, William Henry .....RWT
Cunliffe, William H. .....LDT
Crozier, Raymond Lee .....SLA; MAT
Charles, Chester Andrew .....SLA; KST
Caldwell, Alanson T. .....AGC
Coleman, Andrew H. .....CGC
Cragon, Miller M. .....CGC
Cain, Howard B. .....CGC
Cowan, Robert S. .....CGC

D

Diehl, Raymond George .....SLA; SBI
Donaldson, Flavis Afton .....SLA; CFT
Dupuy, Harry H. .....RSD
Decker, Irwin Stanton .....SLA; CRI
Davidson, John Henry .....SLA; EOT
Dunn, Morrill .....DMA
Dando, Joseph C. .....CGC
Daley, James H. .....PFO
Devine, Paul Francis .....SLA; BFT
Doherty, George J. .....AGC
Diebel, Alfred J. .....Note 10
Dolphin, William R. .....FRF
Daviess, Marion Leonard .....SLA; MAT
Davidson, Arthur W. .....CGC

E

English, Norman Allen .....SLA; MAT
Ellis, Clinton Bloomfield .....SLA; CRI
Ellicott, Charles Glendewer .....SLA; MAT
Ellerbrook, Jerry E. .....RSD
Eisenheis, Perrey Oliver .....SLA; EOT
Eickenberg, Philip .....DMA
Edwards, Maynard Willard .....SLA; EOT
Erwin, Leo Richardson .....SLA; EOT
Evans, Stephen G. .....CGC

F

Fowler, George A. .....DMA
Fisher, Dudley Tyng, Jr. .....SLA; CUI
Fagan, Joseph Aloysius .....SLA; MAT
Fletcher, Toby G. .....LDT
Frisby, Harold G. .....LDT
Foster, Charles M. .....ASM
Fladeland, John F. .....CGC
Faust, Thomas C. .....PFO
Faucher, Joseph A. .....TFT

G

Gaither, Henry G. .....CGC
Greene, Arthur D. .....CGC
Garretson, William V. .....CGC
Goldie, William B. .....TFT
Glenn, Earl F. .....CGC
Gallagher, Robert T. .....PWM
Green, Wilbur Allen .....SLA; MAT
Gayton, Claude Victor .....SLA; TMA
Gilbert, Percival .....SLA; DMA



Major William J. Malone, A.S.A., member of the Board of Control of the Air Service Clubs Association

Gilbert, Arthur C. .....PWM
Garman, Ray L. .....TMA
Gwynn, William S. .....DMA
Greer, Rowan Adams .....SLA; PMT
Graham, Linton John .....SLA; TMA
Giblon, Earl Z. .....FLA
Green, Henry O. .....CGC
Gamble, Verne D. .....CGC
Gerard, John W. .....CGC
Gutterson, Granville .....CGC
Gardner, J. Francis .....CGC
Gilson, Lester C. .....PFO

H

Hepinstall, Lynn David .....SLA; SBI
Hughes, Ambrose Paul .....SLA; PMT
Higbie, Harley G. .....KST
Hughes, Edward Earle .....SLA; RWT
Hegge, Adolph .....SLA; KST
Hilderbrand, Floyd R. .....GLC
Haserot, Francis S. .....SLA; CGC
Hayes, Charles L. .....SLA; CGC
Hart, Victor K. .....TFT
Hovey, George Lynnly .....SLA; MAT
Hughes, Robert W. .....SLA; TFT
Hillix, Albert F. .....CGC
Hanson, Ira E. .....SLA; RSD
High, Lennie L. .....SLA; TFT
Howard, Ernest F. .....CGC
Harris, Frank D. .....AGC
Hathaway, Mortimer D. .....AGC
Horsley, Robert S. .....AGC
Holt, McPherson .....LHV
Hagemeyer, Frank H. .....MAT
Hazzard, Linford Bickings .....SLA; EOT
Harris, James Ewell .....SLA; CRI
Hampton, Herman Randolph .....SLA; SBI
Harvey, Harold M. .....LHV
Holland, Martin L. .....KST
Hunderman, Edward D. .....KST
Harding, Claude Le Roy .....SLA; Note 6
Hitt, Joe Langston .....Note 11
Honeywell, Charles Francis .....SLA; MAT
Henshaw, Thomas Dale .....SLA; EOT
Hamor, Bert L. .....CGC
Hart, Joseph L. .....CGC
Hill, Maurice B. .....CGC
Hait, Roswell N. .....FRF
Harrell, Benjamin F. .....CGC
Harvey, Harold W. .....CGC
Hoare, J. Maurice .....CGC
Houck, Jack Rodney .....SLA; MAT
Henderson, Herbert Kempkey .....SLA; MAT
Hummell, Frank K. .....CGC
Huston, Paul W. .....CFT
Houghton, Harold C. .....RSD
Heard, Jack W. .....TMA
Helms, Leslie R. .....PWM

I

Ingram, Frederick Bernard .....SLA; Note 18
Isbell, Charles Winchell .....SLA; DMA
Ivins, Maurice H. .....TMA
Ingals, Ephraim .....SLA; CRI

J

Johnson, Frank Edwin .....SLA; DAP
Johnson, Fonda Bernard .....SLA; TMA
Jones, Christopher L. .....CGC

K

Kline, Arthur Bernadotte .....SLA; SBI
Keenan, William James .....SLA; SAG
Kuhn, Joseph Benson .....SLA; PMT
Kistler, Bruce .....PWM
Kirkpatrick, Everett L. .....CGC
Kennedy, Gayen L. .....GLC
Kelly, John O'R. .....LHV
Kendall, Lyle A. .....CAF
Kelly, Earl C. .....CGC
King, Olen .....CGC
Kearney, Edward H. .....SLA; AAD
Kane, Hoyt R. .....AGC
Keeney, Douglas .....RSD
Klady, Charles Albert .....FLA; Note 8
Kent, Richard A. .....PWM
Kase, John A. .....AGC
Kreger, Henry L. F. .....AGC

L

Lyman, Francis Josiah .....SLA; BFT
Larson, Clifford Milton .....FLA; HHN
Lium, Elder Leonard .....SLA; CWT
Larned, Edward P. .....BST
Lea, Royal B. .....CGC
Lockhart, Frank .....CGC
Lenoir, Whitman H. .....CGC
Love, John Calvin .....SLA; Note 14
Lathrop, Maxwell James .....SLA; RWT
Lloyd, Milton D. .....PFO
Loney, Charles Richard .....SLA; SBI
Lukens, Arthur Lewis .....SLA; CRI
Luke, James M. J. .....KST
Lowell, Clarence Timothy .....SLA; EOT
Lane, Emory W. .....ASM
Leggett, George P. .....RSD

M

Miller, Forrest Jennings .....SLA; CRI
Maphis, John Alan .....SLA; DAF
Manassa, Charles Ruthvan .....SLA; SBI
Moninger, Arthur V. .....DMA
Mooney, George Bullas .....SLA; KST
Marks, Edwin Isaac .....SLA; SBI
Murray, Albert Francis .....FLA
Moody, Allen Sproule .....SLA; CRI
Mauzy, Charles Gerald, Jr. .....SLA; RWT
Morse, Herbert Kennedy .....SLA; MAT
Miller, Ernest L. .....TFT
Mooers, Clifford .....TFT
Mahannah, Alvah E. .....CGC
Marberry, Jason M. .....CGC
Mabry, Palmer V. .....CGC
Morehead, Hobart E. .....CGC
Manaker, Fred P. .....GLC
Morrison, Raymond .....TFT
Miller, Arthur J. .....CGC
Moore, William S. .....CGC

(*Continued on page 683*)



The French Salmson Biplane, equipped with Hispano-Suiza motor

FOREIGN NEWS

60 Lafayette Fliers Lost

Paris.—At a dinner given by American aviators in honor of their French comrades in the air service, it was announced by the Under-Secretary of Aviation that of 240 American fliers in the Lafayette Squadron, sixty had lost their lives. Many of the most noted French airmen, including Lieutenant René Fonck and Captain Heuteux, as well as Italian aviators, were present at the dinner, which was of the most cordial and intimate character.

The French Aero Club will give a banquet on December 5th in honor of allied airmen who have escaped from German captivity. On the same evening a medal will be presented by the club to Gabriele d'Annunzio, the Italian author-aviator.

Armistice Saved Berlin from a Big Air Raid

London.—The Royal Air Force had completed all preparations for the bombing of Berlin on November 9th with nineteen Handley Page planes, each carrying 3,500 pounds of bombs, according to an official report published in the *Evening Standard*. The weather proving bad, however, the raid was postponed until November 11th, but the armistice was signed that same morning.

Prince Killed by Aeroplane Fall

London.—Prince Antoine Gaston Philippe of Bourbon-Orleans, great-grandson of King Louis Philippe of France, has died in a military hospital from injuries suffered in the fall of an aeroplane.

Report Air Fleet Wrecked

Basle.—One hundred and fifty aeroplanes which had been gathered at the Boeblingen Aerodrome, eleven miles southwest of Stuttgart, to be handed over to the Allies in accordance with the provisions of the armistice, have been rendered useless by order of the Revolutionary Committee, according to a Stuttgart dispatch received here.

British Air Losses 7,589 in Eight Months

London.—Casualties in the Royal Air Forces from April to November 11th were: Killed, 2,680; wounded, missing and prisoners, 4,909; totaling 7,589, according to an official statement by the Air Ministry.

Allied Aircraft in Adriatic

Mr. James Bone, writing in the "Daily Telegraph" of October 3rd, concerning the work of the French Navy, says:—

The Air Forces operating over the Adriatic include important British and American squadrons. In this matter a distinguished British naval commander here pointed out, not without warmth, that very little attention had been given at home to the fact that British flying squadrons in the south of Italy were regularly flying across the Odriatic to attack Durazzzo and Cattaro, which meant flying overseas a distance of about 240 miles, there and back, not on seaplanes, but on aeroplanes. If a machine got a splinter in its engine or had its tank cut, and it had to come down on the sea, it was all up with the aviator. Compared with these exploits the overland trip to attack Constantinople was an easy business.

New Use for German Aeroplanes

Paris.—A German aeroplane arrived November 15th at the French lines bearing an urgent message from the mayor of Mulhausen, asking that a French regiment be sent there to maintain order. The population, full of enthusiasm, has risen against the Germans, who are retiring in the utmost disorder, according to the *Echo de Paris*

12 German Aviators Land on Swiss Soil

Bern.—No less than twelve German aviators landed on Swiss soil Wednesday and Thursday. They came from the western front and said they had lost their direction, but it is believed that some of them came to Switzerland to be interned.

Made 709 Bombing Raids

London.—Statistics published relative to the work of the independent air forces show that during the thirteen months preceding the armistice the astonishing number of 709 bombing raids were made by British aviators over German territory.

There were 374 raids on large German towns; 209 on German airdromes established for the defense of the Rhine, and 126 on other military objectives. The list of large towns visited shows that fifty-two were bombed during the period. In all 737 tons of bombs were dropped.

Aerial Transport in Scandinavia

A large Swedish air transport company has been formed with a capital of 1,000,000 kr. (£55,500), with its headquarters at Malmo. The aerial line will run Malmo-Stockholm-Gothenburg-Malmo. It is contemplated to open communication with Germany, Denmark, and Finland in the future.

Aerial Mail for Greece

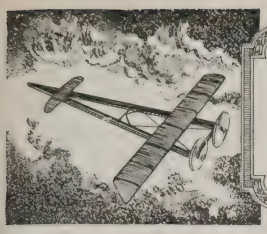
Athens and Salonika are being postally joined up via the air. General D'Esperey has, by reserving a number of machines for the purpose, made this possible, which follows upon a service between Athens and Janina, which is now to be made a regular delivery. This is but a beginning, so it is said, Greek enterprise hoping to be well in the front in the field of aerial mails.

Argentina Wanting Aeroplanes

The Republic of Argentina has always displayed a desire to keep its fighting forces up to date, and the Government has laid before the Chamber a Bill asking for £16,000,000 for the purchase of warships, submarines, aeroplanes and merchant vessels.

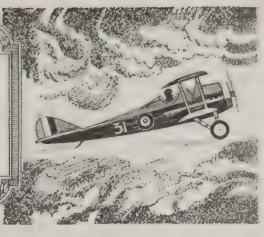


The twin-motored Caudron Biplane, equipped with Hispano-Suiza motors



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Aeroplane Building as a Step to Aeronautical Engineering

I BELIEVE we have sufficient knowledge to construct the Light Horse-Powered Machine we have in mind. Of course our technical end of Aeroplane design was not fully covered, but what we did work out can be applied along with new data, which we will select as we go along. Obstacles will be encountered, but we will not become discouraged or all our previous work will be lost. The prospective builder need not have a thorough knowledge of Aeroplanes to build a large aeroplane, but it will be just "Luck" and nothing else if it flies. Of course the drawings which will accompany the articles will be descriptive and as clear as possible. If the reader follows out these plans to the letter he will have no trouble whatever.

The first step an aeroplane builder must take is to find a suitable motor. I would advise the reader not to attempt planning or building a large aeroplane unless he has a motor and a good one at that. Only too many successful model builders have started to build a big machine with the idea of using a certain motor, then after building it they find that the motor they had in mind has been sold, or perhaps out in the junk heap, which means the whole machine is discarded or must be altered for some other motor. So do not attempt to build an aeroplane unless you have your motor and it has been tested out in every way. The motor we will use is the regular Ford Motor, of course removing the heavy fly-wheel, transmission, etc., which lightens the motor considerable. Other changes could be made to save weight, but it would mean considerable machine work must be done by an expert machinist and we can use the motor as it is almost as well.

Some builders would rather use some other make of motor, which would be of greater weight. It will be necessary for the builder to have a good knowledge of aeroplane in this case, otherwise he will have a good job on his hands balancing the machine, figuring the different speeds, aerofoils, etc., but if he has studied the articles which had preceded this he will be able to use any size or type of engine. As we progress with the machine we will study different data which is used in conjunction with the problems we encounter.

The cost of this machine can be kept low if the builder makes every part himself, and it should go over $300.00. This is the total cost; parts can be purchased as they are needed. For instance, all the lumber can be bought cut to the desired lengths and thicknesses for about $25.00; when these parts are shaped and ready to be assembled, the metal for the fittings can be bought for $25.00, and so on until the machine is complete.

(To be continued)

A Model of the Burgess Seaplane Scout

The model shown in the accompanying illustration was made by the American Model Company from drawings which appeared in AERIAL AGE, August 20, 1917, page 828. This model is constructed entirely of wood with metal ornaments, such as radiator, propeller hub plate, engine cylinders, and so forth. This model was on exhibition at different optical stores for the last six months, and it has attracted considerable interest and should be interesting to the readers of this page.

The body is shaped out of a solid block of white pine. The wings, tail, and rudder are made of soft white wood. Pontoons are constructed also of white wood. Details and insignia are painted on for effect. Comparison with photographs of the big Burgess Machine, which have appeared in AERIAL AGE, will show how exactly this little model has been made to scale.



A scale model of a Burgess seaplane made of wood



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Cross Country

Up with the star of the morning,
Up with the crisp early dawn,
To the pale blue sky, my course I shall fly,
Ere the day full fledged is born.

And the sun peeps o'er the horizon,
And strikes on my silvery wings,
And the earth scuds by, as I speed through the sky,
While my being throbs and sings.

To race with the clouds and battle the winds,
To attact, to dive and to glide,
To spiral and loop, like an eagle to swoop,
To bank, and to slip on my side.

Cross the open fields toward the distant rim,
To a spired hamlet I fly,
For the night is dead and morning has spread,
Her glory across the sky.

P. Laurence Coe, 2nd Lt., A. S. A.

The Aviator's Ten "Commandments"—or There's Lots Worse Off Than You

Brought down from Heaven by Capt. Horace B. Wild, An American Aerial Pioneer.

I

When your Battle-plane you've wrecked—
In a tail-spin you have crash'd—
Your crack at the next show cancel'd
'Cause your bus is badly smash'd;

II

Still, your bones are all together—
Though of Huns you got but two,—
There's many a Pilot that you know
Who'd gladly trade with you.

III

Our team-mates fall—("Gone West" they say)—
Other flyers take the night;
There are many more behind you—
You're not the last one in the fight.

IV

When your heart is sad and heavy,
And you're feeling bad and blue—
Do you ever stop and think a while

'THERE'E LOTS WORSE OFF THAN YOU'?

V

When you look about with envy
On those who've more than you,
Do you ever pause and ponder
There's lots their wealth can't do?

VI

Will it buy a place in Heaven?
Could it buy Love—pure and true?
Could it buy those dearly loved ones
Who are waiting home for you?

VII

We spend so much time wishing
For the things we *'haven't got'*
That we can't enjoy the blessings
Which we have and know them not.

VIII

So, don't look on with envy—
'Twill make you sour and old;
You have many many blessings
That cannot be bought with gold.

IX

Do not fancy all are happy
'Cause they soar so high on wealth—
Why, all the money in the world
Could not buy one hour of health!

X

So, if you're well—be happy—
And thank God both day and night
For giving you what wealth can't buy—
A GOOD BIG APPETITE!

With compliments to my esteemed friend, from
Capt. H. B. Wild.

Nuff's a Nuff

An acting member of the 145th Squadron visited a dentist last week and was told that he had too much nerve, that a nerve in one tooth must come out.

"Nothing feazes me," the entertainer remarked. "Shoot."

The dentist began with a drill and then opened an offensive with the "nerve" hook.

"Does that hurt?" asked the dentist as he went "over the top" and captured the nerve.

"No—ow!" replied the entertainer, wishing to appear nonchalant and brave, although the "hook" was hooking him to the queen's taste.

"Gee, I must have missed it," said the dentist as he made another jab, much more successful, and the patient jumped up with a healthy, full-lunged howl.

"If I hadn't hollered, he might have pulled out a lung," alibied the O. D. actor.





(*Continued from page* 665)

after the explosion of the bomb, and shed a brilliant glare of light.

Instruments

The instrument equipment involved a great variety of problems.

The self-luminous radium dials required for practically all instruments immediately become a production problem.

How the General Electric Company in eight weeks' time were producing 250 airplane compasses per week and how the minute chains in the Aneroid Barometers which serve as altimeters were secured from Switzerland, how the air speed indicators are all calibrated in a wind tunnel and how the National Cash Register Company developed the techometer, are each stories of absorbing manufacturing interest.

Photography

At the outbreak of the war in 1914 aerial photography for military purposes was a new subject; no special camera equipment was available, neither was the equipment for developing and finishing negatives in the field with the extreme rapidity demanded.

The first aerial work was done with cameras held in the hands. These were quickly replaced by cameras attached to the side of the plane, and later working through the bottom of the fuselage.

The later development consisted of cameras supplied with plate magazines. The power to operate these magazines was furnished from a small windmill.

This general line of development went on to an automatic camera, which could be put in action by the pilot and given no further attention during a reconnoissance, leaving the pilot free to fly and fight.

Further development included a film camera for long range reconnoissance work.

At the outbreak of the war it was possible for the aerial photographer observer to fly at low altitudes but as the importance of photography increased, the enemy were more aggressive in bringing down photographic observers. This fact greatly increased the altitude from which photographs could safely be taken, and it was frequently necessary to make exposures from an altitude of 17,000 feet. This increase in altitude required lenses of longer focus and a number of cameras having 50-inch lenses were employed.

The remarkable definition and detail obtained is illustrated by the photographs shown on the wall. Long experience in interpreting photographs has made possible the location with absolute accuracy of concealed batteries, machine gun nests, barbed wire, and even the paths followed by the soldiers.

The development of cameras and photographic equipment to get these really marvelous photographic results involved the most extensive optical, chemical and mechanical research work. Much of this had been carried to a high degree of perfection by our Allies, who sent the very best men they had to this country to aid in initiating the work in the United States.

Radio

Prior to the outbreak of hostilities in August, 1914, radio apparatus had not been used to an appreciable extent on aeroplanes. The development of suitable radio telegraph apparatus was undertaken and this method of communication soon became extremely important and valuable in fire control work, where observation planes are used to correct the firing of long rang artillery. At the time the United States entered the conflict satisfactory radio telegraph apparatus was in use by the combatant forces. Enormous improvements have been effected, however, by the Signal Corps and the Air Service of the United States, in apparatus designed for fire control telegraph signals. The sets which have been made and supplied in thousands to the American Expeditionary Forces are far superior to any apparatus developed by the other nations at war.

In April, 1917, the radio telephone for aeroplanes was in much the same state of development that the radio telegraph was in August, 1914. The aeroplane wireless telephone is by far the most striking method of using radio communication on aeroplanes. By means of this device the commander of an air squadron can direct by voice the movements of the entire group of aeroplanes under his command, thereby making the air squadron a real military unit. The recent developments in aero fighting abroad indicate the inestimable value of this ability to command the units of a squadron. Among other uses for the radio telephone is the communication which can be had between airplanes and ground by telephone, which may become of enormous importance in future use of aircraft. A pilot could thereby talk directly with a general, without intermediate delay and confusion.

A different type of apparatus recently developed enables the observer in an airplane to locate by means of radio signals sent from a land station his position with reference to certain fixed points. The observer can therefore direct the flight of the aeroplane in any predetermined manner by means of this radio compass. The uncertainty attached to the use of the magnetic and gyroscope compasses for aeroplanes make the use of the radio compass a practical certainty.

The problems encountered in working out suitable aeroplane radio apparatus have been principally eliminating the overwhelming effect of the noise of the motor; the reduction

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of weight to the smallest possible value; the necessity of absolute freedom from fire hazard; simplicity which would enable fliers untrained in the use of radio apparatus to operate the same; and eliminating the vibration of apparatus in the aeroplane.

Oxygen Equipment

One of the most important works undertaken by the Department of Military Aeronautics has been the maintenance and care of fliers. This endeavor has been carried on under the direction of Brig. Gen. T. C. Lystor through the Medical Section of the Department of Military Aeronautics. The most important device for maintaining the health and efficiency of the flier, is the oxygen apparatus which is designed to feed oxygen to the personnel of planes and maintain at all altitudes, atmospheric conditions and prevent the degeneration of the human organization.

The great necessity of efficiently maintaining fliers was brought about through a study of the English air casulties during the first year of the war. These were about as follows: 2 per cent. due to the Hun; 8 per cent. due to the plane; and 90 per cent. due to the men, which clearly indicated that something was radically wrong with the personnel, and immediate action was necessary. A thorough study of this situation disclosed the fact that practically all of the flying personnel was suffering from what was known as oxygen fatigue or lack of oxygen being caused by flying so many hours of the day at high altitudes and not securing enough oxygen to properly feed the body.

To design an oxygen equipment which would be entirely automatic, one that would be reliable and efficient, necessitated the building of a device which embodied several instruments and one that would overcome many variable conditions. It was necessary to have a device that would work under variable tank pressures from 100 to 2,250 pounds per square inch with a temperature range of from 70° to 80° F. to 20° or 50° below zero. To overcome these variables necessitated a very thorough study of temperature and pressure effects upon metals and considerable experiment. In addition the apparatus must deliver the required quantity to either one or two men at every altitude from 3,000 to 30,000 feet.

The first apparatus was designed for the British Air Service by Lieutenant Colonel Dryer of the British R. A. M. C. and was made at the plant of DeLestang at Paris. The demand for these apparatus was so great that an automobile was kept waiting at the plant for each apparatus as it was finished and was especially rushed to the front. An indication of the importance of oxygen is shown by the record of the 25th Squadron, 9th Wing, B. F. C. This was the first squadron to use oxygen equipment on planes in the British service. They were using the original Dreyer apparatus and found it efficient, sufficiently at least for Major Birley, who was in charge of the squadron, to state that this squadron in his opinion was giving six times the service of any other British squadron.

An original model of the French made apparatus was brought to this country to start quantity production. The French apparatus was a handmade device, each part being carefully fitted by an individual workman. Under the direction of Brigadier General T. C. Lystor, Medical Research Board of the Medical Section of the Department of Military Aeronautics, and the Bureau of Aircraft Production, the development and engineering of an oxygen apparatus to meet American requirements and to be adapted to American methods of manufacture was undertaken.

The entire apparatus had to be re-designed, first to take care of two men instead of one; second, to reduce the weight, and, third, to meet American methods of manufacture, and, fourth, to make the apparatus more efficient and reliable. This work was started about the first of January, 1918.

On May 3, 1918, six complete equipments, including apparatus, tanks, masks, etc., were sent overseas by special messenger to be actually tried out on the front. On May 31st the first production shipment of 200 apparatus was made. To date over 5,000 apparatus have been manufactured and accepted by the Government, over 3,600 have been shipped to ports of embarkation and over 2,300 have been floated overseas. This production, ranging from a rate of about 400 per month in May to 1,000 per month in October.

The importance of oxygen equipment necessitated the establishing overseas of a special oxygen equipment division to take care of the application of these equipments on planes.

All military planes flying over an altitude of 10,000 feet are equipped for the application of oxygen equipment. The following type of planes all use oxygen equipment: day bombing, pursuit and chase planes and a percentage of both night bombing and army and corps observation, this percentage depending on the altitude at which these types of planes will fly.



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Naval Aircraft Factory

(*Continued from page 667*)

engines, the Navy was able to select the type of aircraft which was best suited for its service and to frame a large and definite building program. As a result there are now over 500 seaplanes in use at naval air stations in the United States, and up to date over 400 seaplanes have been sent abroad. Other aircraft at stations, both in this country and abroad, includes airships and kite balloons. There has been no undue delay in supplying seaplanes, and the delivery of service seaplanes is approximately one month ahead of the scheduled time.

The demand for aircraft necessitated an enormous increase of production facilities, and, as a part of this extension, the Navy Department undertook to build and equip a naval aircraft factory at the Philadelphia Navy Yard. Within 90 days from the date the land had been assigned the factory was erected and the keel of the first flying boat was laid down. In August, 1918, the factory was producing 50 per cent more seaplanes than it had been two months previous. In addition, at least five plants are at present devoted to Navy work, and a large proportion of the output of several other factories has been assigned to the Navy.

The delivery of seaplanes for training purposes has been sufficient to more than meet the requirements. The training of personnel and providing of stations and equipment to carry out this training has expanded sufficiently so that the present output of pilots, observers, mechanicians, and men trained in special branches is keeping abreast or ahead of requirements.

The confidential nature of the work prevents any definite statement being made as to future operations. However, it may be said that the Navy Department recently established several air stations in Canada. These stations have been supplied with personnel and material from the United States, and the Navy Department is at present engaged in training personnel for the Canadian Government, which personnel will eventually take over the operation of the stations. In addition, the government of our allies have requested the Navy Department to take over more stations abroad, and not only are they desired to continue present operations, but also to increase the field of their activities.

From the Report of the Bureau of Steam Engineering

The marked military advantage to be gained by having but one type of aeroplane engine prompted the Navy Department to adopt the engine used by the Army. All Liberty engines used by the Navy are, therefore, obtained through the Aircraft Production Board.

About 1,500 of the engines have been delivered and have been assigned to naval air stations in this country and abroad. Since the number of Liberty engines produced has been too small for the needs of the Army alone, it has been necessary for the Navy to purchase others, to the number of about 700, which have been utilized while awaiting a full supply of Liberty engines.

In addition to these, a large number of engines of less power have been bought for use in training planes, all of which have been distributed to the flying schools, the most important of which is at Pensacola, Fla.

One of the very important duties devolving on the Bureau of Steam Engineering is the equipment and maintenance of stations for the generation of hydrogen for use in airships. A number of stations have been established and a full equipment of hydrogen cylinders provided, so that any calls may be promptly met.

It has also been necessary to give suitable training to a number of young officers for this work and to assign them to stations at home and abroad for the proper conduct of these plants.

From the Report of the Bureau of Construction and Repairs

The department has designed, built and equipped at the Navy Yard, Philadelphia, a factory for producing naval aircraft. This factory has been delivering planes since April of the present year. In January last it was decided to quadruple the capacity of the naval aircraft factory. The expansion is now nearing completion, and the present capacity of the aircraft factory is about fifty seaplanes of the largest size per month, and will, it is expected, eventually reach a capacity of ninety-five seaplanes of the largest size per month.

(*Continued from page 675*)

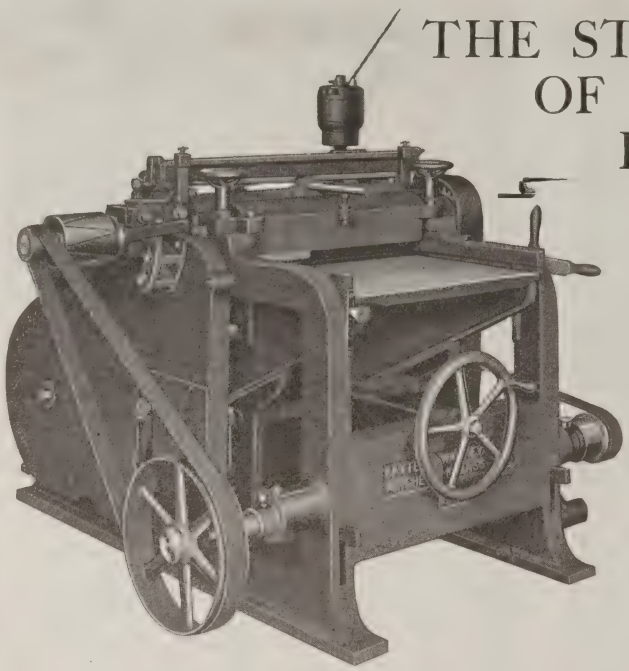
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Mc

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MacRoberts, Harry James ..... SLA; TMA
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McLaughlin, Francis Wilson ..... SLA
McCulloch, Howard Taylor ..... SLA; MAT
McInerney, Mortimer L. ..... PFO
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N

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Nommensen, Anthony Erwin ..... SLA; DMA
Names, Arthur Andrew ..... SLA; MAT
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(*Continued from page* 673)

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This telegram was sent to the following:

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Second Assistant Postmaster-General, Otto Praeger, Washington, D. C.

Rear Admiral Robert E. Peary, President, Aerial League of America, Union Trust Building, Washington, D. C.

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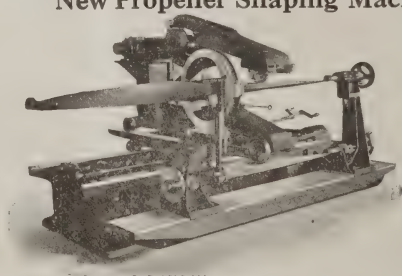
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Mr. and Mrs. Ed. Davenel, the famous stewards of the Aero Club of America, are entitled to much of the credit for making this event possible. It was midnight Wednesday when it was decided at the Club to have this dinner at Elizabeth the following day noon, which meant leaving for Elizabeth soon after 9 o'clock the following day. With their usual promptness and exceptional care, Mr. and Mrs. Davenel had everything ready, including nectar and ambrosia which up-to-date beings who inhabit the skies must have to be completely happy.

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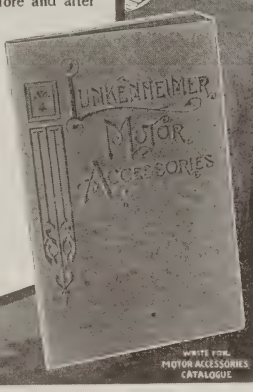
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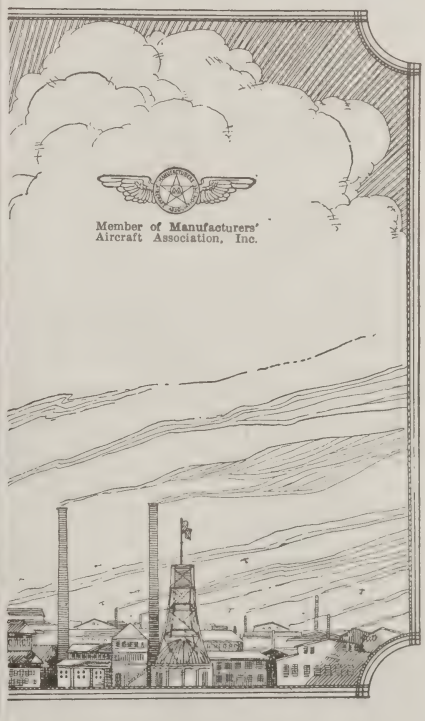
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Rawll, Herbert Frederick ....SLA; Note 2
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S

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Wamsley, John Lewis ....SLA; SBI
Wheeler, Frost Montaine ....FLA; PUP
Weed, Harry Dunmire ....FLA; Note 3
Wachtell, Philip A. ....GLC
Weaver, Edward Myers ....SLA; MAT
Wilder, Myles S. ....CGC
Warfield, Gaither P. ....CGC
Wiedersum, Roy ....CGC
Windsor, Thomas H. ....CGC
Wood, Seth F. A. ....TMA

Y

Young, Carl Ludwig ....SLA; KST
Yount, Paul C. ....GLC

Z

Zimmer, Harry M. ....CGC
Zellner, Wesley A. ....SLA; EOT
Ziebur, Max C. ....TFT

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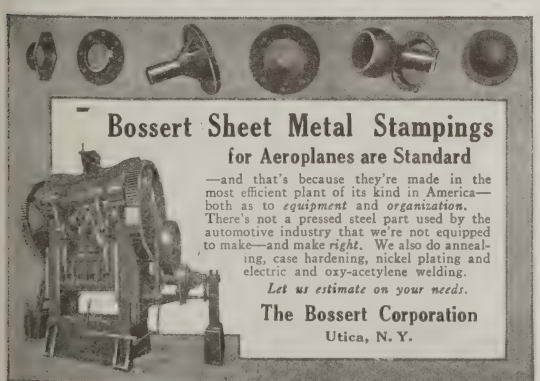
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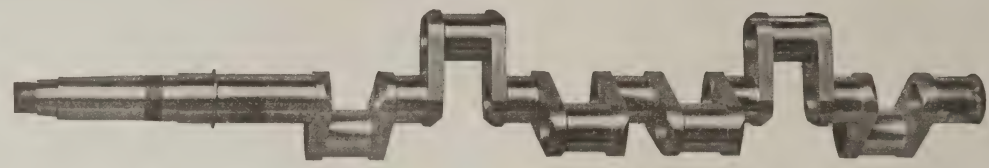
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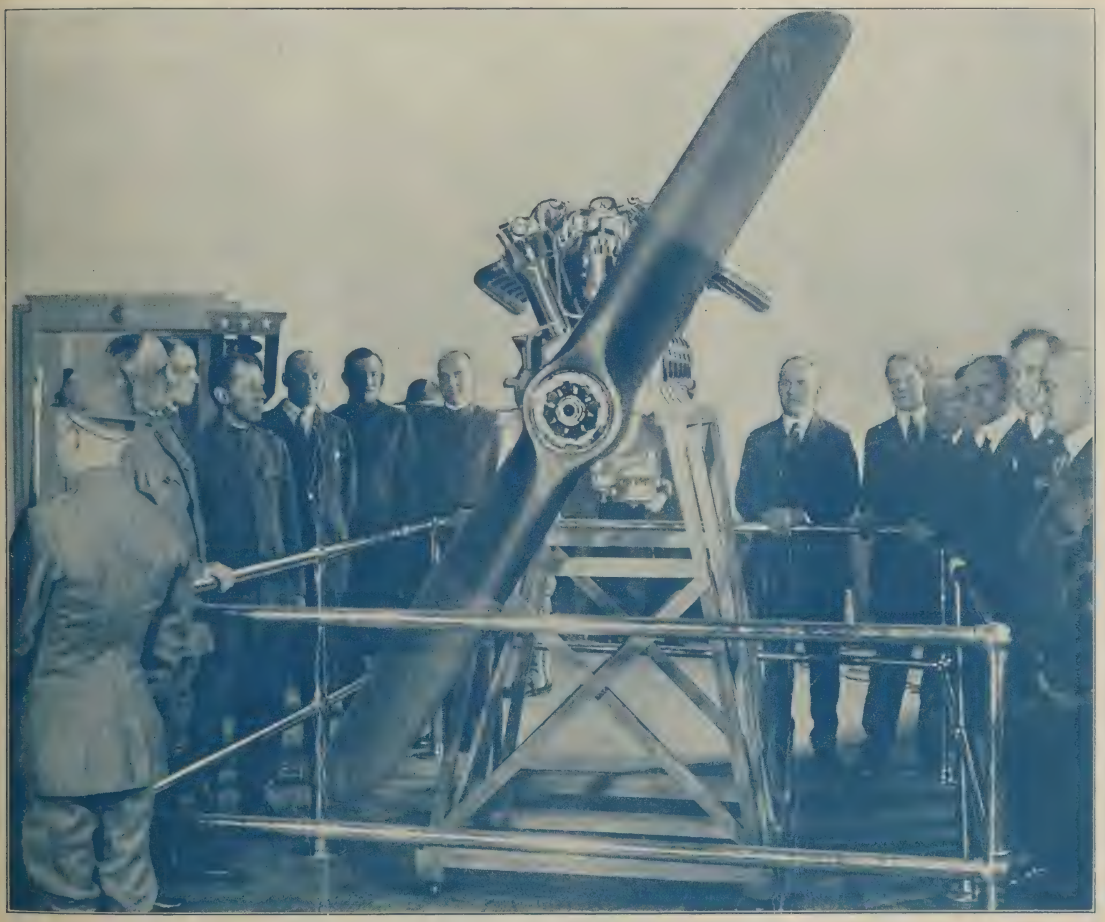
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NEW YORK CITY U.S.A.

Aeronautics
JAN 2 1919

AERIAL AGE WEEKLY

Vol. 8, No. 14 DECEMBER 16, 1918 10 CENTS A COPY



THE MEN WHO UNVEILED LIBERTY MOTOR, NUMBER 10000

From left to right the men in the picture are: Col. E. A. Deeds, Col. J. G. Vincent, Lieut.-Col. L. S. Horner, Mr. H. E. Coffin, Major James G. Heaslet, Lieut. Harold H. Emmons, U. S. N., Mr. Alvan Macaulay, Mr. R. H. Collins, Mr. F. E. Moscovies, Mr. O. E. Hunt, Mr. W. C. Leland. Mr. T. P. Myers, and Mr. A. A. Landon

THE FIRST COMPREHENSIVE DESCRIPTION OF THE LIBERTY MOTOR

-ISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
cription: Domestic, $4. Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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AERIAL AGE WEEKLY

Vol. VIII DECEMBER 16, 1918 No. 14

TABLE OF CONTENTS

PAGE

Aero Club of America Offers Intercollegiate Aeronautic Trophies... 701

Aircraft Appropriations and Aircraft Cancellations 701

Secretary Baker's Report..... 702

The News of the Week..... 703

The Aircraft Trade Review..... 705

U. S. Aerial Mail..... 706

Military Aerostatics 707

The Liberty Motor 708

Report of the Director of Military Aeronautics 720

The First Aeroplane Flight—Fifteen Years Ago 722

Naval & Military Aeronautics 724

Foreign News 726

Elementary Aeronautics and Model Notes 727

Aeronitis 728

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Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
WASHINGTON OFFICE: 619 *Union Trust Bldg.*
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Dec. 16, 1918
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, DECEMBER 16, 1918 NO. 14

AERO CLUB OF AMERICA OFFERS INTERCOLLEGIATE AERONAUTIC TROPHIES

ANOTHER important item has been added to the extensive plans of the Aero Club of America for fostering the use of aircraft for sport, pleasure, civic and scientific purposes.

Appreciating the fact that a large percentage of the 25,000 Army and Navy aviators are college men, including approximately 50% graduates and 50% undergraduates, and that most of them are intensely interested in aviation as a sport, the Board of Governors of the Aero Club of America has decided to create an Intercollegiate Aviation Trophy, to be competed for annually under rules similar to the rules governing the Intercollegiate regattas. The Board of Governors of the Aero Club of America is considering the advisability of creating two Intercollegiate Aviation Trophies, one to be competed for by graduates and one to be competed for by undergraduates.

The creation of the Intercollegiate Aviation Trophy is made possible under the bequest of the late Mr. Samuel H. Valentine, who was a member of the Board of Governors of the Aero Club of America, and who left $10,000.00 to the Club to be given in trophies or prizes for the development of Aviation.

This makes a total of 18 trophies and prizes for aeronautic events which are to be competed for during the coming year under the auspices of the Aero Club of America. Some of these trophies, like the International Aviation Trophy and the international Marine Flying Trophy, will be competed for in France, and the National Elimination Races will be held in the United States under the auspices of the Aero Club of America, to select the American representatives to be sent to France. The aeronautic trophies and prizes to be competed for during the coming year are listed in the Aero Blue Book, edited by Henry Woodhouse, and published by the Century Company, New York, as follows: For International Competition; The International Aviation Trophy; The International Balloon Trophy; The Michelin Trophy; The International Marine Aviation Trophy; The American Annual Aerial Derby; The Pan-American Aviation Trophy; The $50,000.00 and $5,000.00 Trans-Atlantic Flight Prizes. For National Competition: The Curtiss Marine Flying Trophy; The Annual National Elimination Aviation Contest; The Annual National Elimination Balloon Contest; The Mackay (Military) Aviation Trophy; The Valentine Trophies of the Aero Club of America; for Military and Naval Competition; The Collier Trophy; The Intercollegiate Aviation Trophies.

All these trophies and competitions are held under the rules of the International Aeronautic Federation, of which the Aero Club of America, No. 297 Madison Avenue, New York City, N. Y., is the sole representative on the American Continent.

Prospective entrants and competitors for these trophies will be required to hold the pilot's certificate which is issued by the Aero Club of America.

The competition for these trophies is expected to be the factor that will bring about the employment of aircraft for general purposes. It will also be the factor that will bring about the development of aircraft especially suited for civil purposes.

The arrangements for, and the rules and regulations governing the competitions for these trophies and prizes, which are not competed for under the international rules, will be made by the Contest Committee of the Aero Club of America, of which Mr. Alan R. Hawley is Chairman, and the following are members: W. Redmond Cross; Lieut. Godfrey L. Cabot, U. S. N.; Col. C. DeF. Chandler, U. S. A.; Major A. B. Lambert, U. S. A.; Major J. C. McCoy, U. S. A.; Commander H. C. Mustin, U. S. N.; Henry A. Wise Wood, and Henry Woodhouse.

AIRCRAFT APPROPRIATIONS AND AIRCRAFT CANCELLATIONS

THE sudden termination of the war has forced a policy of retrenchment in the Army and Navy aircraft programs and as the new policy is under consideration at present there is no definite military and naval aircraft program upon which the aeronautic industry can base plans for future activities.

Reports are received daily of cancellations of orders and the estimates for appropriations for the Army and Navy, which were included in the reports of the Secretary of War, Secretary of the Navy, and the Chiefs of the Bureaus of Military and Naval Aeronautics, have already suffered so many changes that it is impossible to state what the final estimates for appropriations will be.

The statement issued by the War Department recently announcing the adoption of a policy of Government construction, together with the fact that there are on hand a large number of military aeroplanes and motors, make it advisable for the aeronautic industry to seriously consider and adopt without delay a constructive policy of meeting the extensive demand for aircraft for commercial purposes, sport, pleasure and civic purposes.

This demand is large enough to afford substantial business but serious attention must be given to this field.

Air Service Estimates for 1920

As we have already stated there have been so many changes in the estimates for the air program of the Army and Navy that it is impossible to state what the appropriations will be. It is also impossible to state whether a large part of the appropriations requested is to meet present obligations and what part of the appropriations are to be spent for the upkeep of Government aircraft factories.

We print herewith the original estimates as a matter of record:

The letter from the Secretary of the Treasury to the House of Representatives,* of appropriations required for the fiscal year ending June 30, 1920, includes the following items for the Army Air Service:

*Transmitting the estimates.

Air Service, Aernonautics	$19,933,738.47
Air Service Production	$144,943,514.71
Total Air Service, Army	$164,877,253.18
Total Air Service, Navy	225,000,000.00

AIR SERVICE (AERONAUTICS)

AIR SERVICE, MILITARY—

Creating, maintaining, and operating at technical schools and colleges, and at established flying schools, courses of instruction for aviation students, including cost of construction, equipment and supplies necessary for instruction and subsistence of students, and excluding pay of military instructors and extra pay allowed candidates for commission (cadets) while at flying schools	$784,591.92
Extra pay allowed candidates for commission (cadets) while at flying schools	381,024.00
Vocational training in trades related to aviation, including the employment of necessary civilian instructors, purchase of tools, equipment, materials, machines, text books, books of reference, scientific and professional papers, and instruments and material for theoretical and practical instruction at aviation schools	325,669.20
Purchase of supplies for securing, developing, printing and reproducing photographs made by aerial observers	688,115.20
Purchase of aviation supplies and equipment to be furnished Air Service organizations to be established during the year, and to maintain and replace the equipment of organizations already in service	11,451,313.78
Payment of mileage to officers of the Army traveling on duty in connection with aviation	197,385.00
Establishment, enlargement, equipment, maintenance, and operation of aviation stations, balloon schools, fields for testing and experimental work	5,235,639.37
Salaries and wages of civilian employees in the District of Columbia or elsewhere as may be necessary, and payment of their traveling and other necessary expenses	600,000.00
Actual and necessary expenses of officers and enlisted men, and civilian employees of the Army, and authorized agents sent on special duty at home and abroad for aviation purposes, including observation and investigation of foreign military operations and organizations	25,000.00
Experimental investigation, and purchase and development of new types of aircraft	200,000.00
Necessary expenses incidental to the administration of the Air Service	30,000.00
All damages to persons and private property resulting from the operation of aircraft at home and abroad	15,000.00
Total amount to be appropriated under each head of appropriation: (aeronautic)	$19,933,738.47

PROVIDED, That claims not exceeding $250 in amount for damages to persons and private property, resulting from the operation of aircraft at home and abroad, may be settled out of the funds appropriated hereunder, when each claim is substantiated by a survey report of a board of officers appointed by the commanding officer of the nearest aviation post, and approved by the Director of Military Aeronautics;

PROVIDED, HOWEVER, That the claims so settled and paid from the sum hereby appropriated shall not exceed in the aggregate the sum of $150,000.

BUREAU OF AIRCRAFT PRODUCTION

AIR SERVICE (PRODUCTION)—

AERIAL APPLIANCES, VOCATIONAL TRAINING IN AVIATION, ETC.: For the purchase, manufacture, repair, and operation of airships, war balloons, and other aerial machines, including instruments and appliances of every sort and description necessary for the operation, construction, or equipment of all types of aircraft, and all necessary spare parts and equipment connected therewith; and all necessary buildings for equipment and personnel in any bureau or department charged with the production or procurement of aeronautical equipment and material; and also for the establishment, enlargement, equipment, maintenance, and operation of fields for testing and experimental work, including (a) the acquisition of land, or any interest in land, with any buildings and improvements thereon, by purchase, lease, donation, condemnation, or otherwise.

Total (Production) $144,943,514.71.

CONTINUING THE APPROPRIATIONS FOR THE SIGNAL SERVICE: That funds appropriated by the act approved July 24, 1917, for the fiscal year 1918, entitled "At act to authorize the President to increase temporarily the Signal Corps of the Army and to purchase, maintain, manufacture, repair, and operate airships, and make appropriations therefor, and for other purposes," and the funds appropriated for the Signal Service of the Army in the act approved May 12, 1917, entitled "An act making appropriations for the support of the Army for the fiscal year 1918," and October 6, 1917, for the fiscal year 1918, and prior years, entitled "An act making appropriations to supply urgent deficiencies, etc.," are hereby made available until June 30, 1920.

APPROPRIATION IMMEDIATELY AVAILABLE: That the moneys appropriated in this act for aviation purposes shall be and become available upon the passage of this act, and all shall also be available for the payment of obligations incurred prior to the passing of this act. In the event such obligations are of a character otherwise within the scope of the appropriation.

PROVIDED, That there shall be allotted to the Aircraft Board, by the head of the Bureau or Department charged with the production of aircraft, from the appropriations herein made for aircraft production for the fiscal year 1919 and 1920, the sum of $100,000.00, or so much thereof as may be necessary, which money shall be available during the fiscal year for the payment of such clerks, or other employees, either in the District of Columbia, or elsewhere, as may be necessary for the conduct of its business, including such technical experts and advisors as may be found necessary; and for the payment of rental of offices in the District of Columbia or elsewhere, purchase of necessary office equipment and supplies, including scientific publications, printing, necessary administration, and contingent expenses of said board.

AVIATION, NAVY—

For aviation, to be expended under the direction of the Secretary of the Navy for procuring, producing, operating, preserving, storing, and handling aircraft, establishment and maintenance of aircraft stations, including the acquisition of land by purchase, donation or condemnation, and for experimental work in development of aviation for naval purposes ($220,383,119)	$225,000,000.00
PROVIDED, That the sum to be paid out of this appropriation under the direction of the Secretary of the Navy for drafting, clerical, inspection, and messenger service for aircraft stations shall not exceed $300,000: PROVIDED Further, that the Secretary of the Navy is hereby authorized to consider, ascertain, adjust, determine and pay out of this appropriation the amounts due on claims for damages which have occurred or may occur to private property growing out of the operations of naval aircraft.	
Navy Total	$225,000,000.00

SECRETARY BAKER'S REPORT

IN his annual report for 1918, released December 5th, the Secretary of War reported on the Air Service as follows:

AIR SERVICE

Organization

The Aviation Section of the Signal Corps, which had charge of the production and operation of military aircraft at the outbreak of the war, was created on July 18, 1914. To assist in outlining America's aviation program, the Aircraft Production Board was appointed by the Council of National Defense in May, 1917. In October, 1917, the Aircraft Board, acting in an advisory capacity to the Signal Corps and the Navy, was created by act of Congress. In April, 1918, the Aviation Section of the Signal Corps was separated into two distinct departments, Mr. John D. Ryan being placed in charge of aircraft production and Brig.-Gen. W. L. Kenly in charge of military aeronautics. Under the powers granted in the Overman Bill, a further reorganization was effected by Presidential order in May, 1918, whereby aircraft production and military aeronautics were completely divorced from the Signal Corps and established in separate bureaus. This arrangement continued until August, when the present air service, under Mr. Ryan as Second Assistant Secretary of War, was established, combining under one head the administration of aviation personnel and equipment.

Raw Materials Secured

One of the most important problems which confronted the aircraft organization from the start was the obtaining of sufficient spruce and fir for ourselves and our allies. To facilitate the work, battalions were organized under military discipline and placed in the forests of the western coast. A government plant and kiln were erected to cut and dry lumber before shipment, thus saving valuable freight space. To November 11, 1918, the date the armistice was signed, the total quantity of spruce and fir shipped amounted to approximately 174,000,000 feet, of which more than two-thirds went to the Allies.

The shortage of linen stimulated the search for a substitute possessing the qualities necessary in fabric used for covering aeroplane wings. Extensive experiments were made with a cotton product which proved so successful that it is now used for all types of training and service planes.

To meet the extensive demands for a high-grade lubricating oil, castor beans were imported from India and a large acreage planted in this country. Meanwhile research work with mineral oils was carried on intensively, with the result that a lubricant was developed which proved satisfactory in practically every type of aeroplane motor, except the rotary motor, in which castor oil is still preferred.

Production of Training Planes and Engines

When war was declared the United States possessed less than 300 training planes, all of interior types. Deliveries of improved models were begun as early as June, 1917. Up to November 11, 1918, over 5,300 had been produced, including 1,600 of a type which was temporarily abandoned on account of unsatisfactory engines.

Planes for advanced training purposes were produced in quantity early in 1918; up to the signing of the armistice about 2,500 were delivered. Approximately the same number was purchased overseas for training the units with the Expeditionary Force.

Several new models, to be used for training pursuit pilots, are under development.

Within three months after the declaration of war extensive orders were placed for two types of elementary training engines. Quantity production was reached within a short time. In all about 10,500 have been delivered, sufficient to constitute a satisfactory reserve for some time to come.

Of the advanced training engines, the three important models were of foreign design, and the success achieved in securing quantity production is a gratifying commentary on the manufacturing ability of this country. The total production up to November 11 was approximately 5,200.

Production of Service Planes

The experience acquired during the operations on the Mexican border demonstrated the unsuitability of the planes then used by the American Army. Shortly after the declaration of war, a commisison was sent abroad to select types of foreign service planes to be put into production in this country. We were confronted with the necessity of redesigning these models to take the Liberty motor, as foreign engine production was insufficient to meet the great demands of the Allies. The first successful type of plane to come into quantity production was a modification of the British De Haviland 4—an observation and day bombing plane. The first deliveries were made in February, 1918. In May, production began to increase rapidly, and by October a monthly output of 1,200 had been reached. Approximately 1,900 were shipped to the Expeditionary Force prior to the termination of hostilities.

The Handley Page night bomber, used extensively by the British, was redesigned to take two Liberty motors. Parts for approximately 100 planes have been shipped to England for assembly.

Table 20 shows the status of American production of service planes by quarterly periods.

Table 20.—Service planes produced in the United States in 1918:

Name of plane	Jan. 1 to Mar. 31	Apr. 1 to June 30	July 1 to Sept. 30	Oct. 1 to Nov. 8	Total
De Haviland 4	14	515	1,165	1,493	3,187
Handley Page	..	...	100	1	101

(Continued on page 722)



THE NEWS OF THE WEEK



Wilson Pardons Aircraft Officials

Washington.—President Wilson December 3d authorized the announcement that he had pardoned Lieut.-Cols. George W. Mixter and J. G. Vincent, whom the recent report submitted by Charles E. Hughes, after his investigation of aircraft production, declared to be guilty of violation of a section of the criminal code which prohibits any person interested in profits or contracts of a corporation from acting as an officer or agent of the Government for the transaction of business with that corporation.

Attorney General Gregory agreed with Mr. Hughes's conclusion that these two officers had violated this section of the code, but did not think the ends of justice required that either of the two officers be prosecuted. At the White House it was announced that the President had pardoned both officers because he concurred entirely in the views of the Attorney General.

"He (the President) believes," says the official announcement, "that the two gentlemen concerned were entirely innocent of any improper or selfish intention, that their guilt was only technical, and that their service to the Government, which has been of the highest value and of a most disinterested sort, deserves the most cordial recognition."

No further statement was authorized by the President, but the letters written by the Attorney General were made public. Mr. Gregory's letter dealing with the case of Lieut.-Col. Vincent follows:

Dec. 3, 1918.

To the President,
The White House.
My Dear Mr. President:

In the report submitted to me by the Hon. Charles E. Hughes at the conclusion of the aircraft investigation, Lieut.-Col. J. P. Vincent was one of three officers found to have transacted business for the Government contrary to the prohibition contained in Section 41 of the Criminal Code and against whom prosecutions were recommended. In transmitting the report to you I said:

"I agree with Judge Hughes's conclusion that Lieut.-Col. Vincent violated Section 41 of the Criminal Code, which prohibits any person, directly or indirectly interested in the pecuniary profits or contracts of a corporation, from acting as an officer or agent of the United States for the transaction of business with such corporation. I further agree with Judge Hughes that the evidence does not afford ground for the conclusion that the Government was defrauded, or that there was any intent to defraud on the part of any of the parties concerned, or that the services rendered were not worth the amount paid therefor, or that the estimates of the outlay of the Packard Company were not fair estimates."

While there was a violation of the statute, I do not think the ends of justice require that Colonel Vincent be prosecuted.

Colonel Vincent was one of the designers of the Liberty motor. At that time he was not in the employ of the Government, but was vice-president of the Packard Motor Car Company. When the motor had been designed the Packard Company tendered Mr. Vincent and its engineering staff any facilities for such advice as might be necessary to test out and develop the design for production. The authorities authorized Mr. Vincent to build the required number of models and experimental motors, and he directed his company to do the work under his supervision. Later, during the progress of the work, he was commissioned in the Signal Corps, resigning as an officer of the Packard Company, but retaining the ownership of his stock. His offense is that he acted for the Government in connection with settling the compensation to be paid the Packard Company for this work. There is no evidence that he did not act in entire good faith, or that any advantage was taken of the Government.

The production of the Liberty motor was one of the great achievements in connection with the war. Colonel Vincent rendered invaluable services in designing and perfecting it.

In view of all the circumstances I recommend that a full and complete pardon be granted for the offense, as I believe it was unwittingly committed.

Respectfully,
T. W. GREGORY,
Attorney General.

The text of the other letter is as follows:

Dec. 3, 1918.

To the President,
The White House.
My Dear Mr. President:

The report made by the Hon. Charles E. Hughes to me at the conclusion of the aircraft investigation shows that Lieut.-Col. George W. Mixter acted for the Government in supervising inspection and production at the Curtis Aeroplane and Motor Corporation while he owned twenty-five shares of the preferred stock of that company of the par value of $2,500. I concurred with Judge Hughes in his conclusion that this was a violation of Section 41 of the Criminal Code.



Lt. William T. Campbell, O.I.C. Flying, Love Field, Dallas, who made the world's looping record by looping 151 times in succession

Lieut.-Col. Mixter testified that he had formerly owned a small amount of both common and preferred stock in the company referred to; that at the time he was commissioned he had sold the common stock and overlooked the fact that he still owned the preferred. There is nothing in the evidence warranting the conclusion that Lieut.-Col. Mixter did not act in entire good faith in the transaction referred to, or indicating that he was influenced by his ownership of this preferred stock, which paid a fixed dividend.

Lieut.-Col. Mixter has performed efficient service for the Government, and at a substantial sacrifice. I believe that the offense was unwittingly committed, and recommend that he be granted a pardon.

Respectfully,
T. W. GREGORY,
Attorney General.

Giant Seaplane to Make Radio Tests

Radio tests are to be made daily at the Naval Air Station at Anacostia, near Washington, a giant seaplane equipped with one of the finest wireless outfits in the navy having been assigned to the station especially for experimental work. This plane, which is the largest yet assigned the Washington base, arrived yesterday after a successful flight from Hampton Roads.

The plane has a capacity of eight passengers besides the crew of two, and is equipped with bombing and anti-aircraft appliances. The experimental flights will be carried on until freezing of the river.

Cited for Bravery

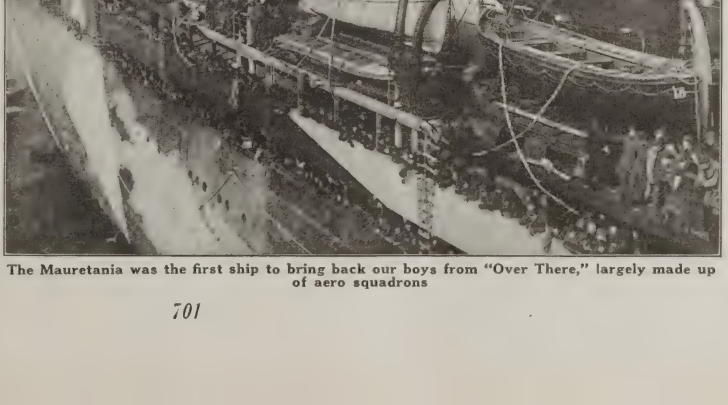
First Lieutenant George R. Phillips of the 50th Aero Squadron, who lives at Lewiston, Pa., and his observer, Second Lieutenant Mitchell H. Brown of Rockwell, Tex., attacked an enemy balloon while on reconnaissance and forced it to descend. They were in turn attacked by three Fokker planes, and incendiary bullets from the enemy machines set the signal rockets in the observer's cockpit afire. "Disregarding the possibility of going down in flames, Lieutenant Phillips manoeuvred his plane so that his observer was able to fire on and destroy one enemy plane and drive the other away.

"He then handed his fire extinguisher to his observer, who extinguished the flames. They completed their mission."

Flies 175 Miles in 75 Minutes

Washington.—Despite heavy snowstorms over the Alleghany Mountains, which forced an ascent to 12,000 feet, the trip from Pittsburgh to Washington, a distance of 175 miles, was made in seventy-five minutes Dec. 6 by a Glenn Martin day bombing plane equipped with twin Liberty motors and piloted by Major Harley W. Lake, inspector for the Division of Military Aeronautics.

Major Lake, a mechanician, and another pilot left Cleveland Dec. 5, but were forced to descend near Pittsburgh for the night. Temperatures as low as 10 degrees below zero were encountered during the flight.



The Mauretania was the first ship to bring back our boys from "Over There," largely made up of aero squadrons

Five Planes Crossing Country

Washington.—Major Albert D. Smith, commanding a squadron of five army aeroplanes which left San Diego Wednesday for El Paso, received authority Dec. 6 from the War Department to continue the trip to the Atlantic seaboard if possible.

If the transcontinental flight is made it will be the first by a military aircraft formation.

After leaving El Paso it is expected that the planes will stop at Kelly Field, San Antonio, Texas; Ellington Field, Houston, Texas; Camp Taylor, Montgomery, Alabama; Souther Field, Americus, Georgia; Dorr Field, Arcadia, Florida, thus completing the flight from the Pacific to the Atlantic.

Germany Preparing for Next Air War

According to the correspondence of the Associated Press, in Germany there is a society called the "Deutsche Fliegerbund." Just as the German Navy League was largely influential in giving Germany a powerful navy, so this new flying league, it is believed here, is expected to promote the German aim in "the next war" of conquering the world from the air.

According to a Bremen paper, the league will undertake the preliminary work in the training of young men for the air service. Flying schools are to be established for the "practical and theoretical" instruction of boys from 15 to 18 years old.

The training will be carried out, the paper says, by means of model aeroplanes. The monthly fee will be one mark, about 25 cents. "Practical training, four marks a year," the announcement reads.

French Aces to Foster Aerial Sports

French military aviators are planning the organization of an association to foster aerial sports and to place competent pilots at the service of the government and industry and business. The association will include the leading French aviators and will have the support of the government. Numerous aces already have signified their intention of joining.

Pittsburgh to Washington in 95 Minutes

Washington—Capt. Norbert Carolin made a flight in an army aeroplane from Pittsburgh to Washington, December 3, in one hour and thirty-five minutes. War Department officials said the best previous record was two hours and twenty minutes.

More Aero Squadrons Returning

Washington.—Two steamships, the "Empress of Britain" and the "Adriatic," sailed from Liverpool December 2 for New York with American troops, the War Department announced. The "Empress of Britain" carries 76 officers, 10 nurses and 2,389 men. The "Adriatic" carries 80 officers and 2,208 men.

Aboard the "Empress of Britain" are the 307th, 361st, 140th, 337th, 256th and 834th aero squadrons; the Tenth, Thirteenth, Seventeenth and Fourteenth air service construction companies, and a number of casuals and sick and wounded.

The "Adriatic" carries the 828th, 338th, 336th, 334th, 472d, 377th and the 637th aero squadrons; the Fourth, Sixth, Seventh, Eighth and Ninth air service construction companies.

Air Service Clubs' Association

The total embership of the Air Service Clubs' Association is now very near the thousand mark, with membership campaigns being conducted in almost every field. At Kelly Field, Texas, a meeting of the officers was recently held at which plans were made to enroll members in the Association.

Returning aviators from France in almost every case are joining the Air Service Clubs' Association. Applications are also being received from men in the Naval Branch of Aviation. The Balloon Section has also responded in a gratifying manner.

Kenly Flies from Washington to Garden City

Major General Wm. L. Kenly, Director of the Division of Military Aeronautics, with Major Wm. C. Ocker, Air Service, Aeronautics, as pilot, made the air trip from Washington to New York City, on November 29, in one hour and fifty-five minutes flying time. They left Bolling Field at 10:20 A. M. in a de Haviland plane and arrived at Garden City, N. Y., at 12:15 P. M.

Wilbur Wright Demobilizing

Demobilization at the Wilbur Wright field will begin within the next few days it is unofficially announced, and it is expected it will require about two months to muster out of service the more than one thousand men stationed at the Armorers' school. Lieut. W. G. Marvin, acting commanding officer at the field; Lieut. Lockwood, assistant technical executive, and Capt. B. A. Milter, gunnery officer, will return to private life this week. Col. B. Q. Jones, commanding officer at the field, was in Washington this week getting information concerning demobilization. Col. T. H. Bane, of the M'Cook Field, is also in Washington.

Information Bureau Ends Domestic Duty

The Committee on Public Information, of which George Creel was the head, has gone out of existence so far as the domestic service is concerned.

There will be no diminution, however, in the public supply of government news. The only difference will be in the system. Hereafter the news of the governmental operations will be disseminated by the publicity bureau of each department separately.

Reserve Officers to Have Annual Flight Instruction

The War Department authorizes the following:

Officers of the Air Service, Aeronautics, who remain in the Reserve Corps following their discharge from the regular service, will be permitted to fly Army planes even after their release from active duty. This information is of special interest to the Army pilots now leaving the service, as most of them had expected that they would have to give up flying or buy a plane. Although something like air livery planes are foreseen in the near future, the present cost of a plane is equal to the price of the most expensive English or French automobile, a price prohibitive to most flyers, and even though an expert pilot might be able to arrange for a "jazz" flight in some ship capable of fifty or sixty miles an hour, if he had been accustomed to flying planes doing from 90 to 135 miles an hour, it would be tame sport for him and of little attraction.

According to present plans, reserve officers of the Air Service, Military Aeronautics, will be called to flying fields for active duty for a period not to exceed two weeks each year. There pilots who have not flown for some time would be sent up, first, under an instructor in order to demonstrate their ability to handle a ship. After the dual control flight they would be permitted to fly solo during their period of training service. In the event of another emergency, these flyers would immediately be taken into the service again as commissioned officers without further training or instruction.

Splitdorf Activity in the War

An echo of Splitdorf activity in the War—the Splitdorf of ignition renown in the aeroplane automobile, truck, motorcycle, tractor and motorboat field—was sounded recently. A. B. Chace, factory manager of the Splitdorf Electrical Company's home plant at Newark, N. J., recently received a letter from Arthur J. Fleidner, one of the many Splitdorf workmen serving with the American Expeditionary Forces in France. Fleidner, who was one of the first to be included in the overseas contingent, in the course of an interesting letter and commenting upon the fact that even the Huns knew a good thing when they saw it, writes:

"Well, the Splitdorf Dixie 441 and the rest of the Dixies are standing right up at the front, as they are on all Packard trucks and Indian motorcycles. We have had no trouble with them and I hope that they put them on all machines after this.

"I have a piece of a breaker bar from a Splitdorf Magneto which was on a 'Hun' aeroplane which was brought down right near where we were stationed. We boys are giving the 'Hun' all they want, and it won't be long now when everything will be over."

First Forecast Made on Aerial Weather

Washington.—The first aerial weather forecast to be issued in the United States was made public Dec. 3 by the Weather Bureau in co-operation with the aerial mail service of the Post Office Department. It is as follows:

New York to Cleveland, cloudy, 8 P. M. Snow near Lake Erie. Winds moderate northwest to north northwest east of the Alleghanies up to 6,500 feet and moderate south winds west of Alleghanies, shifting to west southwest at about 1,500 feet. Forecast, snow to-day, Monday, with increasing northeast to north winds up to about 6,000 feet, backing to strong northwest above.

It is the purpose to extend this forecast for all the territory from New York to Chicago by December 15, when the aerial mail service between those and intermediate cities is to be inaugurated.

Long Island Flying School Reopens

The Hydrerocraft Co. has reopened its flying school at Central Park, L. I. Due to war conditions, the work at the school was temporarily suspended, but as its popularity had long been established, a lively resumption of peace-time flying activity is contemplated.

From New York City, the flying field at Central Park is easily reached by train from Jamaica, or by automobile by way of Hempstead. Classes are being formed for solo instruction on the Curtiss JN 4 tractor, and passenger flights can be arranged by appointment.

Balloon Section Congratulated

The Balloon Section is being congratulated as a result of the publication of the following orders:

Headquarters First Division,
American Expeditionary Forces,
France, October 12, 1918.

From: Chief of Staff, 1st Division
To: Commanding Officer, 2nd Balloon Company
Subject: Appreciation of Services

1. The Commanding General, 1st Division, directs me to express to you his appreciation and the appreciation of the division for the services rendered by your organization during the operations participated in by this division between the Meuse and the Argonne from September 29 to October 11, inclusive. The energy and alertness of your organization, which enabled the frequent identification of artillery targets, were of great value to the division.

J. H. Greely,
Chief of Staff.

Balloon Group
Fifth Army Corps, A. E. F.
A. P. O. 769
19 October, 1918.

Group Special Order No. 26.

1. The entire Balloon Service honors the maneuvering squad of the 12th Balloon Company. The devotion to duty shown by the men who composed this squad on October 1, 1918, was such as to set a glowing example to all other balloon companies in the American Expeditionary Forces.

2. Despite the fact that shells were falling on all sides of the balloon, two so close as to tear holes in the fabric, no man left the ropes nor faltered, well knowing that death was liable to come to them at any moment. The safety of the balloon was their first thought; their personal safety second. They have shown the spirit and loyalty which is expected of true soldiers.

3. This order is to be read to all balloon organizations, in the Balloon Group, Fifth Army Corps, at the first formation after its receipt.

By order of Major Jouett:
Carleton C. Jones,
1st Lieut., A. S., U. S. A.
Adjutant.



The Aviation Section of the N. Y. Police Department in a recent parade

The AIRCRAFT TRADE REVIEW

Col. Vincent to Remain on Job Until Jan. 1st

Col. J. G. Vincent, who has been commandant at the M'Cook Experimental Field here, and resigned, will remain at his post until January 1, giving his successor, Col. T. H. Bane, all the help he can in this work. Col. Vincent returns Jan. 1 to Detroit to resume his work as vice president of the Packard Motor Co.

Personal Notes

C. A. Shayne, formerly student at the Massachusetts Institute of Technology, Cambridge, is now junior mechanical engineer with the Nation Advisory Committee for Aeronautics, Washington, D. C.

R. B. Jones, formerly superintendent of engineering shops, Curtiss Aeroplane & Motor Corp., Buffalo, is now production engineer of the Canadian Aeroplanes, Ltd.

Frank M. Taylor, formerly purchasing agent in The Glenn L. Martin Co., Cleveland, is now director of purchases for The Parish & Bingham Co., that city.

John Swinscoe, formerly chief engineer with Crown Cork & Seal Co., Baltimore, Md., is now industrial engineer in the Wright-Martin Aircraft Corp., New Brunswick, N. J.

Austin P. Palmer, formerly electrical consulting engineer in New York City, is now electrical tester with the Sperry Gyroscope Co. of Brooklyn, N. Y.

G. H. Peterson, formerly designing engineer of the Champion Ignition Co., Flint, Mich., is no longer connected with that company.

Fort Omaha Balloon Pilots Continue in Experiment Flights

Leo Stevens, Lt.-Col. J. D. Carmedy and Capt. Raymond C. Pierce made a free balloon flight from Fort Omaha for experimental purposes and the balloon used has a capacity for 35,000 cubic feet of gas.

The flyers are all master balloonists and, it is safe to say, that three more experienced and daring aeronauts never before made a flight together.

Leo Stevens holds all honors as the foremost balloon pilot in the country. He has made ballooning his business since he was a mere lad and most of the great fliers of today were trained under Stevens. He has made several thousand flights and many hundred parachute drops.

Captain Pierce has given ballooning devoted study and has invented a machine attachment for the distributing of literature to be dropped during flights.

American-British Gage Bureau

Major H. W. Torney, U. S. A., and Mr. H. J. Bingham Powell, of England, have charge of the U. S. Bureau of Aircraft Production Section of Gages and Standards, and the Gage Inspection Department of the British War Mission, located in New York City. This highly important and very advanced combined organization is installed at 45th Street and Madison Avenue. Here gages are designed, purchased and inspected.

All new gages are sent to this bureau, inspected and returned to the particular districts in which they are used. Formerly district officers had discretionary power to use in certain classes of work gages rejected for given specific purposes, but this practice has been discontinued; once a gage is rejected, that is the end of it.

Visits are made to the war products plants fortnightly to examine for wear the gages in uses there. The history of each gage is recorded in books at the respective factories, the inspectors noting down the result of each periodical examination of them. The use of any gage is discontinued after it develops an amount of wear that has been predetermined.

The United States Army has received greatly appreciated assistance from the British in the establishment and operation of this branch of its inspection work. Nearly one hundred persons are employed in the laboratory at this time. There is an adequate drafting room for the design of the gages. The basic purpose of the bureau is to aid manufacturers in production and facilitate their meeting the gages in their work. That is, the activity is gage procedure in the broad sense, much of this practice being based on reports of the National Physical Laboratory of London. Clear instruction in the use of gages is given. A branch is maintained in Detroit.

Conflict of Thread Standards

The matter of the international conflict of thread pitches is of course before the bureau much of the time. This is one of the subjects that was considered in a preliminary way at the conference of American and British engineers held early in the year in London in cooperation with the work of the British Engineering Standards Association for the determination and promulgation of mechanical standards for the British Government.

The British representatives here feel that if a series of screw or bolt pitches could be agreed upon by Great Britain and this country, the rest of the points in connection with thread practice that would have to be solved would be easy of disposition. For example, the difference in the specifications for the Whitworth and for the United States forms of thread is not considered formidable. In other words, they are of the opinion that in practctice the United States form of thread is produced rounded in a way approaching that specified in the Whitworth standard. The view has been expressd that the five-degree difference in the angle of the British and of the United States thread is not an insurmountable obstacle to Anglo-American standardization. U. S. nuts have been assembled on Whitworth screws without great "over-wrenching" in the great majority of cases in recent trials made.

There is a strong tendency in England to replace the Whitworth pitches by the British standard fine pitches. These latter run numerically about half-way between those of the United States standard and of the S. A. E. Standard Regular. Some of the British engineers make the statement that the British standard fine pitches will answer the needs of all engineering practice. They are anxious that an Anglo-American standard of pitches shall be established.

The British Association threads are dimensioned in the metric system. This system, which originated in Switzerland, runs up to a little over ¼ in. diameter, and is used in instrument making.

Gage Inspection

In the American-British laboratory here women are employed extensively. They are found to be good on automatic work. In some of the gage testing machines, a system of wires under weight tension is used, electric visual signals flashing out when a given dimension on a gage is as it should be. Generally speaking, each dimension is measured by a separate person. The establishment is equipped with gage blocks accurate within a few ten-thousandths of an inch. Measurements to two hundred-thousandths are made.

The gage tolerances are usually in amount one-tenth those of the product.

In the case of a complicated gage, like that for an oil-pump, two days are needed for inspection.

The lantern screen system of magnified measurement is used, photographic views of gages thrown on the screen being made. The merit of the work depends, of course, upon the field accuracy of the lens used. Photometric gages will replace steel gages to some extent.

A study is being made of the polarized light method of indicating distribution of stresses, in celluloid pieces cut to shape. It is known in a general way that in the case of threads the stresses are applied on the first few threads only, the most stress being imposed on the first. From this it is deduced that there is no advantage in long threads, unless differentiated threads are used on bolt and nut, the latter being pulled up by a wrench.

To Sell Army Aeroplanes

A campaign has been inaugurated to sell in open marked, with the approval of the Chief of the Supply Section, several hundred aeroplanes and engines, which served their purpose well as training ships for our aviators and which are no longer needed. These aeroplanes, it is believed, will find a ready sale in open market and will do much to popularize flying in the United States. Another possible market for some of these aeroplanes is to nations of South America.

Major Packard Resigns

The resignation of Major John H. Packard as Officer in Charge of the Aeronautical Information Branch was announced this week. Major Packard returns to his home in Philadelphia to resume his business. Major Packard was presented with a monogrammed gold and silver cigarette case by the civilian and military members of the Information Branch.

The Aeroplane as a Possible Bootlegger Thwarted

Pensacola.—Aeroplanes have been added to the means by which liquor may not be brought into the State of Florida.

The bill to which Senator John Stokes gave his name and which he prides himself on having made "the most drastic anti-liquor law ever framed in the history of the world" has been amended to include "all machines traveling through the air" among those vehicles which may be forfeited and disposed of for aiding bootlegging.

Hundreds of aviators fly regularly from half a dozen places in Florida to New Orleans or to coast points where illicit stills are in operation. Gov. Sidney Catts had been told that liquor was brought back on their planes by these men.



Woodworking department in an American aircraft factory

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
L. T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations



PILOTS

Ira O. Biffle
Irving Graeb
Trent C. Fry
Carl B. Smith
Leon D. Smith
L. V. Smith
Dunn K. Steele
Lyman W. Doty
Carroll C. Eversole
Dan Davison
Dana C. DeHart
Edwin W. Hubbard
D. I. Lamb

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Geo. R. Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AVIATOR-MECHANICS

Christopher C. Cole
Julian Sykes
Wm. L. Lindley
August E. Carlson

Postmaster Burleson Reports Plans for Aero Mail

In the course of his annual report Postmaster Burleson goes into much detail as to the use of aeroplanes. On this it says:

Cost of Air Service

"One round trip daily, except Sunday, by postal aeroplanes carrying mail is being made without fail. The trip from Washington to New York is performed on an average of two hours and thirty minutes, and from New York to Washington in two hours and fifty minutes, the difference in time being due to resistance offered by the prevailing winds, which are usually from a westerly direction. An average of seven and one-quarter tons of letter mail is being carried each month. The cost of the operation of the service since it began, including development of new routes, is at the rate of $108,223.41 per year, or 79 cents per mile operated. The cost per ton mile of mail carried is $5.35. By this service mail between New York and Washington is advanced from two and one-half to three hours over the train service.

"The Washington-New York route has served as a working laboratory in which the many unknown factors that enter into the maintenance of a daily aerial service are being successfully solved, and the Post Office Department only awaits the day when the aircraft production of this country can more than supply the needs of our own army and those of our allies to make effective the programme for the aerial mail that I have directed to be put into operation as speedily as war conditions will permit.

"This programme directs, first, the establishment of an aerial mail service connecting the principal commercial centres of the country by a system of trunk lines and feeders, and, secondly, connecting this country with the West Indies and Central and South America. The trunk lines and feeders decided upon under this programme are:

"1. New York to San Francisco, with feeders from (a) Chicago to St. Louis and Kansas City; (b) Chicago to St. Paul and Minneapolis; (c) Cleveland to Pittsburgh.

"2. Boston to Key West, with feeders from (a) Philadelphia to Pittsburgh; (b) Washington to Cincinnati; (c) Atlanta to New Orleans.

"3. Key West, via Havana, to Panama.

"4. Key West, via the West Indies, to South America.

"On this programme I have to report progress as follows:

"1. Boston to Key West.—Of this route the Washington-New York division has been operated since May 15, and is functioning perfectly.

"The Boston-New York division has been tentatively laid out and will be established whenever, in the opinion of the War Department, its operation will not conflict with the war needs of the country.

"The Washington-Atlanta and Atlanta-Key West routes are now being worked out with a view to their immediate establishment at the close of the war.

"2. New York to San Francisco.—Of this route the division from New York to Chicago has been carefully worked out. The War Department has released to the Post Office Department, for the use of this division, aeroplanes of 650 pounds mail-carrying capacity which are no longer suitable for war needs. The hangars have been ordered, landing fields obtained, and the route has been ordered established before the close of the present year.

"In a series of aeroplane flights by the Post Office Department early in September the route was carefully charted for emergency and regular landing fields. In this work one aeroplane made a record flight from Chicago to New York in less than fourteen hours, including all stops en route. The flights were made through storm and heavy rains over parts of the route. The reconnaissance developed that it will be feasible to maintain a daily nine-hour schedule between New York and Chicago, as compared with the twenty-one-hour schedule of the Twentieth Century Limited.

"The time between Chicago and Cleveland will be cut to three hours forty-five minutes, and between New York and Cleveland to five hours fifteen minutes. Mail from the Atlantic seaboard will be advanced from twelve to twenty-four hours to the West and Southwest by this new service. The feeder routes from Chicago to St. Louis, Kansas City, St. Paul, Minneapolis, and the remainder of the trunk line from Chicago to San Francisco will be worked out during the ensuing year with a view to their immediate inauguration at the close of the war.

"3. Key West to Panama, and 4. Key West to the West Indies and South America.—Negotiations looking to the conclusion of special aerial mail conventions between the United States and the foreign countries involved for the establishment of these routes to the West Indies and Central and South America are now in progress. It is realized that these oversea routes will require the most powerful aeroplanes with wireless installation and special construction to make them safe over the seas, but the enormous commercial advantage that will result by materially reducing the time between this country and Central and South America will justify the expenditure that such a service will entail."



The Thanksgiving luncheon party in the cockpit of the Handley Page Biplane that will shortly be in active aerial mail service

One Hundred and Twelve Additional Aeroplanes for Mail Service

The War Department has turned over to the Post Office Department 100 De Haviland No. 4, and 12 Handley-Page aeroplanes, in compliance with the provision of the 1919 appropriation bill, to be put in operation in the Air Mail Service. The De Haviland fours will carry 400 pounds of mail and may be altered so as to increase the capacity to 1200 pounds. The 12 Handley-Page are large bombing planes capable of carrying a ton or more.

The New York-Chicago air route will be divided into three legs. Starting from Elizabeth, N. J., the first regular stop will be Bellefont, Pa., with emergency landing field at Lehighton, Pa.; the next regular stop will be at Cleveland, Ohio, with an emergency landing place at Clarion, Pa.; and the final leg from Cleveland to Chicago with a stop at Bryan, Ohio, to take on and discharge mail. Three planes will be used between New York and Chicago, one for each leg of the trip.

The Post Office Department has just employed ten additional regular pilots and four emergency pilots, which, with the four regular fliers now on the New York-Washington route, make a total force of 19 pilots.

(*Continued on page 731*)



MILITARY AEROSTATICS

By LIEUT. H. K. BLACK, R. F. C., C. F. A.



Free Ballooning

THOUGH a captive observation balloon does not go floating at the dictates of the wind over the lines, there are times when such a thing might happen. Balloons break away from their cables in a high wind sometimes and then a captive balloon becomes, to all intents and purposes, a free balloon. If the wind is carrying the balloon toward the Hun lines there is only one thing to do. The observer must throw his instruments overboard and then follow them to earth in his parachute.

The balloon generally goes over the Hun lines hotly pursued by the anti-aircraft shells of both the Germans and our own batteries.

If, however, the wind is away from the Hun lines the balloon will drift back into friendly territory. In that case it is necessary that the pilot of the balloon be able to bring his balloon down to earth without injury to himself, his passenger or the gas bag itself. Therefore is the need of free balloon training as a preliminary for observation balloon work. This necessity has been questioned several times since war broke out, and as an instance of the non-necessity of it the fact was quoted that the French didn't use it. The prevailing winds in France are toward the Hun lines, so while the French did not do the free ballooning, they were making a virtue of necessity in refraining from it. Had they done so, the chances are they would have lost a good many balloonists by them drifting over the Hun lines. This would be particularly the case in long night flights. It was notorious throughout the British balloon wings that the French were having very high casualties among their balloon observers on account of the lack of free balloon training. This training does more, however, than teach the pilot how to bring his balloon to earth safely; it teaches him the very indescribable thing known as the "feel of the air." In other words, it gives the balloonist a great deal of confidence in himself, his balloon and his ability.

Free ballooning as well as the captive ballooning is taught at Roehampton, England.

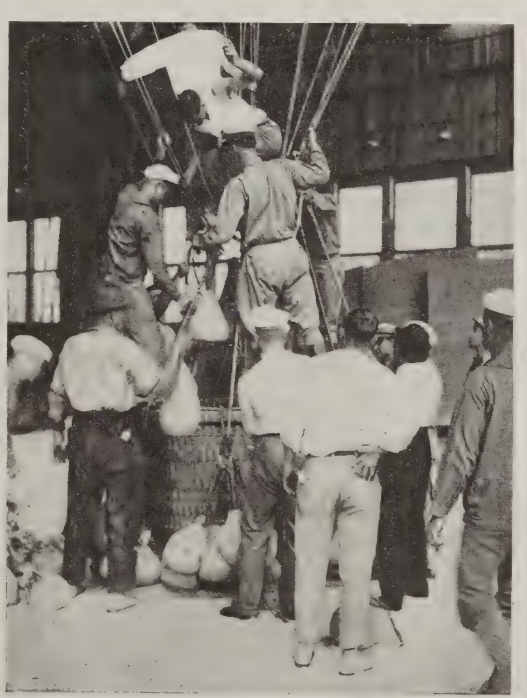
That place is where the British Royal Air Force has its Lighter Than Air School. While the writer does not want to introduce personal experiences, there is one thing about Roehampton which is printed indelibly on his memory.

He landed in a hospital not very far from the balloon school on his return from France. Being rather shot to pieces, he was put to bed immediately, and for two or three days he was too sick to pay attention to anyone or anything. However, one day came when he was feeling quite chipper and with the sun streaming in on the floor of the ward he felt a bit better. As he sat up in bed he gazed out of the window opposite, and the first thing which met his eyes was the sight of three Caquot balloons riding in the sky. Right there he pinched himself to see if he was really awake, and, being convinced that he was, grave doubts of his sanity assailed him. The next time he looked for them they were not to be seen, but it was not till the next day that he summoned up enough courage to ask the nursing sister if she saw those balloons also. What he had been looking at were the balloons at the Roehampton school.

It was not an uncommon sight to see six or eight large spherical balloons floating over London at six to ten thousand feet altitude which had come from the Roehampton school. There are several places in the United States where the same thing may be seen almost every day, but outside of the immediate vicinity comparatively few people seem to know about it. Making a landing with a free balloon is a rather ticklish proceeding when one has to land in a thickly enclosed country. In England the balloon cadets used to try to land in the back garden of some jolly old chap, the idea being that they could then get someone else to pack up the balloon while the gallant balloonist was entertained at tea or lunch, etc. There might even be a pretty daughter in the house. Cupid has various methods and airmen as a rule know mostly all ways of getting acquainted. The warm, affectionate welcome which one is expecting is apt to be somewhat modified, if not totally absent, when one in trying to land on a gentleman's lawn misses connections and lads on his pet cucumber frames or his greenhouse, after having the drag rope wind itself round one or two of his chimney pots and pull them to the ground amid a shower of tiles. Even when all that happened on one occasion, I know of one case where the old chap chuckled and said it wasn't half as bad as the last air raid he had been through.

Free ballooning is, among numerous other things, one of the best sports I know of. It used to be the ambition of most of the balloon officers in France to have their balloon break away with a southeast wind blowing. I have forgotten just exactly what the bearing of the wind would have to be to land us in London, but we all knew while we were there. We all swore that if any of us ever broke away with that wind we would forget everything we ever knew about landing a balloon until we had crossed the Channel and could bring her down gently in London or as close as we could get. So far as I know no one ever got the chance to try it. Balloons have landed in London, however, and in the busiest part of the city at that. One day a great big spherical from Roehampton was forced to land right in the crossroads of a very congested street. The London policeman on duty there upheld the reputation of that force for capability, for as the gasbag settled to earth he simply reversed traffic without shifting his position, for all the world as though he had had notice of the balloon's descent there for a month in advance.

(*To be continued*)



Preparation for a free balloon flight. A spherical balloon just after she has been "got on her feet". The balloon has been inflated with gas and the basket has been attached. The photograph shows the instruments being attached and the final preparations being made. The man second from the top holds in his hand a string which when pulled will release the catch on the appendix. This is done just before leaving the ground as the gas expands at a height. Were the appendix not open the balloon would be in danger of bursting from the internal pressure. Free ballooning is a very necessary part of a balloon pilots training, for he not only learns how to handle his balloon in an emergency, but by it he acquires the "feel of the air". The photograph was taken at an American Naval training station

THE LIBERTY MOTOR

By G. DOUGLAS WARDROP. M. S. A. E., A. S. M. E.

THROUGH the courtesy of the Engine Production Division of the Bureau of Aircraft Production, we are enabled this week to present a series of most interesting photographs of the Liberty Twelve, the greatest achievement of America's aeronautic program. The history of the development of the motor is an amazing demonstration of the skill of American engineers and the capacity for production of the automotive industries. On May 26, 1917, the Liberty Motor was merely an idea; on June 5 drawings had been made; on July 24 a complete motor was tested, on November 29 first production deliveries were made; on October 12, 1918, the ten-thousandth motor was delivered to the Government! This feat has never been equalled in automotive engineering and production, and Colonels Hall and Vincent, with the engineers who co-operated closely with them, and the two-hundred manufacturing concerns who made the production possible, have merited the heartiest commendation.

The first official announcement concerning the Liberty was made by the War Department on May 15, 1918. The statement read:

"The design of the parts of the Liberty engine were based on the following:

"Cylinder—The designers of the cylinders for the Liberty engine followed the practice used in the German Mercedes, English Rolls Royce, French Lorraine Dietrich, and Italian Isotta Frachini before the war and during the war. The cylinders are made of steel inner shells, surrounded by pressed steel water jackets. The Packard Company by long experiment had developed a method of applying these steel water jackets. The valve cages are drop forgings welded into the cylinder heads. The principal departure from European practice is in the location of the hold-down flange, which is several inches above the mouth of the cylinder, and the unique method of manufacture evolved by the Ford Company. The output is now approximately seventeen hundred cylinder forgings per day.

"Cam Shaft and Valve Mechanism Above Cylinders Heads—The design of the above is based on the Mercedes, but was improved for automatic lubrication, without wasting oil, by the Packard Motor Car Company.

"Cam Shaft Drive—The cam shaft drive was copied almost entirely from the Hall-Scott motor; in fact, several of the gears used in the first sample engine were supplied by the Hall-Scott Motor Car Company. This type of drive is used by Mercedes, Hispano-Suiza, and others.

"Angle Between Cylinders—In the Liberty engine, the included angle between the cylinders is forty-five degrees; in all other existing twelve-cylinder engines it is sixty degrees. This feature is new with the Liberty engine, and was adopted for the purpose of bringing each row of cylinders nearer the vertical and closer together, so as to save width and head resistance. By the narrow angle greater strength is given to the crank case and vibration is reduced.

"Electric Generator and Ignition—A Delco ignition system is used. It was especially designed for the Liberty engine, to save weight and to meet the special conditions due to firing twelve cylinders, with an included angle of forty-five degrees.

"Pistons—The pistons of the Liberty engines are of Hall-Scott designs.

"Connecting Rods—Forked or straddle type connecting rods, first used on the French De Dion car and on the Cadillac motor cars in this country are used.

"Crank Shaft—Crank shaft design followed the standard twelve-cylinder practice, except as to oiling. Crank case follows standard practice. The forty-five degree angle and the flange location on the cylinders made possible a very strong box section.

"Lubrication—The first system of lubrication followed the German practice of using one pump to keep the crank case empty, delivering into an outside reservoir, and another pump to force oil under pressure to the main crank shaft bearings. This lubrication system also followed the German practice



An assembly of Liberty Twelves in the Marmon factory

in allowing the overflow in the main bearings to travel out the face of the crank cheeks to a scupper, which collected this excess of crank-pin lubrication. This is very economical in the use of oil and is still the standard German practice.

"The present system is similar to the first practice, except that the oil, while under pressure, is not only fed to main bearings, but through holes inside of crank cheeks to crank pins, instead of feeding these crank pins through scuppers. The difference between the two oiling systems consists of carrying oil for the crank pins through a hole inside the crank cheek, instead of up the outside face of the crank cheek.

"Propeller Hub—The Hall-Scott propeller hub design was adapted to the power of the Liberty engine.

"Water Pump—The Packard type of water pump was adapted to the Liberty.

"Carburetor—A carburetor was developed by the Zenith Carburetor Company for the Liberty engine.

"Bore and Stroke—The bore and stroke of the Liberty engine is 5 x 7 inches, the same as the Hall-Scott A-5 and A-7 engines, and as in the Hall-Scott twelve-cylinder engine.

"Remarks—The idea of developing Liberty engines of four, six, eight, and twelve cylinders with the above characteristics was first thought of about May 25, 1917. The idea was developed in conference with representatives of the British and French missions, May 28 to June 1, and was submitted in the form of sketches at a joint meeting of the Aircraft (Production) Board and the joint Army and Navy Technical Board, June 4. The first sample was an eight cylinder model, delivered to the Bureau of Standards, July 3, 1917. The eight-cylinder model, however, was never put into production, as advices from France indicated that demands for increased power would make the eight-cylinder model obsolete before it could be produced.

"Work was then concentrated on the twelve-cylinder engine, and one of the experimental engines passed the fifty-hour test August 25, 1917.

"After the preliminary drawings were made, engineers from the leading engine builders were brought to the Bureau of Standards, where they inspected the new designs and made suggestions, most of which were incorporated in the final design. At the same time expert production men were making suggestions that would facilitate production.

"The Liberty twelve-cylinder engine passed the fifty-hour test, showing, as the official report of August 25, 1917, records, that the fundamental construction is such that very satisfactory service, with a long life and high order of efficiency, will be given by this power plant, and that the design has passed from the experimental stage into the field of proven engines.

"An engine committee was organized informally, consisting of engineers and production managers of the Packard, Ford, Cadillac, Lincoln, Marmon, and Trego companies. This committee met at frequent intervals, and it is to this group of men that the final development of the Liberty engine is largely due."

The prime consideration of the designing engineers was to have a motor that would be efficient from every modern standpoint, and at the same time suitable for production on a rapid basis. Both results have apparently been achieved.

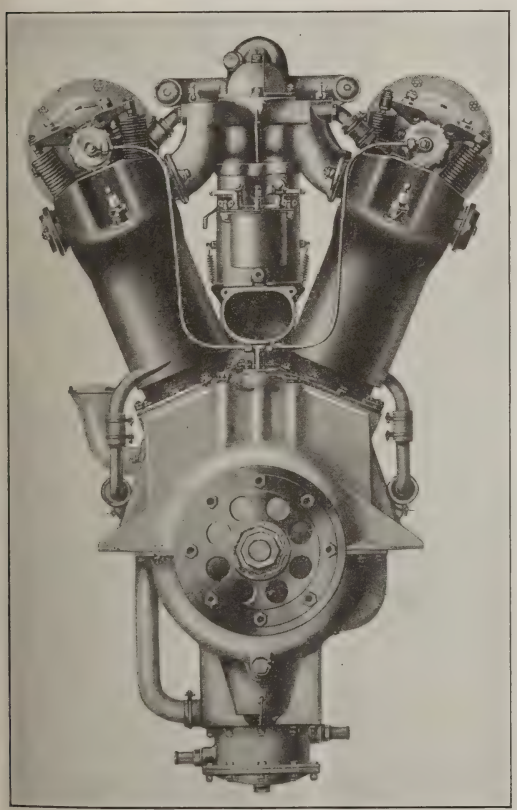
Before proceeding to a discussion of the detail of the motor, the following dimensions and characteristics are of interest:

General Data:

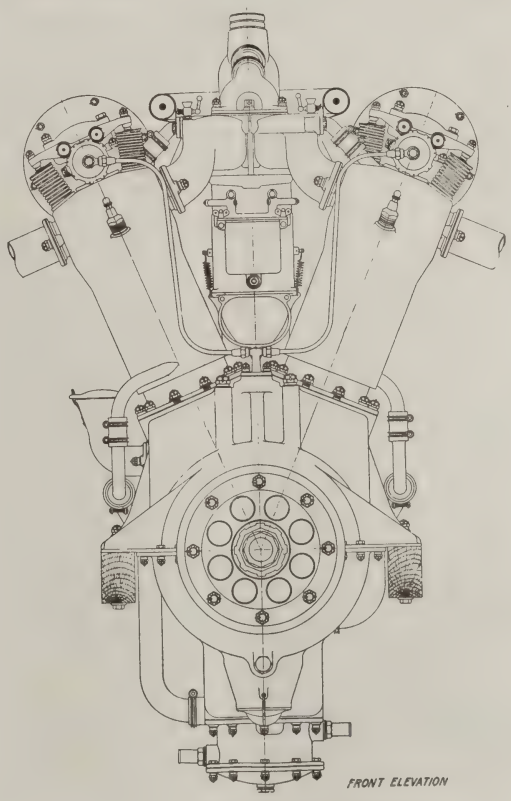
Number and arrangement of cylinders	Twelve-Vee
Included angle	45°
Bore	5″
Stroke	7″
Stroke-bore ratio	1.4:1
Area of one piston	19.635 sq. in.
Total piston area	234.62 sq. in.
Swept volume of one cylinder	137.445 cu. in.
Displacement of motor	1649.5 cu. in.
Compression ratio (Army)	5.4:1
Compression ratio (Navy)	5.:1
Normal brake H. P.	400 at 1750 RPM
Type of valve gear	Overhead cam shaft and valve rockers
Number of carburetors	Two Duplex Zenith

Valves:

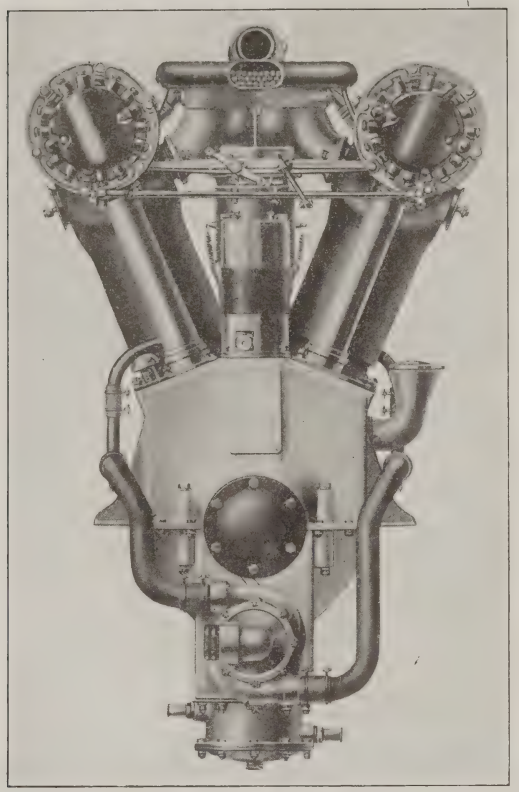
Number per cylinder	One inlet and one exhaust
Outside diameter	2¾″



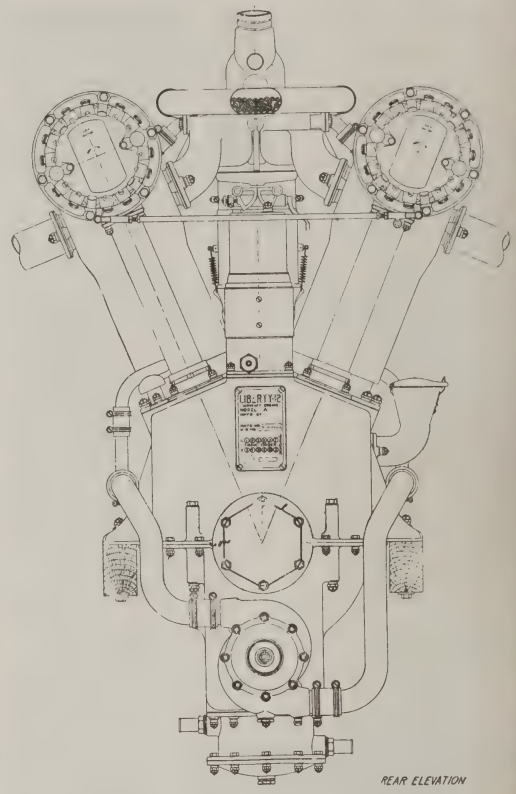
The propeller end of the engine, showing the arrangement of the carbureter and manifold



Front elevation of the Liberty Twelve



Anti-propeller end of the Liberty Twelve



Rear elevation of the Liberty Twelve

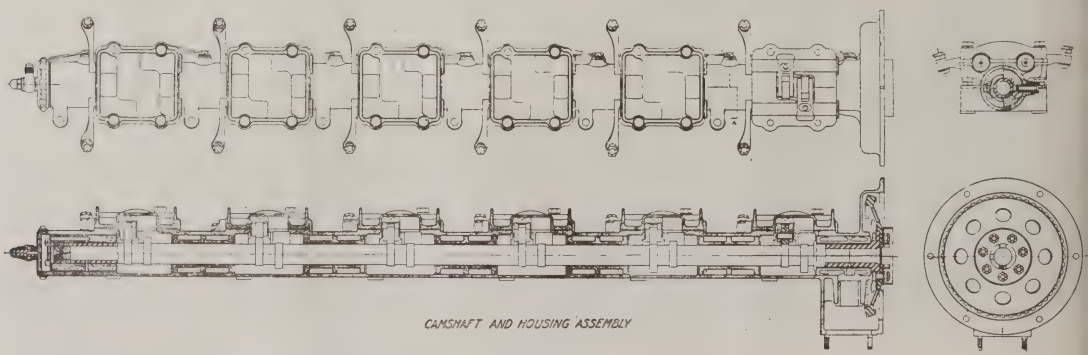
Port diameter	2½″
Width of seat	⅛″
Angle of seat	30°
Valve lift (Inlet)	7/16″
Valve lift (Exhaust)	⅜″
Diameter of stem	7/16″
Length of Valve	6 3/16″
Number of springs per valve	2 concentric
Length of spring in position	2 3/16″
Mean diameter of coils (large spring)	1 7/16″
Mean diameter of coils (small spring)	1″
Inlet rocker clearance	.015″
Exhaust rocker clearance	.020″
Included angles of valves	27°

Cylinders:

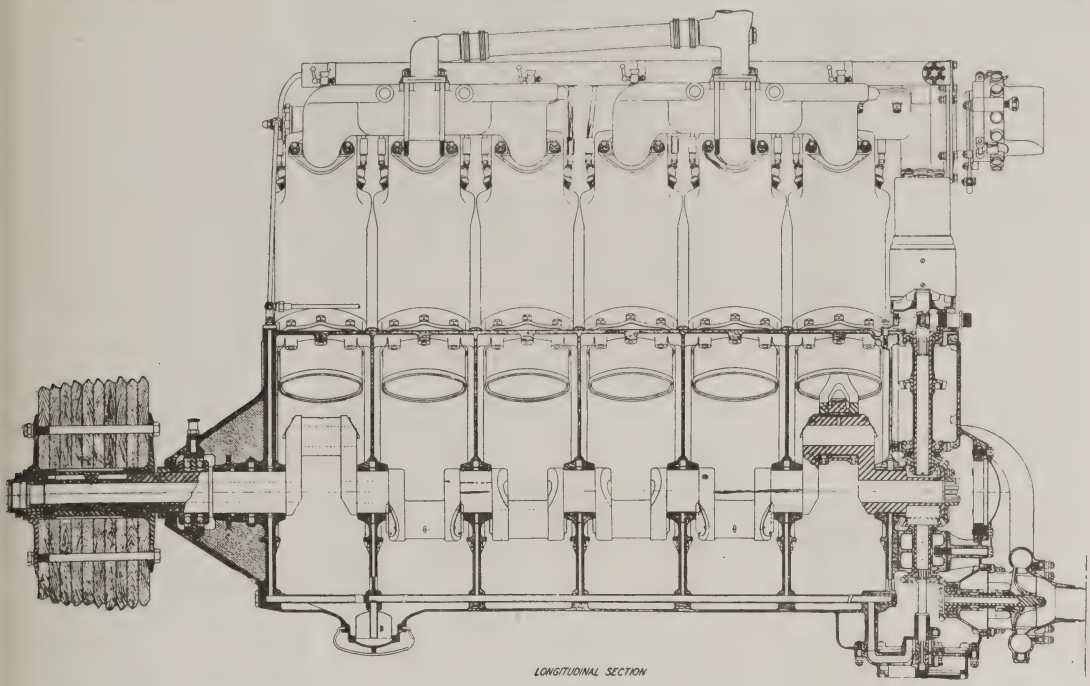
Overall height of cylinders	16 13/16″
Length of projection in crankcase	57/64″
Diameter of cylinder over waterjacket	6¾″ max.
Diameter of cylinder over waterjacket	5 13/16″ min.
Thickness of flange (base)	¼″
Number of studs	10
Diameter of stud	⅜″
Thickness of waterjacket	3/64″
Thickness of cylinder head	3/16″
Thickness of combustion chamber-wall	5/32″
Thickness of cylinder barrel	⅛″
Number of reinforcing ribs	8
Thickness of valve ports	⅛″
Diameter of port at valve	2½″
Diameter of port at flange	2⅛″
Number of spark plugs	2 per cylinder

Pistons:

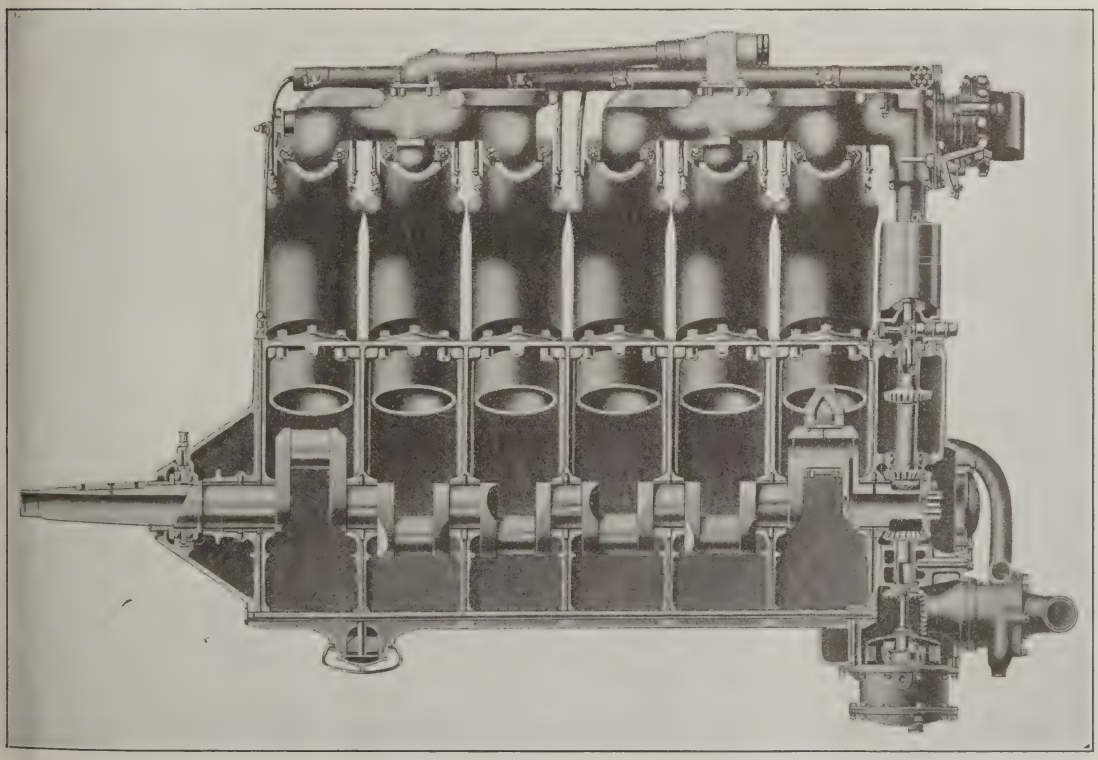
Type of piston (Army)	Crowned
Type of piston (Navy)	Flat
Material	Aluminum
Length of piston	5″
Length to diameter ratio	1:1
Number of rings per piston	3



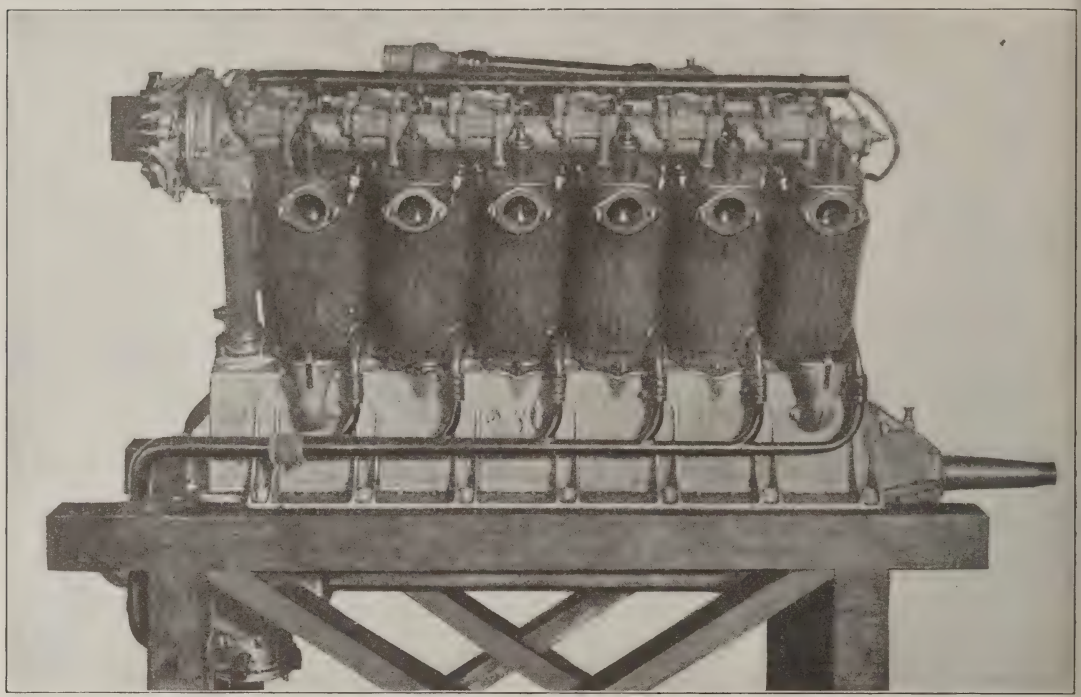
CAMSHAFT AND HOUSING ASSEMBLY



Longitudinal section of the Liberty Twelve



Longitudinal section of the Liberty Twelve

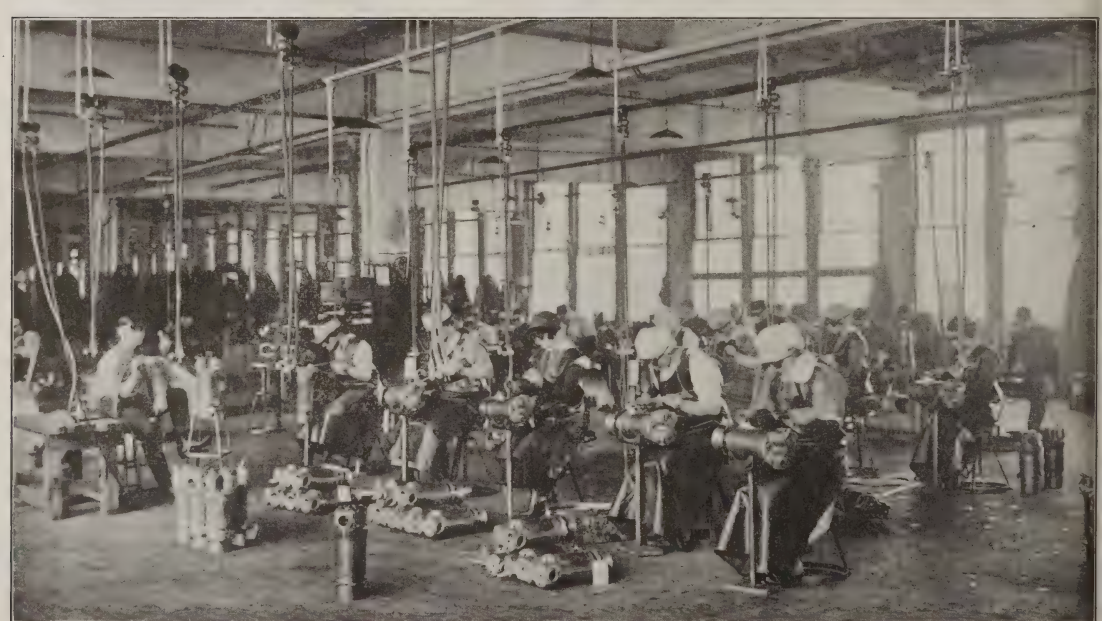


Side view of the 12 cylinder Liberty Motor

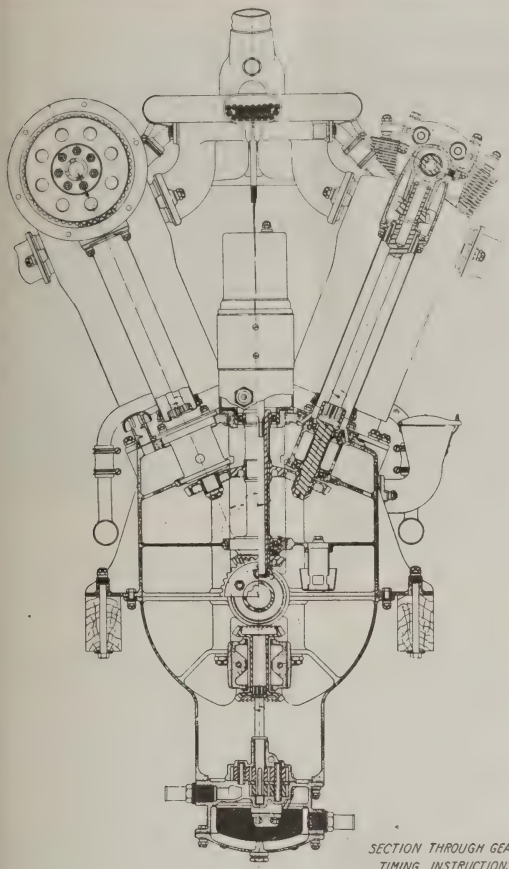
Position of rings	Above gudgeon pin
Width of rings	¼″
Width of lands	⅛″
Distance from bottom to center of gudgeon pin	2″
Thickness of head	⅜″
Thickness of wall at bottom	3/16″
Diameter of gudgeon pin	1¼″
Thickness of gudgeon pin wall	⅛″

Connecting Rods:

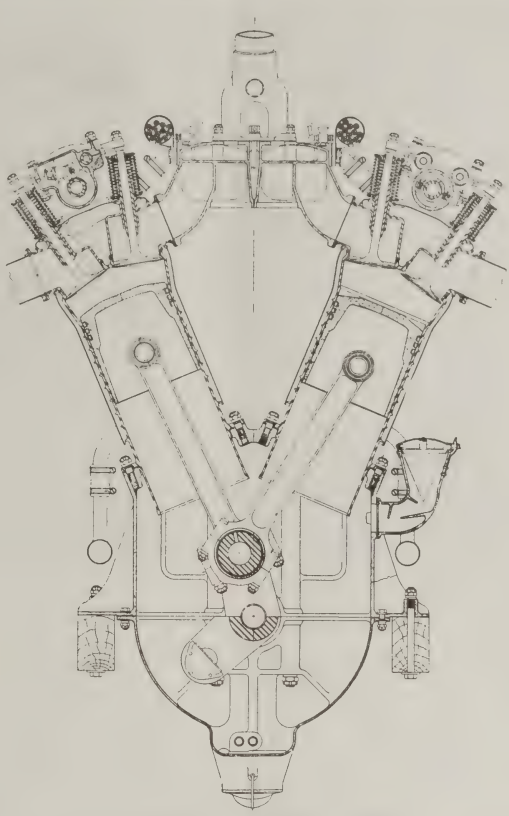
Type	Forked
Length between centers	11⅞″
Ratio length to crank throw	3.49:1
Small end bearing	bronze bushing
Outside diameter of bushing	1⅜″
Length of bushing	
Length of small end of rod	



Finishing Liberty cylinders at one of the factories in Detroit



SECTION THROUGH GEARS TIMING INSTRUCTIONS



TRANSVERSE SECTION THROUGH CYLINDERS

Outside diameter	1 11/16"
Type of section	"I"
Depth	1 5/16"
Width	15/16"
Thickness of web	
Thickness of flange	3/32"
Large end bearing	Bronze, babbit lined
Inside diameter	2⅜"
Outside diameter	2 13/16"
Length	2½"
Thickness of babbit	1/16"

Crankshaft:

Number of bearings (Main)	7
Cylinder centers	6½"
Crank pins:	
Outside diameter	2⅜"
Inside diameter	1¼"
Length diameter	2½"
Main bearings:	
Outside diameter	2⅝"
Inside diameter	1⅜"
Length	2"
Length (propeller end)	4½"
Crank webs:	
Width	2¾"
Thickness	1"
Radius of fillets	⅛"
Weight of shaft	103 lbs.

Camshaft:

Diameter of shaft	1"
Inside diameter	11/16"
Number of bearings	7
Length of bearing (5 intermediate)	3⅛"
Length of bearing (gear end)	2¾"
Length of bearing (front end)	3¼"
Width of cam face	⅜"
Number of cams per cylinder	1 inlet and 1 exhaust
Diameter of gear flange	2⅝"
Thickness of gear flange	3/16"
Diameter of bolt circle	2"
Number of bolts	7
Diameter of bolts	¼"
P. D. of gear	6"
Number of teeth	48
Width of face	½"
Camshaft housing	Barrel type
Material	Aluminum
P. D. of pinion	2"
Number of teeth	16
Width of face	½"
Diameter of inclined drive shaft	¾"

Crankcase (upper):

Material	Aluminum
Thickness of wall	3/16"
Thickness of cylinder pads	½"
Thickness of supporting flange	3/16"
Center distance of motor support bolts	16¾"

Crankcase (lower):

Material	Aluminum
Thickness of wall	⅛"

Lubrication:

Type	Forced feed
Type of pumps	Rotary gear
No. of pumps	1 double pressure and 1 scavenging
Ratio of pump speed to crankshaft speed	1.5:1

Ignition:

Type	Battery and generator
Firing order	L 1-9-5-11-3-7, R 8-4-12-6-10-2
Number of plugs per cylinder	2

Type of plug	A. C.
Ratio of generator speed to crankshaft speed	1.5:1

Cooling System

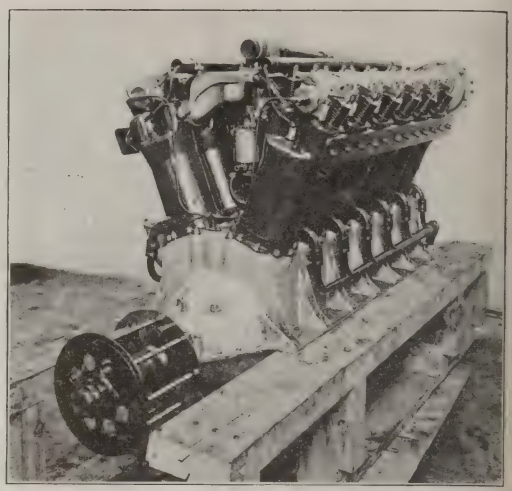
Type	Water cooled
Pump	1 centrifugal
Diameter of inlet pipe	2"
Diameter of outlet pipe	1⅜"
Number of outlets	2
Diameter of rotor	3⅛"
Ratio of pump speed to crankshaft speed	1.5:1
Water temperature inlet	155° F.
Water temperature outlet	175° F.

Ignition System

The ignition system used on the Liberty Twelve is known as the generator-battery type. The system comprises two independent breaker and distributor mechanisms, identical in every respect and each one firing all twelve cylinders. For starting and for idling speeds up to 650 R.P.M. current is drawn from a specially constructed four cell storage battery. The battery is very light and carries very little liquid or electrolyte. Nevertheless, it has sufficient capacity to ignite the engine at full speed for three hours. It is so constructed that, even though it be turned upside down, it will still continue to function properly.

In addition to the battery, a positively clever generator is provided, so geared that it runs at one and one-half times crankshaft speed.

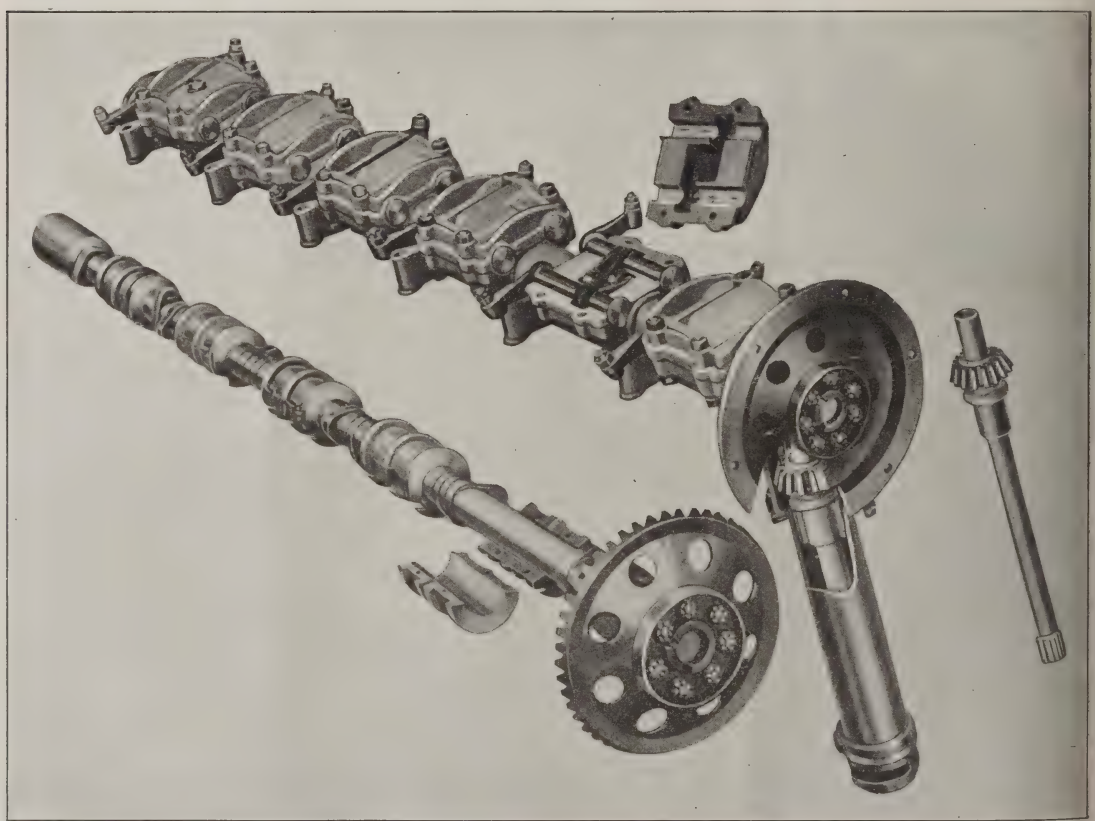
Electrical energy for starting and idling speeds is supplied by the battery. As the engine speed is increased, the generator "builds up" and its output grows greater until, at about 650 R.P.M. the generator voltage equals that of the battery. The maximum generator outputs exceed the requirements for ignition so that, at speeds above 650 R.P.M., the direction of flow current is reversed and the excess output of the generator goes to recharge the battery. The generator is controlled by a "voltage regulator" which prevents the output exceeding a predetermined figure. In view of this fact, the generator will supply current for ignition indefinitely, without the battery, so long as the engine speed is not allowed to drop below 500 R.P.M. A duplex switch permits of either one or both distributors being turned "on," and the switch is so constructed that either set of ignition alone can be used without connecting the generator.



Propeller and three-quarter view of a Marmon constructed Liberty Twelve

Carburetion

Two Zenith duplex carbureters are used on the Liberty Twelve. This is equivalent to four single carbureters, each one supplying three cylinders of the engine. Each duplex



Camshaft and camshaft housing of the Liberty Twelve



Final assembly of Liberty Twelve

carbureter consists of a single float chamber and a single air inlet joined to two separate and distinct spray nozzles, venturi and idling devices. As the V-type engine is, in a sense, two separate engines joined together for greater utility, so the Zenith is built in double form for the purpose of supplying each one of these two engines with its exact requirements. Each of the two barrels of each carbureter is fitted with a throttle valve of the butterfly type. The shafts of the throttles are parallel with the center line of the engine, and are interconnected by means of gear sectors pinned to the throttle shafts and meshing together. The two pairs of throttles are operated simultaneously by a shaft, provided with an adjustment at each end by means of which the pairs may be synchronized. Each duplex carbureter is fitted with an "altitude adjustment" which affects both barrels equally.

Gasoline from the tank enters the float chamber through the gasoline inlet D and the needle valve seat S, lifting the float F. As soon as the gasoline reaches a predetermined height in the float chamber, the metal float F, acting through the levers B and the collar G2, closes the needle valve G1 on its seat S.

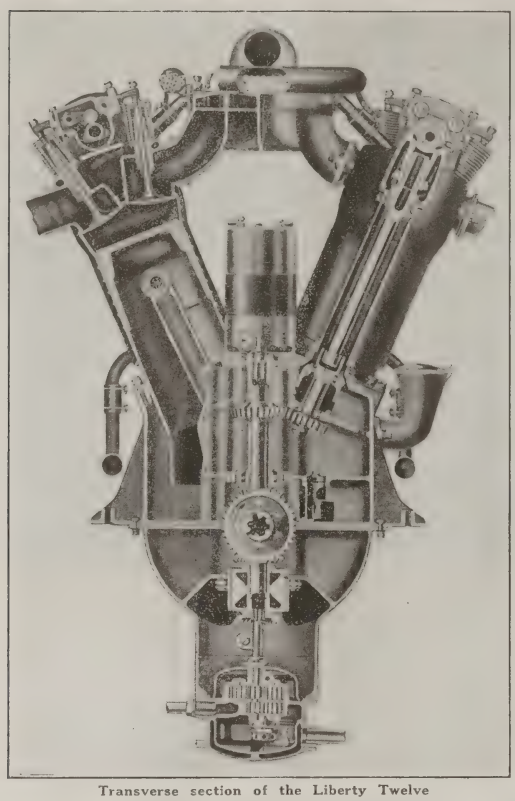
From the float chamber to the engine, gasoline flows through three different channels in various quantities and proportions, according to the size of nozzle, speed of motor and to the degree of throttle opening. At low speed when the butterfly throttle valve T is nearly closed, there is little or no suction in the throat X, but as there is considerable suction at the edge of the throttle T, gasoline is drawn through the idling device instead of through the jets G and H. This device (see Figure 31) consists of the idling tube M within the secondary well P inserted in the main well J, at the bottom of which the compensator I is located, and which is open to the atmosphere through holes A.

Gasoline from the compensator I flows through the calibrated hole in the bottom of the secondary well P (which is open to the air through holes Y) thence through the passage R to an opening opposite the throttle valve.

With the throttle fully open most of the gasoline flows



Grinding operations on Liberty Twelve parts in one of the Detroit factories



Transverse section of the Liberty Twelve

through the channel E and main jet G; some flows through compensator I, which is located at the bottom of the well J, open to the atmosphere through holes A (see Figure 31), then through channel K to the cap jet H which surrounds the main jet. Main jet and cap jet work together and furnish the proper mixture at all motor speeds.

Oiling System

Oil supply is carried in a reservoir provided with a suitable means for cooling it. Oil is led from this reservoir to the connection on the right side of the oil pump body marked "Oil In." It is filtered at this point through a large area fine mesh screen. A delivery pump of the gear type takes the oil up after it has passed through the screen and delivers it under considerable pressure to a distributor pipe running the entire length of the crankcase. Opening out of the passage between the pump and the distributor pipe is a pressure regulating valve designed to maintain a pressure not to exceed fifty pounds per square inch on the oiling system.

Pipes are fitted in the case leading from the distributor pipe to the main crankshaft bushings.

The crankshaft is hollow and in the center of each main bearing a radial hole is drilled through the shaft into the hollow center. This hole in the shaft registers with the corresponding hole in the bearing bushing once every revolution of the shaft, at which time a small quantity of oil is forced through into the hollow crankshaft. A passage leads from each hollow main bearing to the adjacent crank pin, which is also hollow. A radial hole is also drilled through each crank pin and carries the oil out on the surface of the pin. Oil grooves and passages in the connecting rod bushings insure proper lubrication for both the forked and plain connecting rods.

The excess oil thrown off the rapidly moving connecting rod ends forms a mist which lubricates the piston pins and the cylinder walls.

Part of the oil conducted to the main crankshaft bearing at the propeller end of the engine goes through a passage around this bearing and up through pipes to the propeller end of the camshaft housings. From the end of the camshaft housings it is led around the end camshaft bearing to a passage drilled diametrically through the bearing midway of its length. Once every revolution of the camshaft a hole drilled through the camshaft into its hollow center registers with the oil passage through the bearing.

Thus once every revolution a small quantity of oil is forced into the hollow camshaft.

The oil is led through the camshaft and out through holes drilled in it to each camshaft bearing. The excess works out of the ends of these bearings and collects in small reservoirs to a depth of about ¼". The cams, in revolving, dip into this oil and splash it over the cam rollers and into pockets in the rocker lever shafts. From these pockets it is led through the hollow rocker shafts to the rocker shaft bearings.

The excess oil eventualy finds its way to the gear end of the camshaft housings, over the gears and down the drive shaft housing into a chamber just above the oil pump.

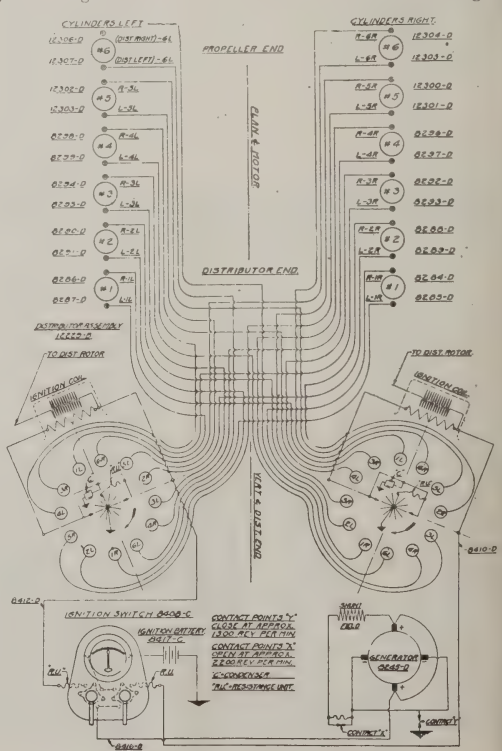
The excess oil thrown off in the crankcase by the connecting rods collects in this same chamber when the engine is inclined so that the propeller end is high. If the propeller end of the engine is low, this oil collects in a small sump or chamber at the propeller end of the crankcase.

Immediately above the *oil delivery* pump is located an *oil return pump* consisting of three gears, and driven by the same shaft as the delivery pump. The function of this oil return pump is to draw the excess oil out of the crankcase and return it to the oil reservoir. One-half of this pump draws oil from the sump at the propeller end of the crankcase and the other half draws oil from the sump at the distributor end of the crankcase. Both halves of the pump deliver oil to the connection on the left side of the oil pump body marked "Oil Out," from which point it returns to the oil reservoir.

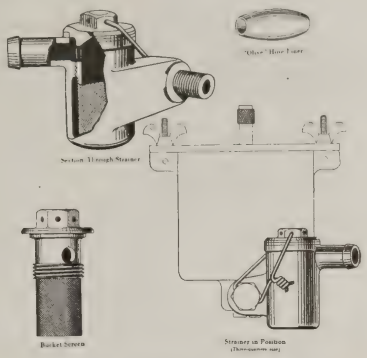
Cooling System

Cooling water is circulated through the Liberty engine by means of a centrifugal pump running at one and one-half times engine speed. The capacity of this pump is 100 gallons per minute at 1,700 R.P.M. The cooling system from the pump inlet to and including the water outlet header will hold 5½ gallons of water.

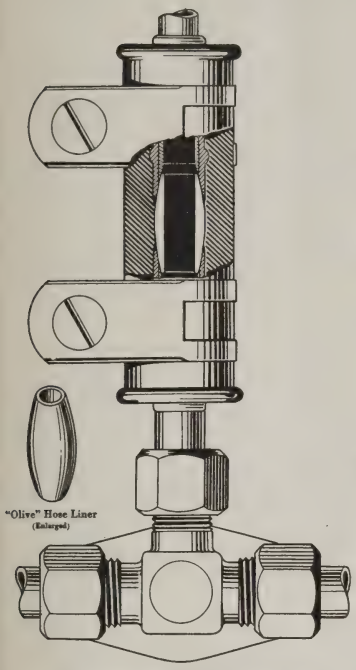
The water pump is provided with a single inlet, the outside diameter of which is 2", and two outlets, each one delivering water to a header supplying the right and left hand cylinders respectively. Water is forced into each cylinder jacket tangent to its outside surface. This construction gives



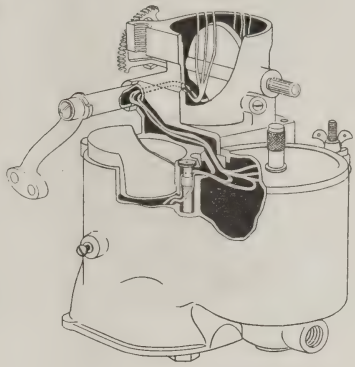
Firing order of the Liberty Twelve



The "Olive" Oil Hose Line



"Olive" in Place at Three-way By-pass of Oiling System
(Enlarged)



Cutaway view of new altitude adjustment showing suction on float chamber

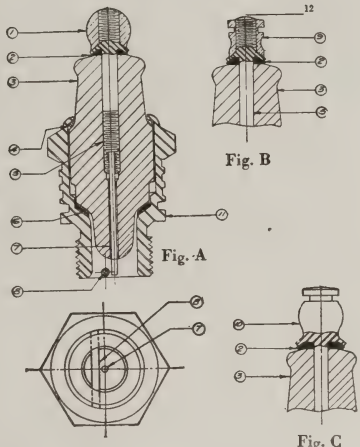


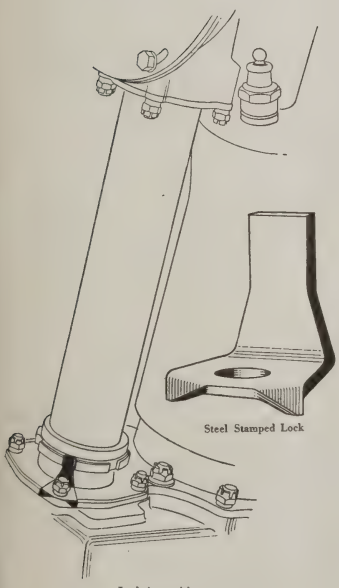
Fig. B

Fig. A

Fig. D

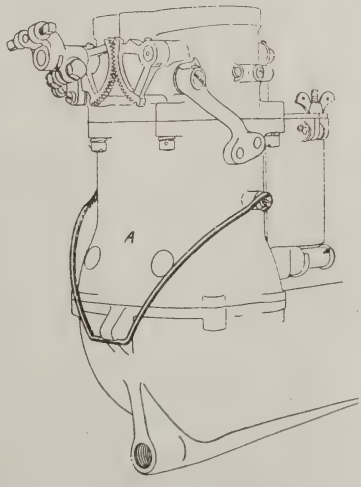
Fig. C

Diagram of Spark Plugs

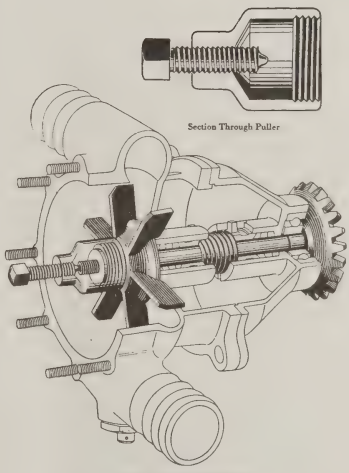


Lock in position on driving shaft housing

Vertical Shift lock nut



Sketch of Bail Attachment



Water Pump Impeller Puller

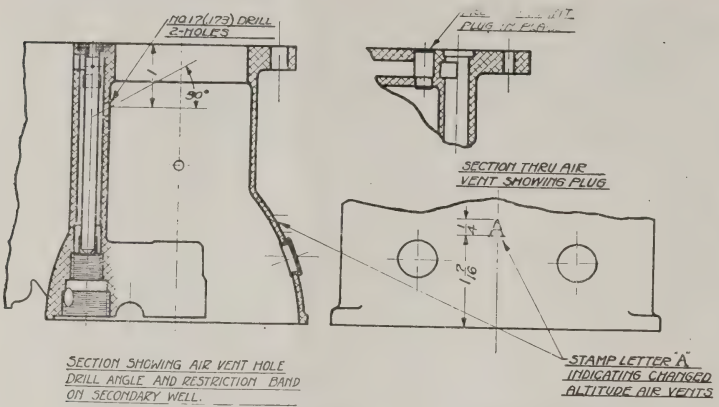


Figure 1—Detail showing carburetor changes in altitude adjustment

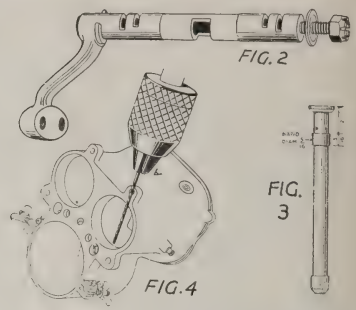


Figure 2—Altitude valve with progressive slots. Figure 3—Secondary well with restriction band. Figure 4—Drilling holes in well for new air vents

the water a whirling motion inside the jacket and insures uniform cooling.

The water outlet pipe for each cylinder extends inside the jacket to a point very close to the exhaust valve chamber, which guarantees the proper cooling of the exhaust valve. The cooling water then goes through a passage cored in the intake headers. This serves to warm and further vaporize the incoming gas as well as assist in coling the water. These passages in the intake headers are connected by two water outlet headers, the final outlet of which has an outside diameter of two inches.

Carburetor Air Intake

Tests have recently been conducted at Detroit and at McCook Field, Dayton, Ohio, to determine upon the best way of modifying the present carbureter air intakes to decrease the fire hazard.

The design which proved the most satisfactory is shown in an accompanying drawing and consists of a T-shaped casting with the air intake extended upwards, in the form of a pipe stack, through the top of the engine bonnet. Drain tubes are provided at either end to carry the gasoline waste outside of the fuselage.

Dynamometer and flight tests made at McCook Field have demonstrated the performance of the new arrangement to be fully as efficient as that of the old, while the fire hazard has been greatly reduced by draining away gasoline drippings from the hot engine "V," and carrying the carbureter back-fire flame out of the hood. This thorough gasoline drain and consequent absence of combustible vapor also protects the pilot from the fire hazard of incendiary bullets passing through the bonnet.

With this construction it is not difficult to make jet inspection or changes. By sliding up the pipe stack, springing off the attaching bails and disconnecting drain tubes, the manifold can be moved forward or backward as desired, to reach the jets of either carbureter.

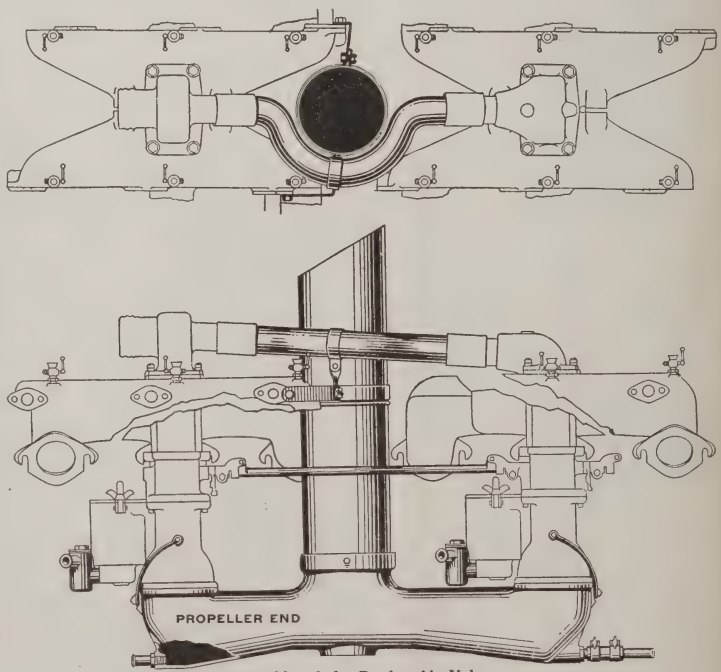
The changes necessary in making this installation consists of replacements to provide clearance for the new intake stack and its parts. These changes consist of new offset or curved intake header water curved carbureter throttle control connection. New and larger drain tubes are also included.

A hole must be cut in the motor bonnet to provide for the exit of the air intake pipe stack which is cut at an agle above the top of the bonnet so that pressure may be produced in the air intake by the propeller slip stream.

Carburetor Altitude Adjustment

The altitude adjustment on Zenith type U. S. "52" carbureter furnished on Liberty "12" cylinder engines is of limited range because the float chamber vent, which supplies air to both the float chamber and compensator, is too large for the best results. It is the purpose of this adjustment to cut down the flow of gasoline through the jets at high altitude where the air is thinner and lighter. Weighing less per unit volume here than at sea level, the air contains less oxygen to support combustion and must, therefore, need less gasoline for the most economical mixture. The altitude valve links up the float chamber with the engine suction at the carbureter throat for the purpose of holding back the flow or applying a gasoline brake. However, instead of maintaining a partial vacuum on the gasoline in the float chamber to retard its flow through the jets at high altitude, the screened air vents nullify this effect through their excess capacity.

To correct this condition without interfering with air supply to the compensator, modifications have been made in the original design by removing the screened air vents, plugging the holes in the casting, and drilling a new compensator air intake vent as shown in sketch Figure 4 and drawing Figure 1. Venting of the float chamber is thus accomplished through the air passage around the secondary well of the idling sys-



Assembly of the Duplex Air Valve

Note.—The illustration shows the new gasoline strainer in place.

tem, but is partially restricted by a collar added to the secondary well as shown in sketch, Figure 3. The diameter of this collar determines the amount of air restriction and, hence, the degree of vacuum permitted in the float chamber. This, in turn, directly affects the flow at the jets and, hence, the gasoline economy.

Flight tests made at McCook Field show that the use of this altitude adjustment will enable the operator to effect a gasoline economy of approximately 30 per cent. under that obtained formerly at the same engine R.P.M. and at an altitude of 18,000 feet.

In addition it has been found advantageous to employ progressive slot openings in the altitude valve, instead of the parallel drill holes formerly employed. (See Figure 2.) The slots coming into action progressively permit a more gradual leaning of the mixture, and the use of a greater range somewhat in excess of that actually required. The pilot can ascertain that the valve is operating by pulling the control back further than necessary and noting the falling off in engine R.P.M.

Changes can be made by dismounting the carbureter from the engine, and removing the throttle housing, the choke, the idling well system, the float mechanism and the altitude valve. Drill two No. 17 holes (see sketch, Figure 4, and drawing, Figure 1) into main well and securely plug air vent hole with special plug shown on drawing, Figure 1, and which must be positively locked in place by the attachment of the throttle housing. Build up shoulder of solder (for temporary use) on secondary well shown in sketch, Figure 3, and machine to dimensions of which diameter is most important. Insert new altitude valve. Reassemble the carbureter in the usual way, and stamp letter "A" on carbureter body as shown in drawing, Figure 1. All carbureters now coming through have letter "A" cast in place, which refers to venting of well only. To check up on altitude valve, pull out and note whether drilled or slotted.

"Olive" Oil-Hose Liner

The "olive" in the oil hose line is designed to reinforce the strength of the rubber tubing, and to act as a spacer with its tapered ends slipping into the countersunk openings of the oil pipe and the three-way valve connection when these two are pushed snugly into the rubber hose. In this way, the rubber hose is protected from full contact with the oil pressure and pieces of rubber which may be loosened through deterioration are not liable to enter the oiling system.

An improved olive is now in production which is shorter and smaller than the one formerly used. The new olive is 5/8" in length instead of 1", and is .304 plus or minus .004 in outside diameter.

All engines now going through have the smaller "olive" in place.

Vertical Shaft Packing Nut Lock

The packing nut used on the camshaft driving shaft housing where the upper and lower housings join is now further secured by a simple stamped steel lock employed as illustrated.

This lock can be used over either of the two outside studs on each of the two housings and is held in place by the usual castellated nut. The one-sixteenth inch thickness of the lock will make it difficult to insert the cotter pin as formerly but a smaller wire will answer the purpose, and prevent nut from loosening.

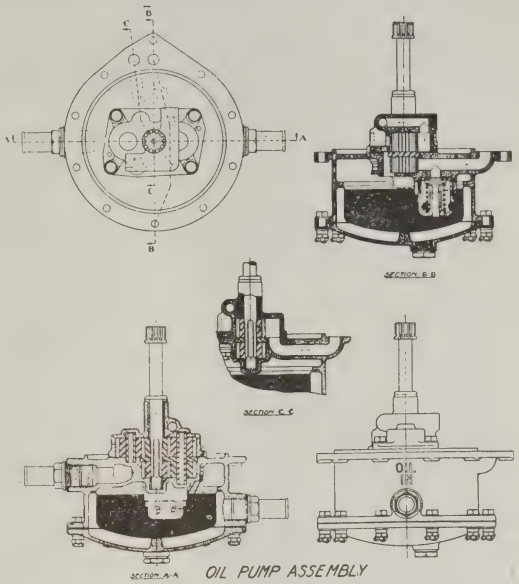
Water Pump Impeller Puller

An improved method of removing the water pump impeller without damage from its firm seat on the tapered shaft is clearly illustrated.

The new impeller puller now going into production performs this operation with ease, and is of the usual cup and screw type. The cup is threaded to engage the end of the impeller hub while the action of the screw draws the impeller off the shaft. The screw is always retained in the cup by punching the edge of the first screw thread to prevent disassembly.

Carbureter Gasoline Strainer

There has been some difficulty experienced through dirt working into the carbureter jets, and disturbing the measured flow necessary for the best results. This has been made possible because there has been no strainer in the gasoline system between the tank and the carbureter; and gasoline coming into contact with rubber hose will rot this in time, causing particles of rubber to be carried along into the carbureter.



To avoid this difficulty, a gasoline strainer has been designed to filter the gasoline entering the float chamber and to make an easy mechanical breakdown for removing the carbureter. This strainer incorporates a bucket screen. The gasoline entering from the top filters through the screen while the dirt is caught in the bottom of the bucket, which can easily be removed and emptied at intervals.

As a further protection against rubber particles a brass hose liner or "olive" is inserted in the rubber hose. This strengthens the hose and acts as a spacer between the supply pipe and the strainer intake; the tapered ends of the "olive" fitting into the beveled ends of the pipe and strainer preventing the gasoline from coming into direct contact with the rubber.

To install the strainer assembly, it is only necessary to remove the gasoline connection from the carbureter bowl and screw the strainer in its place. The gas line attaches to the gasoline connection at the top of the strainer by means of the rubber hose containing the brass hose liner. Suitable clamps are furnished.

AC Titan Aeroplane Spark Plugs

It has been found desirable to issue general instructions covering the care and adjustment of the AC Titan, used on Liberty 12-cylinder engines, as many plugs have been unnecessarily destroyed through rough treatment. Spark plug production is not up to government needs and all departments should practice conservation to meet the scarcity of this article. The following description and directions are important:

The AC Titan is known as a one-piece, or integral, plug wherein the porcelain is sealed with a gas-tight joint (at No. 6) into the shell and the central electrode is cemented into the porcelain. Unless the plug is preserved in its original gas-tight condition, its value is destroyed. Rough handling can easily crack the porcelain, while too much tool pressure in screwing down may cause a fracture of the joints. No mechanical repairs are ever required, and must not be attempted.

In Figure A is shown a cross-section of this plug. The ball terminal connection No. 1 is screwed on the upper end of the center wire No. 5, and a special riveting operation is performed to prevent it from coming loose. As the pressure applied in this operation is necessarily limited, it sometimes happens that on a small number of plugs part No. 1 is not rigid. A slight play here has no bearing on the action of the plug, and any attempt to tighten it may ruin the porcelain.

In Figure B is shown a special terminal connection used in Hispano-Suiza motors. In Figure C is shown a combination terminal connection which will be standard on all AC Titan aeroplane plugs by January 1, 1919.

(To be Continued)

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2—The design and construction for the Navy of the largest flying boats in the world, colossal crafts capable of carrying five tons useful load. It was one of these boats that recently carried fifty passengers.

3—The design and construction for the U. S. Navy of the fastest and most efficient Seaplane in service anywhere. This craft which is known as the Curtiss model H-A, with Liberty motor, made an official speed of 126 miles per hour with full military load, armament, ammunition, pilot and passenger.



The Curtiss Engineering Corporation is today the center of aeronautical devo
Glenn H. Curtiss and his engineers have been busy in drafting rooms, research l
of suitable commercial types. Aircraft especially designed for sportsman's use, m
workmanship and performance as Curtiss military planes have proved themselves to

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—The development and construction of a 12 cylinder, 400 H.P. motor of an entirely new and much lighter type, known as the Curtiss model K-12. These motors have undergone exhaustive tests and are already in production.

—The development and construction of the Curtiss model K-6, a new and much lighter 6 cylinder motor. These engines develop 160 H.P. and possess greatest endurance and reliability.

—The development and construction on a large scale of the Curtiss OXX motors, and the J-N-4. training planes, which were used almost exclusively by the United States and Canada and largely in England for the training of American and British aviators. The training of over seven-tenths of the original land and marine flying pilots, most of whom entered the service and formed the nucleus of the United States Training Forces.



s activities instead of being decreased will be increased by the coming of peace. s vind tunnels and shops in perfecting designs and carrying forward the production nd other peace-time purposes are already available and are as superior in design,

RATION, Garden City, L. I.

ft Association.

REPORT OF THE DIRECTOR OF MILITARY AERONAUTICS

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
November 3, 1918.

SIR: I have the honor to submit herewith the annual report of the Division of Military Aeronautics for the fiscal year ended June 30, 1918. Though the Division of Military Aeronautics was created only on April 24, 1917, it was agreed that the duties intrusted to it and previously carried out by the Signal Corps should be covered in this report in order to present a continuous story of the development of the personnel, training, and organizing phases of the present Air Service. Also it should be pointed out that operations on the front in France have been left largely to whatever report the American Expeditionary Force may deem wise.

The fiscal year 1917-18 saw aviation develop from a wholly subsidiary branch of the Army as the Aviation Section of the Signal Corps to a position of extreme and decisive importance as the Air Service, directly under the Chief of Staff. From the most insignificant beginnings it came within the year to be one of America's major efforts in the war.

This is all the more surprising when America's previous backwardness in aviation is considered. This country has stood practically still in aerial progress, while the war in Europe brought about an extraordinary advance. From all this the United States was entirely shut off up to the time it abandoned neutrality. So little exact knowledge was available that the first American planes to go with the expedition into Mexico in March, 1916, were all rendered useless in accidents within a short time of arrival. There was practically no aviation technique here comparable to Europe's, almost negligible manufacturing facilities, not a hundred trained flyers, and only the most rudimentary facilities for training. Moreover, no one had any adequate appreciation of the intricacy and skill required in the making of either an aeroplane or the training of a pilot.

As against this stagnation Europe's progress in two and one-half years of war had been tremendous. The first planes to go to the front in 1914 had been few in number, unequipped with radio, machine guns, bombs, or photographic apparatus, and entirely unproved in military value. Their extraordinary success, however, in disclosing the size of the German concentration in Belgium at once brought them into a position of great importance. Very shortly radio was installed to replace signaling by dropping tinsel or making curious evolutions; the pistols of the pilots gave way to machine guns; the easy-going system of dropping bombs over the side was replaced by regular bombing planes, and the occasional taking of photographs by an intricate system of picturing every mile of the front. Engine power increased to 200, 300, 400, 500 horsepower; huge planes with large carrying capacity were being developed for night bombing; and operation were taking place by whole squadrons in various air strata—light, single-seater scouts around 15,000 to 20,000 feet, two-seater day bombers around 9,000 feet, and photographic and observation planes around 6,000 feet.

In contrast to all this development the United States at the time of its entry into the war stood very little ahead of where it had been before the world war broke out. Aviation, both in its personnel and its equipment, was included in that part of the Signal Corps known as the Aviation Section, which had been established by Congress July 18, 1914. Its chief was Maj. Gen. George O. Squier, who after four years as military attaché in London, had been put in charge of the Aviation Section in May, 1916, and made Chief Signal Officer on February 14, 1917, continuing to have charge of aviation through nearly the whole of the fiscal year. On April 6, 1917, the total assets on hand consisted of 65 officers, 1,120 men, two small flying fields, less than 300 very second-rate training planes, practically no manufacturing facilities, and only the most meager technical information as to Europe's startling developments.

The original American war program, based on an army of a million men, made aviation but a relatively insignificant part of the general military forces. This program, which represented the view of the General Staff before the arrival of the foreign missions, was met by two appropriations, $10,800,000 on May 12, 1917, and $43,450,000 on June 15, many times larger than any appropriations ever before made.

The British and French missions, however, arriving the last part of April, completely revolutionized this viewpoint. Supported by an urgent cable of May 24 from the premier of France, calling for 2,000 planes a month and a total of 5,000 pilots and 50,000 mechanicians, the $640,000,000 appropriation, the largest ever made by Congress for one specific purpose, was drawn up, put through the House of Representatives Military Affairs Committee in two meetings, the House itself in one, the Senate Military Affairs Committee in 45 minutes, and the Senate itself a week later, becoming law on July 24, 1917. On this date the present large program was really launched, two months and a half after the outbreak of war, and largely in response to allied appeals.

The rest of the fiscal year was taken up in amplifying and executing the lines of effort here laid down. Toward the end of the year, however, it became obvious that the system of organization of an Aviation Section as a subsidiary branch of the Signal Corps was not functioning efficiently. The British and French, perceiving that we were encountering the same kind of obstacles as theirs, strongly recommended a separate, independent air service similar to the air ministries they had been obliged to establish and which have worked so successfully since. As a result, a first step was taken in a rearrangement of duties designed to effect a greater independence and a greater concentration of authority when, on April 24, the War Department authorized the following statement:

Mr. John D. Ryan has accepted the directorship of aircraft production for the Army.

A reorganization of the Aviation Section of the Signal Corps has been also effected, of which the principal elements are as follows:

Gen. Squier, as Chief Signal Officer, will devote his attention to the administration of signals; a Division of Military Aeronautics is created, under the direction of Brig. Gen. William L. Kenly. The Aircraft Board, created by act of Congress, remains as an advisory body, as it has been in the past, with Mr. Ryan as its chairman. This arrangement is made with the entire concurrence of Mr. Howard Coffin, who remains a member of the Advisory Commission of the Council of National Defense and will render assistance and counsel to the Aircraft Board and Mr. Ryan.

The Division of Military Aeronautics will have control of the training of aviators and military use of aircraft. The exact division of functions in the matter of designing and engineering will be worked out as experience determines between the Devision of Military Aeronautics and the Division of Production.

This announcement involves no change of personnel in the present Equipment Division of the Signal Corps, of which W. C. Potter is chief, and which will continue under his direction.

This reorganization, however, was admittedly but the first step. The first action taken by the President under the broad powers of the Overman Act was to effect a still further reorganization by taking aviation entirely out of the jurisdiction of the Signal Corps, where it has been from its inception on July 18, 1914, and to set up two separate bureaus, one for securing and training the large flying and ground forces and the other for providing planes, engines, and equipment.

The presidential order of May 21 covering this change follows:

By virtue of the authority in me vested as Commander in Chief of the Army and by virtue of further authority upon me specifically conferred by "An act authorizing the President to coordinate or consolidate executive bureaus, agencies, and offices, and for other purposes, in the interest of economy and the more efficient concentration of the Government," approved May 20, 1918, I do hereby make and publish the following order:

The powers heretofore conferred by law or by Executive order upon and the duties and functions heretofore performed by the Chief Signal Officer of the Army are hereby redistributed as follows:

I.

(1) The Chief Signal Officer of the Army shall have charge, under the direction of the Secretary of War, of all military signal duties, and of books, papers and devices connected therewith, including telegraph and telephone apparatus and the necessary meterological instruments for use on target ranges, and other military uses; the construction, repair, and operation of military telegraph lines, and the duty of collecting and transmitting information for the Army by telegraph or otherwise, and all other duties usually pertaining to military signaling; and shall perform such other duties as now or are or shall hereafter be devolved by law or by Executive order upon said Chief Signal Officer which are not connected with the Aviation Section of the Signal Corps or with the purchase, manufacture, maintenance, and production of aircraft, and which are not hereinafter conferred, in special or general terms, upon other officers or agencies.

(2) A Director of Military Aeronautics, selected and designated by the Commander in Chief of the Army, shall hereafter have charge, under the direction of the Secretary of War, of the Aviation Section of the Signal Corps of the Army, and as such shall be, and he hereby is, charged with the duty of operating and maintaining or supervising the operation and maintenance of all military aircraft, including balloons and aeroplanes, all appliances pertaining to said aircraft and signaling apparatus of any kind when installed on said aircraft, and of training officers, enlisted men, and candidates for aviation service in matters pertaining to military aviation, and shall hereafter perform each and every function heretofore imposed upon and performed by the Chief Signal Officer of the Army in, or in connection with, the Aviation Section of the Signal Corps, except such as pertains to the purchase, manufacture, and production of aircraft and aircraft equipment and as is not hereinafter conferred, in special or general terms, upon the Bureau of Aircraft Production; and all aeroplanes now in use or completed and on hand and all material and parts, and all machinery, tools, appliances, and equipment held for use for the maintenance thereof; all lands, buildings, repair shops, warehouses, and all other property, real, personal, or mixed, heretofore used by the Signal Corps in, or in connection with, the operation and maintenance of aircraft and the training of officers, enlisted men, and candidates for aviation service, or procured and now held for such use by or under the jurisdiction and control of the Signal Corps of the Army; all books, records, files and office equipment heretofore used by the Signal Corps, in, or in connection with, such operation, maintenance, and training; and the entire personnel of the Signal Corps as at present assigned to, or engaged upon work in, or in connection with, such operation, maintenance, and training, is hereby transferred from the jurisdiction of the Chief Signal Office and placed under the jurisdiction of the Director of Military Aeronautics; it being the intent hereof to transfer from the jurisdiction of the Chief Signal Officer to the jurisdiction of the said Director of Military Aeronautics every function, power, and duty conferred and imposed upon said Director of Military Aeronautics by subparagraph (2) of paragraph I hereof all property of every sort of nature used or procured for use in, or in connection with, the functions of the Aviation Section of the Signal Corps placed in charge of the Director of Military Aeronautics by subparagraph (2) of paragraph I hereof, and the entire personnel of the Signal Corps in charge of the Director of Military Aeronautics by subparagraph (2) of paragraph I hereof.

(3) An executive agency, known as the Bureau of Aircraft Production, is hereby established, and said agency shall exercise full, complete, and exclusive jurisdiction and control over the production of aeroplanes, aeroplane engines, and aircraft equipment for the use of the Army, and to that end shall forthwith assume control and jurisdiction over all pending Government projects having to do or connected with the production of aeroplanes, aeroplane engines, and aircraft equipment for the Army and heretofore conducted by the Signal Corps of the Army, under the jurisdiction of the Chief Signal Officer; and all material on hand for such production, all unfinished aeroplanes and aeroplane engines, and all unfinished, unattached, or unassembled aircraft equipment; all lands, buildings, factories, warehouses, machinery, tools, and appliances, and all other property, real personal, or mixed, heretofore used in or in connection with such production, or procured and now held for such use, by or under the jurisdiction and control of the Signal Corps of the Army; all books, records, files, and office equipment used by the said Signal Corps in or in connection with such production; all rights under contracts made by the Signal Corps in or in connection with such production; and the entire personnel of the Signal Corps as at present assigned to or engaged upon work in or in connection with such production are hereby transferred from the jurisdiction of the Signal Corps and placed under the jurisdiction of the Bureau of Aircraft Production, it being the intent hereof to transfer from the jurisdiction of the Signal Corps to the jurisdiction of the said Bureau of Aircraft Production every function, power, and duty connected with said production, all property of every sort or nature used or procured for use in or in connection with said production, all property of every sort or nature used or procured for use in or in connection with said production, and the entire personnel of the Signal Corps, as at present assigned to or engaged upon work in or in connection with such production.

Such person as shall at the time be chairman of the Aircraft Board created by the act of Congress approved October 1, 1917, shall also be the executive officer of said Bureau of Aircraft Production, and he shall be, and he hereby is, designated as Director

of Aircraft Production, and he shall, under the direction of the Secretary of War, have charge of the activities, personnel, and properties of said bureau.

II.

All unexpended funds of appropriations heretofore made for the Signal Corps of the Army and already specifically allotted for use in connection with the functions of the Signal Service as defined and limited by subparagraph (1) of Paragraph I hereof shall be and remain under the jurisdiction of the Chief Signal Officer; all such funds already specifically allotted or use in connection with the functions of the Aviation Section of the Signal Corps as defined and limited by subparagraph (2) of Paragraph I hereof are hereby transferred to and placed under the jurisdiction of the Director of Military Aeronautics for the purpose of meeting the obligations and expenditures authorized by said section; all such funds already specifically allotted for use in connection with the functions hereby bestowed upon the Bureau of Aircraft Production, as defined and limited by subparagraph (3) of Paragraph I hereof, are hereby transferred to and placed under the jurisdiction of said Director of Aircraft Production for the purpose of meeting the obligations and expenditures authorized by said bureau in carrying out the duties and functions hereby transferred to and bestowed upon said bureau; and in so far as such funds have not been already specifically allotted to the different fields of activity of the Signal Corps as heretofore existing, they shall now be allotted by the Secretary of War in such proportions as shall to him seem best intended to meet the requirements of the respective fields of former activity of the Signal Corps and the intention of Congress when making said appropriations, and the funds so allotted by the Secretary of War to meet expenditures in the field of activity of the Aviation Section of the Signal Corps are hereby transferred to and placed under the jurisdiction of the Director of Military Aeronautics for the purpose of meeting the obligations and expenditures authorized by said section; and the funds so allotted by the Secretary of War to meet the expenditures in that part of the field of activity of the Signal Corps, which includes the functions hereby transferred to the Bureau of Aircraft Production, are hereby transferred to and placed under the jurisdiction of the Director of Aircraft Production for the purpose of meeting the obligations and expenditures authorized by said bureau.

III.

This order shall be and remain in full force and effect during the continuance of the present war and for six months after the termination thereof by the proclamation of the treaty of peace, or until theretofore amended, modified, or rescinded.

Under this order Mr. John D. Ryan continued as Director of Aircraft Production and Maj. Gen. William L. Kenly became Director of Military Aeronautics.

This division of responsibilities and functions gave a clearer conception of the unique duties of the Air Service in production of planes and training of pilots, and is significant, too, of the many tactical reasons which made it imperative for England and France to establish separate and independent air services.

The end of the fiscal year found this problem of higher organization one of the most important to be faced. An early defect discovered in the reorganization developed when there appeared to be inadequate liaison between the Bureau of Aircraft Production and the Division of Military Aeronautics. One was responsible for the production of planes, the other for their operation and military efficiency. The method of selecting a type to put into production and the final decision whether any plane produced was suitable for its military purposes or not, was undetermined. The situation of two sets of officials with equal authority in their respective fields of action, neither responsible to the other, at once demonstrated that neither could be held for the final production of an acceptable plane for the front. This was partially obviated by an agreement between the Division of Military Aeronautics and the Bureau of Aircraft Production that the types of plane to be put into production must first be mutually agreed upon, and that before a plane could be sent to the front it should be given a military test and accepted by the Division of Military Aeronautics. But considerable time was lost before this policy was definitely arranged, a policy which might easily have at once been established by a unified department.

The personnel side of the air service, including the selection, training, organization, and operation of the flying forces, developed within the fiscal year 1917-18 into an educational system on a scale infinitely larger and more diverse than anyone had anticipated. Teaching men to fly, to send messages by wireless, to operate machine guns in the air, to know artillery fire by its bursts, and to travel hundreds of miles by compass, teaching other men to read the enemy's strategy from aerial photographs, and still others to repair instruments, ignition systems, propellers, aeroplane wings, and motors, has required a network of flying fields and schools, a large instructional force, and a maze of equipment and curricula.

None of this, practically speaking, was on hand at the outbreak of the war, neither fields, instructors, curricula, nor, more serious than all, experience to show what was to be needed. This country had never trained an aviator sufficiently to meet the demands of overseas aerial warfare and had not the slightest knowledge of the instruction necessary for radio, photography, or enlisted personnel. Consequently, the first men largely taught themselves before teaching others, and experience led on from one course to the next.

At first, in the point of need, was that of flying fields. Two were in limited operation at the outbreak of war, San Diego and Mineola; three more were selected, cleared, equipped, and made ready for flying in six weeks' time, and by the end of the year over a score were in operation all over the country. All were protected by a three-year lease with option to buy, if desired, at a fixed price. During the year also five supply depots, three concentration depots, three balloon camps, two repair depots, one experimental field, one radio laboratory, and one quarantine camp were built.

The selection of men for training as flyers was a complicated task, as the requirements were necessarily rigid. Volunteer examining boards of the highest medical skill were organized all over the country, 36 urban and 30 divisional boards, and a total of 38,777 men were examined to June 2, of whom nearly half, or 18,004, were disqualified. This naturally led to a high grade of personnel, and made the later training both more rapid and more efficient.

The first step in instruction was at one of the new "ground" schools opened on May 21 at the Massachusetts Institute of Technology, Cornell and Ohio State Universities and the Universities of Illinois, Texas, and California, with Princeton and the Georgia School of Technology added on July 5. Here, in eight weeks, under military discipline, the cadets were grounded in all the elements of aviation at a cost to the Government at first of $65 per pupil, and later $10 each for the first four weeks, and $5 weekly thereafter. By June 30, 1918, a total of 11,539 men were graduated to the flying fields and 3,129 were discharged for failure in studies, etc.

Next came the actual flying instruction, divided into two phases, primary and advanced. The former averaged about eight weeks, included ability to execute the simpler evolutions and cross-country flights, and led to an officer's commission and the right to wear the Reserve Military Aviator's wings. To June 30, 1918, 4,980 men had been graduated as Reserve Military Aviators for final training, and about 400 had been disqualified as incapable of becoming fliers.

The advanced training, however, presented infinitely more difficulties. It was not nearly so simple to teach the more complex stunts, formation flying, aerial machine gunnery, bombing, and night flying, while at the same time the highly specialized equipment necessary required considerable time for manufacture. Nevertheless, advanced schools of the three types necessary were opened toward the end of the year 1918, with what equipment was available, and had graduated 110 bombers, 85 bombing pilots, 464 observers, 389 observer pilots, and 131 pursuit pilots by June 30, 1918.

The ideal arrangement in mind at the end of the year was to train each pilot completely on this side of the ocean, where facilities are very good, supplies in abundance, and information and experienced pilots from the front available in ever-increasing numbers. The fliers can then be organized into provisional squadrons and wings and given training as large units with their own administrative officers and enlisted personnel so that they will be able to go immediately to the front, after a month or so of transformation work in France, learning geography and familiarizing themselves with new types of planes. Plans are under way looking to the establishment of such wings and brigades in the United States with the end in view of furnishing complete and fully trained units to the American Expeditionary Force.

The whole training program was considerably held up by lack of equipment. Obviously it required far less time to select men for training than to build the fields, planes, and accessories necessary to train them. Primary training planes, the only type manufactured here before the war, soon become available in increasing numbers, till by the end of the year more were on hand than needed. The advanced training planes, however, presented problems wholly new to this country, so that primary planes had to be fitted with more powerful engines and equipment and made to serve the purpose. The first 16 single-seater pursuit planes were not delivered till January, 1918, the first bombers till March, and the first gunnery late in May.

During this fiscal year a grand total of 407,999 hours were flown by Army aviators in the United States, as contrasted with 745.5 hours in 1914 and 1,269 in 1915. In the single week ending June 30, 1918, a total of 19,560 hours were flown, or 15 times, for that single week, the number for the whole year three years before. This, at 75 miles an hours, is equivalent to over 30,000,000 miles, or 1,223 times around the Equator.

During it there were 152 fatalities, or 2,684 flying hours and 201,000 miles flown to each death. Of these, 86 were caused by stalls, when the plane, usually through some error by the pilot, lost its flying speed and dropped into a straight nose dive or turned into a tail spin, from which the pilot did not have the time or the skill to extricate it. Collisions were responsible for 30 other accidents, often due to failure to fly according to the rules. Side-slips, the only other large cause of accidents, resulted in 10 deaths.

Regrettable as these accidents are, it is felt that, considering the newness of the science, the early state of development of the planes, the inexperience in instruction, and the necessity of teaching stunts in themselves rather dangerous, this number is not large. As a matter of actual statistics, fatalities in American training are less than half as large as those of the other allied countries.

Besides flyers, however, engineer officers to direct the upkeep of the equipment, supply officers to keep sufficient equipment on hand, and adjutants to keep the records and do other military work had to be especially trained. These men, absolutely essential to the maintenance of the Air Service organization, could be secured only after a detailed course of instruction. An engineers' school, opened for a 12 weeks' course at the Massachusetts Institute of Technology on January 12, graduated 590 men and discharged 228 before June 30; a supply officers' school, opened at the Georgia School of Technology, graduated 852 men and discharged 111 from an eight weeks' course before it was closed on May 11; and an adjutants' school, opened at Ohio State University on January 12, graduated 789 and discharged 97 men in an eight weeks' course before it was closed June 22.

A six weeks' course for armament officers and men to care for machine guns and bombs was opened at Fairfield, Ohio, on April 22, graduating 95 officers and 465 men by June 30, all of whom went forthwith overseas. Just at the end of the year a series of special schools in aerial gunnery were opened as the final step in the flyers' training in this country, graduating 102 pilots, 111 observers, and 101 fighting observers by June 30. Also a special course for compass officers was opened at Camp Dick, Tex., on April 10, with 53 graduates, and another course at the same time for a score of navigation officers.

Radio also required very special instruction, with courses and instructors for all flyers through the various stages of their progress, for the receiving force on the ground, and for the men responsible for the upkeep of the radio equipment. At the outset, volunteer civilians, each with his own methods of instruction, stepped into the breach, but by the end of the year two radio officers, and four enlisted men's schools were in operation with 49 and 329 graduates, respectively; radio officers and equipment had been sent to every field and ground school; and the courses for flyers had been standardized all the way through.

Aerial photography, which had developed during the war into an exact science, required similar triple instruction—that for observers to operate the cameras in the air, intelligence officers on the ground to interpret them, and enlisted men to aid in the developing, printing, and enlarging, and to keep the equipment in condition. Where the United States had not even a single aerial camera at the outbreak of the war, by the end of the year there had been opened on March 25 a large school for developers and printers at Rochester, N. Y., with 680 graduates by June 30, an officers' school on January 6 at Cornell teaching map compilation and interpretation, and photographic "huts" with complete personnel and equipment for instruction at each of the flying fields.

One of the most serious problems, and one of late development, was that of enlisted men, the ground force needed to keep the planes and engines always in prime condition, repair minor breaks, tighten up wires, strengthen struts, and make sure that no airman went up in a faulty plane. This was work wholly new to American mechanics, and of a delicacy and carefulness to which they were quite unaccustomed. Moreover, mechanics of the skill required had largely been drained off by the draft, by enlistment, or by other war industries.

Consequently, a whole series of schools was necessary. At first, in the fall small detachments of mechanics were sent to various factories—ignition, magneto, propeller, welding, instruments, sail-making, cabinet work, copper work, machine guns, and motors to secure as much experience as possible. While about 2,000 men awere being graduated from 17 courses at 34 different schools of this type, more fully worked out courses were established at five northern flying fields closed for flying during the winter. With 2,500 graduated here, still more detailed courses were opened at four large mechanics' schools, which

added another 5,000 men. By the end of the year two large and complete Government schools were in operation at Kelly Field, Tex., and St. Paul, Minn., capable of graduating 5,000 men every three months.

A noteworthy event of the year was the opening on May 15 of the first regular aerial mail service in the United States between New York, Philadelphia, and Washington. The Army furnished six planes and pilots, shortly doubled, for a daily round trip, carrying about 350 pounds of mail each way, and with a record of 50 minutes for the 90 miles between Philadelphia and New York, and 1 hour and 50 minutes for the 135 miles from Philadelphia to Washington. Ninety per cent of the trips were made successfully.

Another vitally important phase of the Air Service is that of ballooning, which during the war has been developing into a system of ever-watchful sentries on guard all the way from the North Sea to Switzerland. Less spectacular, perhaps, than the heavier-than-air work, this branch of the service has a quite indispensible function. The observer, swinging in a captive balloon at an altitude of a mile, 2 to 5 miles from the enemy's lines, and with a range of vision of 8 miles in all directions, can make a far more detailed, minute-by-minute analysis of the enemy's movements than the wider visioned but transitory aviator, and can maintain such a flow of minute information to the staff below that no important movement can take place unobserved within his view.

Here, also, at the outbreak of the war the United States was practically without facilities. The only school was at Fort Omaha, Nebr., recovered from complete abandonment the previous November, with accommodations for 15 officers and 400 men, and equipment of balloon shed, gas plant, two obsolete captive balloons, and some telephone material. The original program of August 13 necessitated a very large expansion, fully comparable to that in the heavier-than-air branch.

To meet the program the Fort Omaha school was enlarged in September to accommodate 61 officers and 1,200 men; on December 28 Camp John Wise was opened at San Antonio with a final capacity of 150 officers and 2,200 men, and special companies were sent to Fort Sill, Okla., for cooperation with the Coast Artillery. By June 30, 440 balloon officers had graduated, of whom 155 were fully qualified observers, and 73 had been sent overseas. The enlisted strength stood at 9,621 with 1,382 abroad.

Thus, by the end of the fiscal year, the Air Service had in operation an educational system complete in all the details necessary to man this intricate service. Fields, curricula, instructors, and equipment were on hand for the most diverse courses, and men were graduating in hundreds trained to all the difficulties of operating aeroplanes and translating their work into effective action. A total of 34,209 men had been graduated from the various courses, with 20,976 men enrolled in 50 schools of 16 different types.

Many outside bodies were called upon to cooperate in this development. Great Britain, France, and Italy all early established large aviation missions in Washington which brought their three years of experience to help solve problems confronted here for the first time. The National Advisory Committee for Aeronautics, the Bureau of Standards, and several joint Army and Navy Boards also added their information on the subject.

Nevertheless the work was carried out under extreme difficulties. Operation and production were not properly coordinated. Much time was lost in having to obtain the necessary authority to build a new field or secure increases in personnel, instead of being able to carry out a main program with full independence and authority. Moreover, experienced and trained personnel was lacking; work had to be done while the actual organization to do it was being built up; much time was lost in the expansion and moving about of offices in Washington, some half a dozen times; while officers were constantly being shifted between Washington, the fields, and overseas.

Meanwhile overseas, work of organization was similarly going on. Hardly six weeks after the United States entered the war, namely, on Many 27, the first cadets sailed for France for training in the highly developed French flying schools, till by the end of the year nearly 2,500 men were under instruction in France, England, Italy, and Canada. The collapse of Russia, Italy's serious defeat, and the weight thrown on the allied services made it impossible, unfortunately, for the allies to meet the schedule of training planes necessary, so that many of these cadets, the most promising of America's material, were in idleness for months. Nevertheless, what facilities were available greatly advanced America's aerial preparation and helped relieve the shortage of equipment here. It was early in May, 1918, however, over a year after America's entry into the war, that the first German plane fell victim to an aviator in the American service. About the same time 468 fully trained American aviators organized into 13 complete American squadrons or brigades with British and French squadrons were actually on the front, taking increasing toll of the enemy.

During the same time an enlisted force of 46,667 men had also been sent overseas. The first to go were sent to France to lay the foundations for the great organization soon to be built up, including training fields, assembly depots for American-built planes, and aerodromes near the front. Others were formed into service squadrons in England and France to be ready as soon as American pilots were trained into their own organizations. Still others went to relieve French skilled labor of unskilled work so that they could go back into aeroplane factories, while others went to England for the construction work necessary to carry out the night bombing program.

Consequently, by June 30, 1918, two large training organizations were in operation, the source of supply in this country training and organizing thousands of pilots and men in all sorts of tasks and the operation end overseas giving the final training in France, England, and Italy the fast moving fully trained squadrons to the front.

Where, at the outbreak of the war, there had been but 65 officers in the Air Service, there were now 14,230; the enlisted strength, similarly, had jumped from 1,120 to 124,767; the number of men in or awaiting training for flyers from less than 100 to over 18,000. There were 4,872 officers and 46,667 enlisted men overseas. Indeed, the Air Service alone was by June 30, 1918, larger than the American Army at the outbreak of the war. While its development had been infinitely more complicated and much less rapid than expected, there is reason to believe that it is essentially sound.

WILLIAM L. KENLY,
Major General, U. S. A.,
Director of Military Aeronautics.

The SECRETARY OF WAR.

(*Continued from page* 700)

A total of 2,676 pursuit, observation, and day bombing planes, with spare engines, were delivered to the Expeditionary Force by the French Government for the equipment of our forces overseas.

Considerable progress was made in the adaptation of other types of foreign planes to the American-made engines, and in the development of new designs. The U. S. D. 9A, embodying some improvements over the De Haviland 4, was expected to come into quantity production in the near future. The Bristol Fighter, a British plane, was redesigned to take the Liberty 8 and the Hispano Suiza 300 h.p. engines. A force of Italian engineers and skilled workmen was brought to America to redesign the Caproni night bomber to take three Liberty motors, and successful trial flights of this machine have been made.

Several new models are under experimentation. Chief of these is the Le Père two-seater fighter, designed around the Liberty motor, the performance of which is highly satisfactory. Several of these planes were sent overseas to be tested at the front.

Production of Service Engines

In view of the rapid progress in military aeronautics, the necessity for the development of a high-powered motor adaptable to American methods of quantity production was early recognized. The result of the efforts to meet this need was the Liberty motor—America's chief contribution to aviation, and one of the great achievements of the war. After this motor emerged from the experimental stage, production increased with great rapidity, the October output reaching 4,200, or nearly one-third of the total production up to the signing of the armistice. The factories engaged in the manufacture of this motor, and their total production to November 8, are listed in Table 21.

Table 21.—Production of Liberty motor to November 8, 1918, by factories:

Packard Motor Car Co.	4,654
Lincoln Motor Corporation	3,720
Ford Motor Co.	3,025
General Motors Corporation	1,554
Nordyke & Marmon Co.	433
Total	13,396

Of this total, 9,834 were high-compression, or army type, and 3,572 low-compression, or navy type, the latter being used in seaplanes and large night bombers.

In addition to those installed in planes, about 3,500 Liberty engines were shipped overseas, to be used as spares and for delivery to the Allies.

Other types of service engines, including the Hispano-Suiza 300 h.p., the Bugatti, and the Liberty 8-cylinder, were under development when hostilities ceased. The Hispano-Suiza 180 h.p. had already reached quantity production. Nearly 500 engines of this type were produced, about half of which were shipped to France and England for use in foreign-built pursuit planes.

Table 22 gives a résumé of the production of service engines by quarterly periods:

Table 22.—Production of service engines in 1918.

Name of engine	Jan. 1 to Mar. 31	Apr. 1 to June 30	July 1 to Sept. 30	Oct. 1 to Nov. 8	Total
Liberty 12, Army	122	1,493	4,116	4,093	9,824
Liberty 12, Navy	142	633	1,710	1,087	3,572
Hispano-Suiza 180 h.p.	...	...	185	284	469

Improvement in Instruments and Accessories

Few facilities existed for the manufacture of many of the delicate instruments and intricate mechanisms going into the equipment of every battle-plane. The courage and determination with which these most difficult problems were met and solved will form one of the bright pages in the archives of American industry.

One of the most important outgrowths of the research work which the war stimulated was the development of voice command in formation flying by means of wireless devices. The great significance of this invention will be appreciated when it is realized that the leader of a formation has heretofore been dependent on signals for conveying instructions to the individual units of the squadron.

Training of Personnel

After the declaration of war the constructoin of training fields proceeded with such rapidity that the demand for training equipment greatly exceeded the output. Since the latter part of 1917, however, the supply of elementary training planes and engines has been more than sufficient to meet the demands, while the situation as regards certain types of planes for advanced training has greatly improved. Approximately 17,000 cadets were graduated from ground schools; 8,602 reserve military aviators were graduated from elementary training schools; and 4,028 aviators completed the course in advanced training provided in this country. Pending the provision of adequate equipment for specialized advanced training, the policy was adopted of sending students overseas for a short finishing course before going into action. The shortage of skilled mechanics with sufficient knowledge of aeroplanes and motors was met by the establishment of training schools from which over 14,000 mechanics were graduated.

At the cessation of hostilities there were in training as aviators in the United States 6,528 men, of whom 22 per cent were in ground schools, 37 per cent in elementary schools. and 41 per cent in advanced training schools. The number of men in training as aviator mechanics was 2,154.

Forces at the Front

Early in 1918 the first squadrons composed of American personnel provided with French planes appeared at the front. The number was increased as rapidly as equipment could be obtained. On September 30,

(*Continued on page* 730)

THE FIRST AEROPLANE FLIGHTS—FIFTEEN YEARS AGO



The Wright Camp at Kitty Hawk, N. C., in 1903. *Wilbur Wright standing in front of building.*



The first flight, December 17, 1903, *Orville Wright at the helm; Wilbur Wright alongside of machine.*



The rail used to start the Wright flyer and the flyer at point where it landed in the flight of 59 *seconds, December* 17, 1903.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Air Service Headquarters, Fayetteville, N. C.
Note 3—Report to Air Service, Detroit, Mich., to the officer in charge.
Note 4—Report to Honolulu, T. H., to the Hawaiian Dept. for duty with the 6th Aero Squadron.
Note 5—Report to Aberdeen, Md., to Commanding Officer of the 271st Aero Squadron.
Note 6—Report to Chief of Tech. Section, Dayton, Ohio.
Note 7—Report to Dist. Mgr. Aircraft Prod., Dayton, Ohio.
Note 8—Report to Bureau of Aircraft Prod., Air Building, Dayton, Ohio.
Note 9—Report to Students' Army Training Corps, Boston, Mass.
Note 10—Report to Commerce Building, Houston, Texas.
Note 11—Report to Chamber of Commerce Building, Indianapolis, Ind.
Note 12—Report to Air Training Radio Warehouse, Houston, Texas.
Note 13—Report to Aircraft Acceptance Park, Elizabeth, N. J., and wire DAP.
Note 14—Report to Emerson Field, Camp Jackson, Columbia, S. C.
Note 15—Report to Dist. Mgr. Aircraft Finance, 360 Madison Ave., N. Y. C.

Special Orders Nos. 270 to 279 Inc.

A

Alexander, James H. ..... AGC
Alford, Ernest E. ..... DAP
Ainsworth, Frank W. ..... ELA
Adams, Harold V. ..... PMT
Allen, William L. ..... LHV
Allen, Porter W. ..... PWM
Allen, John E. ..... RSD
Allen, Thomas B. ..... PMT
Annan, Duncan C. ..... LHV
Anderson, Milton S. ..... EOT
Almy, John Hull ..... ABC
Apple, Addison A. ..... AGC
Amundson, George ..... BST
Adler, Elmer E. ..... KST
Abbott, Leo James ..... SLA; KST
Atkinson, Thomas P. ..... FLA

B

Boone, Franklin George ..... MAC
Burger, Charles Neff ..... MAC
Bouldin, John Watson ..... MAC
Ballinger, Glenroy ..... MAC
Barlow, Leonard M. ..... PFO
Beckman, Fred H. ..... PFO
Blood, Wayland P. ..... KST
Baumann, Emil J. ..... RSD
Brierly, George C. ..... RSD
Baker, Lewis Samuel ..... SLA; ELA
Boyd, James Francis ..... SLA; RWT
Buedinger, William Anton ..... SLA; RWT
Benham, Reid F. ..... CAF
Bryan, James T. ..... CGC
Bricks, Walter W. ..... TFT
Byrne, Melvin G. ..... TFT
Bidwell, Ira M. ..... TFT
Birkland, Harold ..... TFT
Blitman, Charles H. ..... TFT
Brenner, Fred C. ..... TFT
Brown, Ray W. ..... GLC
Bryan, Edgar A. ..... CJW
Bartlet, Frank E. ..... TFT
Boettcher, Arthur ..... FOB
Byrnes, James E. ..... HHN
Brooks, John B. ..... BST
Bergen, Elston H., Jr. ..... UTA
Banning, George H. ..... PFO
Prelin, Hilding G. ..... PFO
Borresen, Marldean Alfred ..... SLA; KST
Butcher, Clifford Finley ..... SLA; KST
Baker, David Reeves ..... SLA; KST
Batty, John H. ..... EOT
Benson, Hardy M. ..... AGC
Baldwin, Robert C. ..... CGC
Benvie, Frank W. ..... AGC
Bedlinger, Robert C. ..... CAF
Billett, Clifford H. ..... CGC
Bonhag, George V. ..... ELA
Belding, Hiram H. ..... UTA
Brown, Laurence C. ..... DIK
Baxter, Hubert E. ..... KST
Bennett, Edward M. ..... RSD
Bolster, Richard Hawks ..... SLA; KST
Brant, Gerald C. ..... FRF
Blotter, Richard G. ..... HHN
Baker, Cecil C. ..... LHV
Balon, Anthony J. ..... KST
Bonney, George L. ..... TFT
Burckhardt, Karl F. ..... AGC
Beard, Ralph B. ..... AGC
Bradford, George L. ..... HHN
Bower, Byron F. ..... TFT
Pancroft, Earbee McLaurin ..... SLA

Bird, Lee W. ..... BST
Bowman, George O. ..... BST
Briggs, Charles E. ..... BST
Brooks, Charles H., Jr. ..... TMA
Butler, William H., Jr. ..... CGC
Biber, Walter E. ..... LDT
Brownstein, Herman ..... AGC
Blackston, Walter F. ..... KST
Burke, Walter C. ..... TFT
Griffin, James L. ..... SAG
Becker, Alfred F., Jr. ..... KST
Barton, Paul W. ..... HHN
Baker, Herbert A. ..... KST
Barlett, Charles D. ..... BST
Beck, Thomas E. ..... TFT
Boyd, Wilfred R. ..... KST
Bacon, Guy Clarence ..... SBI
Bonney, George L. ..... TFT
Bettannier, Leo C. ..... PFO
Bolender, Fred J. ..... KST
Brunner, Frank J. ..... AGC
Brock, Howard M. ..... AGC
Buell, William C. ..... TMA
Braun, Milton F. ..... AGC
Brown, George R. ..... AGC
Brinkman, Walter E. ..... GLC

C

Cochrane, William R. ..... KST
Coyle, Benedict A. ..... FRF
Crawford, Otis Black ..... SLA; MAC
Clark, Harold M. ..... RSD
Carroll, Mitchell B. ..... MIT
Carmody, John D. ..... AAD
Cleveland, Bruce ..... KST
Corrigan, Ray E. ..... TFT
Connolly, Frederick W. ..... DMA
Cagney, John A. ..... AGC
Chowins, Harold Stanley ..... SLA; SAG
Cline, Carl Peter ..... SLA; SAG
Coad, Ralph G. ..... KST
Curtis, Tobin S. ..... MAT
Cone, J. Carroll ..... RSD
Cameron, Graham Duncan ..... SLA; ABC
Cavenaugh, Thomas E. ..... LHV
Corbett, Thomas C. ..... CGC
Comer, Harry Hunt ..... SLA; EOT
Carney, Herbert S. ..... TFT
Culver, Rubus B. ..... TFT
Charlton, John P. ..... LDT
Cochran, Harold R. ..... LHV
Creedon, John H. ..... DAF
Coray, Claude L. ..... CFT
Cobb, James F., Jr. ..... CGC
Collins, Ralph O. ..... LHV
Cathcart, Sewall C. ..... GLC
Chandler, George D. ..... EOT
Cassiday, Charles W. ..... TFT
Crandall, Gavin D. ..... KST
Cameron, Mortimer B. ..... KST
Cheney, Clair E. ..... BST
Christie, Donald C. ..... MAC
Craig, Alexander, Jr. ..... AGC
Caldwell, Robert M. ..... GLC
Converse, Julian L. ..... CGC
Carter, Frank L. ..... TFT
Clark, George D. ..... ELA
Clark, Wilder C. ..... LHV
Chaney, James M. ..... AGC
Collins, Robert B. ..... PFO
Compton, Ralph O. ..... UTA
Carney, Paul J. ..... LHV
Cooper, Francis J. ..... CFT
Cochran, Harold Rupert ..... SLA; SAG
Christensen, Rudolph ..... SLA; EOT
Curtiss, Dwight W. ..... AGC
Connell, Maurice Joseph ..... SLA; SAG
Carmichael, Norvel O. ..... PWM
Campbell, Theodorick P., Jr. ..... AGC

D

Dauphin, Charles H. ..... DMA
Drennan, Walter R. ..... RSD
Doyle, Horace M., ..CUI; DMA; LHV; Note 1
Davis, Trayton Hooker ..... SLA; CRI
Douglas, Benard M., Jr. ..... BFT
Dry, Paul Homer ..... SLA; CFT
Driscoll, Egbert G. ..... TMA
Doolin, B. M. ..... DMA
Donaldson, John O. ..... FRF
Dolan, Charles H., Jr. ..... FRF; CAF
Davidson, Wilbur L. ..... DMA
Duble, Norman ..... FRF
Dewey, John P. ..... AGC
Dunnavan, Paul H. ..... AGC
Davis, Lloyd E. ..... MIT
D'Arcy, James ..... HHN
Buttler, Bruce B. ..... KST
Dugas, Graham C. ..... FLA
Dobbins, Verne F. ..... PWM
Dresser, Burtin E. ..... WFO
Dean, Orman L. ..... LHV
Davis, Claude A. ..... LHV
Davis, William R. ..... WFO
Diehl, Raymond G. ..... RSD
Dunstan, Wendell J. ..... KST
Dwyer, Maurice K. ..... RSD
Delatour, Beckman J. ..... FRF
Donavan, Laurence J. ..... EOT
Devine, Paul F. ..... RSD
Dining, Beecher J. ..... TFT
Borden, Frank H. ..... HHN
Day, Harold M. ..... SAG

E

Evans, Russell W. ..... FRF
Elliott, Frank T. ..... DMA
Ellis, Robert E. ..... DMA



Colonel Clarence C. Culver, whose indefatigable efforts were largely responsible for the successful development of the wireless telephone

Elliott, Clinton K., Jr. ..... LDT
Eckerson, Gilbert H. ..... KST
Evans, Brinkley ..... KST
Eyman, Bradford ..... HHN
Ehrlichman, Ben B. ..... LDT
Emmerich, Edmund M. ..... AAD
Ellicott, Charles G. ..... PFO
Eames, Richard D. ..... LDT
Emerson, George ..... LDT
Elins, Harry A. ..... AGC
Erickson, Arthur X. ..... CGC
Ellis, Myron B. ..... SAG
English, Norman A. ..... BST
Engstrom, Walter Charles ..... SLA; SAG
Emmons, Howard Edward ..... SLA; CFT
Everett, Edward Arthur ..... SBI
Eisnebeis, Herbert O. ..... LDT
Ebi, Kenneth A. ..... TFT
Eislee, John H. ..... KST

F

Fisher, Dudley T., Jr. ..... CFT
Fortune, Thomas Leo ..... SLA; EOT
Fishback, Fred Cleveland ..... PMT
Farish, Stephen P. ..... KST
Fagley, Wilber Manz ..... SLA; CRI
Foster, Traverse S. ..... DMA
Fuller, Eugene W. ..... TFT
Foster, Kenneth Clemons ..... SLA; EOT
Fisher, Benjamin W. ..... LDT
Frankenberry, Thomas H. ..... FRF
Fagan, Joseph A. ..... LDT
Fuller, Eugene W. ..... TFT
Fee, Ray E. ..... AGC
Fife, James E. ..... BFT
Farnum, William C. ..... CJW
Fergus, Ernest Leroy ..... GLC
Harding, Noah ..... AGC
Frank, Graham M. ..... TMA
Fitzgerald, Freeman C. ..... CFT
Fischer, Harold J. ..... UTA
Fries, John R. ..... AGC
Foster, Robert H. ..... KST
French, George F. ..... TFT
Flynn, Frank J. ..... ELA
Fish, Charles Colgate ..... RWT
Finger, Moritz Hobart ..... CFT
Feld, Aaron Spencer ..... EOT
Frankley, Lawrence W. ..... HHN
Fitch, George Edward ..... SLA; SAG
Farnsworth, Tom D. ..... AGC
Flannagan, Roy C. ..... BST

G

Gilbert, Robert E. ..... KST
Grav, Lewis Magee ..... SLA; ELA
Gallagher, Thomas J. ..... KST
Glaspell, Dean W. ..... TFT
Graybeal, Carlyle West ..... SLA; MAT
Greene, Calvin W. ..... FRF
Green, Joseph M. ..... BST
Garrett, Robert E. ..... WFO
Glebe, Egbert Gustav ..... SLA; EOT
Gay, Strawn A. ..... BST
Garrity, Edward Joseph ..... SLA; EOT
Geary, Roland Woodbridge ..... EOT
Guiham, William Charles ..... EOT
Graham, Earle H. ..... AGC
Galvin, Patrick Joseph ..... SLA; RSD
Garrett, Robert E. ..... DMA; WFO; Note 1
Griffee, Jan H. ..... KST
Gilbert, Lester F. ..... AGC
Griffin, Vernon Orrin ..... SLA; EOT
Genye, Clarence F. ..... DMA
Griffin, Bulkley Southworth ..... SLA; TMA
Garner, Bernard R. ..... LHV
Gelvin, Clyde Richardson ..... PFO
Givens, James D. ..... PFO
Gregory, Ralph L. ..... TFT
Gray, Donald Alfred ..... SLA; KST
Godfrey, Frank H. ..... DAP
Goodman, Timothy S. ..... KST
Grossman, Herrick J. ..... KST
Goodrich, Donald Reuben ..... ELA
Gravatt, Charles M. ..... RSD
Greenwood, John H. ..... AGC
Greenshields, Bryce W. ..... KST
Guerin, Omer F. ..... RSD
Gault, John B. ..... AGC
Glover, William B. ..... BST
Goldsmith, Bertram J. ..... PWM
Gregg, Dean B. ..... CGC
Glatts, Bernard R. ..... PWM
Greer, John E. ..... HHN

H

Hickerson, Sanford Burnham ..... SLA; PMT
Hawkins, Emin W. ..... LHV
Hodgkin, George Barclay ..... AGC
Harding, Frank E. ..... PMT
Hamilton, Pierpont M. ..... HHN
Haislip, James G. ..... RSD
Hassell, Bert R. J. ..... BST
Haskell, Spencer H. ..... KST
Hine, Virgil ..... RSD
Howard, Robert B. ..... Note 5
Hellenberg, Frederick W. ..DMA; BFT; Note 1
Huber, William C. ..... RSD
Hartz, Rutherford S. ..... DMA
Halley, Samuel R. ..... EOT
Huebner, Herbert C. ..... FRF
Hinds, Gordon Ferguson ..... FLA
Hendricks, Walter ..... DMA
Handy, John C. ..... EOT
Hill, Thomas R. ..... DMA
Herbert, William H. ..... DMA
Hitt, Arnold D. ..... LHV
Hellman, Isaac H. ..... DMA
Heffner, Roy J. ..... PFO
Hamilton, Andrew A. ..... PWM
Hoars, John L. ..... HHN
Hale, Frazer, ... LHV
Hoover, William John ..... RSD
Hooker, Roger W. ..... RWT
Hansen, Frank A. ..... TFT
Hechinger, Michael Vincent ..... SLA; CRI
Hobson, Henry B. ..... Note 6
Hoskins, James Marvin ..... SLA; SAG
Hans, Karl Hickman ..... SLA; SAG
Henderson, William A. ..... HHN
Hitchcock, Harry C. ..... LHV
Holladay, Daniel M. ..... HHN
Hunt, Spencer S. ..... HHN
Hurt, Samuel F. ..... GLC
Hayes, Fred E. ..... AGC
Heimer, Roy A. ..... AGC
Hemmer, Francis J. ..... AGC
Hosp, William Wallace ..... RWT
Honeywell, Charles F. ..... RSD
Hutchinson, Byron M. ..... BST
Hollstein, Arthur Watts ..... KST
Hampton, Herman R. ..... RSD
Hagenah, Harry Bartell ..... SLA; SAG
Hermes, Bryan A. ..... RSD
Hanisch, Arthur O. ..... TFT
Haile, Thomas J., Jr. ..... TFT
Haugen, George A. ..... TFT
Hahn, Stanley W. ..... CJW
Hine, Harold K. ..... CJW
Humphreys, Robert H. ..... LHV
Henderson, Finley D. ..... KST
Haynes, Roy M. ..... TFT
Hamrick, Roy H. ..... TFT
Hoffman, Edward L. ..... TMA
Hammett, Irving Russell ..... RWT
Heberton, Craig ..... RWT
Hudspeth, Clyde E. ..... AGC
Hale, John T. ..... KST
Haase, Gus ..... TFT
Hepinstall, Linn D. ..... LHV
Henderson, Rema J. ..... AGC
Hoffman, Jacob V. D. ..... AGC
Hopkins, Julian B. ..... LHV
Hileman, David I. ..... TFT
Higgs, Gerald Hillam ..... SLA; RWT
Hodgkin, George B. ..... AGC
Harmon, Jack ..... KST
Hruda, Adolph H. ..... AGC
Hur, Donald C. ..... PFO
Heffner, Paul ..... PMT
Hollingsworth, Joe L. ..... RSD
Hickam, Laurence B. ..... PFO
Hegge, Adolph ..... RSD
Huffman, Carl F. ..... DAF
Higgs, Gerald H. ..... RSD

(*Continued on page 733*)

FOREIGN NEWS

France Projects Aerial Lines

Paris, Nov. 17.—The French Government is contemplating the creation of about twenty aerial lines connecting Paris with the chief towns of France and the great foreign centers.

British Machines in German Hands

As an indication of the types of machines used by the British last summer, the following official list published in Germany is of interest. It shows a total of 136 British machines which the Germans claim as having fallen into their hands on the Western Front during the month of July, 1918:

(Single-seaters) 40 Sopwith Camels; 27 S.E. 5s; 14 Sopwiths; 9 Sopwith Dolphins; 1 D.H. 5. (Two-seaters) 20 D.H. 4s; 5 D.H. 9s; 14 B.F.s; 1 Sopwith; 1 F.E.; 1 R.E. and 1 Bristol. Also "a large fighter," which evidently the Germans failed to idenify, and 2 Handley Page bombers.

Norwegian Aircraft Company

The Bergens Tidende states that a company is being formed at Christiania, the "A/S Mekanisk Teknisk Industri," its object being, among other things, the manufacture of frames and other woodwork for aeroplanes. The Director of Military Aeroplane Factory, Captain Sem-Jacobsen, is to be the company's technical adviser and factory manager. The offices will be at Christiania, but a piece of land at Strommen has been secured for the building of the factory. The company's capital is fixed at Kr.350,000, a large portion of which is already subscribed.

Aeronautical Development in Japan

With his usual far-sightedness our Eastern Ally, Japan, has quickly realized the necessity for preparedness in matters aerial. The Prime Minister was recently a guest at a luncheon with Baron Sakatani and General Nagaoka, the respective vice-presidents of the Imperial and National Aviation Associations, and a large company of bankers and other men of affairs, who met in order to form a combined national association to secure the widest financial help for an effort to raise aviation in Japan to the level of other countries.

Air Traffic in Germany

London (British Wireless Service.)—Air traffic has been begun between some of the largest German towns, advices reaching here report. The aeroplanes are carrying parcel post matter and passenges. The fare per passenger is 2½ marks a kilometer, or about 94 cents a mile.

The machines can fly at the rate of eighty miles an hour, and the journey from Berlin to Munich, for instant, can be accomplished in four and a half hours.

One company is constructing a new, large type of aeroplane, able to carry forty passengers.

Huge German Plane for Ocean Flight

London.—The Berlin correspondent of *The Daily Express* telegraphs descriptions of a visit he paid to a German aircraft factory at Staaken, in the suburbs of Berlin. He says an aeroplane for a transatlantic flight which is now under construction there will have a wing spread of 198 feet and engines developing 3,000 horse power. The correspondent also learned that an airship for a transatlantic flight which is being built at the Zeppelin factory at Friedrichshafen has nine engines, eight propellers, and will carry a hundred passengers.

If the international situation clears, the first flight will take place in July. The voyage is expected to last forty hours.

At Staaken the correspondent saw great aeroplanes of the type used in bombing raids on London and Paris. They have five motors, each developing 250 horse power and driving five propellers. They have a wing spread of 140 feet, carry eight men and 2,840 pounds of bombs, and can fly fourteen hours at a speed of 81 miles an hour. The correspondent adds:

"Hardly was the armistice ink dry, when the workers at Staaken began in feverish haste to transform raiders into commercial machines. I saw men tinkering and hammering to turn them into passenger-carrying aeroplanes to link up all European capitals with Berlin. I saw dozens of fighting machines, all built of aluminium, being transformed for the postal service.

"Going into the airship department, I learned details of a remarkable Zeppelin flight which took place last year. At 8 A. M. on November 21 a Zeppelin, with a crew of twenty-two, carrying twenty-five tons of munitions and medicines, left Jamboli, in Bulgaria, for German East Africa. On the night of November 22-23 the airship was over Khartoum, when it received a wireless message from Nauen ordering it to return, because Berlin had learned through a Reuter dispatch that the majority of von Letton-Worbeck's troops had surrendered. The airship returned and came to anchor at Jamboli at 8 A. M. on November 25. The ship, says Herr Rasch, managing director of the factory, was capable of going from Berlin to New York and returning without a stop."

Plane to Carry 100 With Cabin and Beds

Rome, December 8.—Gianni Caproni, interviewed by a New York *Times* correspondent about the prospect of continuing the development of aviation now that the war is over, said:

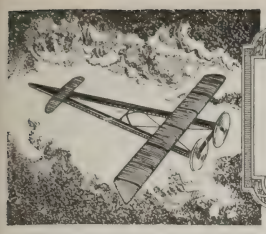
"The war has served to reveal the practical importance of aviation and to hasten its technical perfection. Italy especially, owing to its geographical formation, will benefit immensely by it to communicate with the Dalmatian Islands, Africa, and the Near East. The aeroplane must also become like the transatlantic steamers and serve as a means of worldwide commerce.

"With a triplane we can already transport thirty persons and a heavy cargo. I am building a triplane which will accommodate a hundred passengers with all modern comforts, cabins and beds. When sufficient planes have been built to form a flotilla, I shall sketch out an itinerary for each one to take. For the present we cannot transport third-class passengers owing to the expense of the journey.

"One of the chief aims of aviation will be transportation of mail and merchandise. Journalism will gain immensely by this quick means of transportation, the newspapers of Rome being distributed almost at the same time in Naples as in the capital. We are positive of important results, but think that others will follow that will be even more important."



French Caudron Biplane equipped with two Hispano-Suiza motors



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



The Ford Motored Aeroplane and Its Construction

AS we start to construct our light horse-powered tractor I might call attention to the fact that the aeronautic industry is waking up to the need of the small light horse-powered machine and we have started none too early. At the present time five light machines are being constructed by different manufacturers, three of them with Ford motors.

Before going further I might inform the readers that the machine will be described as fully as the space of this page will permit. This may not be sufficient for the less experienced reader, or for the great number of persons who have sent in requests for full plans and drawings of the Ford machine.

So to help those persons who have sent in requests, and for those who might not be able to get all the information from this page the writer has drawn up a full set of blueprints which sell for a small sum.

The body is 16 feet long and the scale given at the upper left hand corner should assist in correctly laying out the machine. When making the struts, if the builder would make a pencil mark at the center of the strut, it would be easy to line up the machine later.

It was my idea to place the radiator over the engine, but after checking up I find that for ease in building and greater efficiency the radiator is best placed in front.

The body should be laid out first. The longerons are made from a 9 ft. strip of ash and a 9 ft. strip of fir. These pieces are joined together at a small distance behind the pilot's seat. To join them it is necessary to taper each piece. The taper being 18" long. These tapers are then placed together, glued, and wrapped with 1½" wide silk ribbon. The ash should be placed at the forward end of the machine on account of the added strains occurring at this point. The weight of these longerons should not go over 11 pounds.

The struts to the rear of the pilot's seat are made ⅞" fir. When cutting these struts take care to have the ends at the correct angle at which they meet the longerons. (See Figure 3.) The struts forward are made of ash 2" x 1". The ends are left square but the inner portions are made of a sort of diamond shape, for lightness, as shown. The struts must not weigh over 13 pounds for the lot. An engine bed made of angle steel or iron, ⅛" thick and 1" deep on each side, is then fastened in place. These two strips are made as shown in Figures 7, 8 and 9. Figure 9 shows the piece before the ends are bent down and welded. Holes can be drilled at distances to equal the holes on the Ford cylinder block, where the oil pan fastens in place.

Figure 15 shows the method of fastening the rear struts in place. These fittings are made from a piece of .050 sheet steel as shown in Figure 1. When made they are bent along the dotted line to the shape as in Figure 2. Note that the angle of the bottom portion of the fitting changes to meet the angle of the longerons in the top view of the fuselage. The top portions do not change from 3 degrees off center.

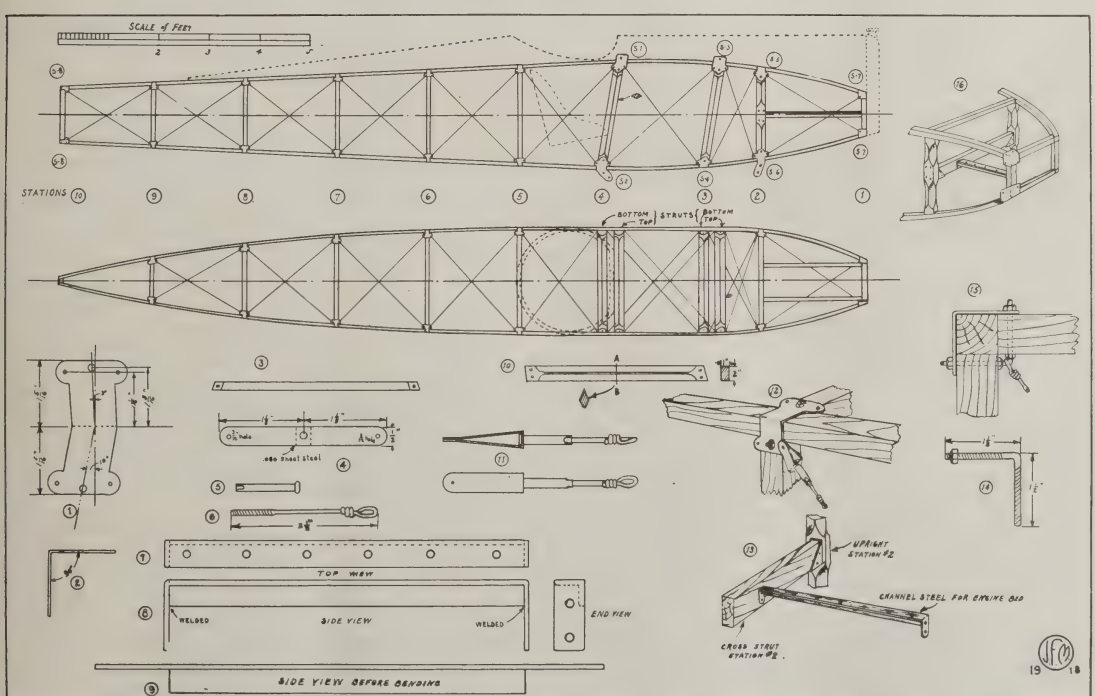
The angle bolt is made from ⅛" drill rod bent to a 90 degree angle and threaded at each end almost to the bend as shown. If a regular 32 die is used, nuts to fit can be purchased. Figure 12 shows the method of fastening the brace wires and turnbuckles.

Turnbuckles are made from 105 gauge mortorcycle spokes as shown in Figure 11. The strap is .050 sheet steel ½" wide and bent to the proper shape.

When bracing the body note that wires are left out of the top section where the pilot's seat is placed, and also the cross bracing in front where his legs will protrude.

The body is laid off and different stations noted, as shown in the circles, starting at one from the nose of the machine and ending at ten to the rear. In the future these points will be known as Station 6, etc.

The circles having the numbers S-1, S-2, etc., are given to show the number of special fitting which will be shown in later drawings.





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Aviator

On giant wings he rises from the ground,
And in ascending quickly circles round,
'Ere climbing up into the ether blue,
Where in fleecy clouds he seems lost to view,
But to appear then disappear again,
'Til but a tiny speck he does remain
On the horizon, when at last all sight
Of him is lost; so rapid is his flight.

'Tis wonderful how in the divine plan,
The power to create is given man,
How he with lofty thoughts and objects high
Has achieved his purpose which was to fly
Like a bird, and to travel through the air,
Penetrating through banks of mists to where
The earth would disappear; then wing his flight
To where it pleased his fancy to alight.

But the birdman who was at first content
To fly for pleasure, has his mind now bent
On winning honors in the Flying Corps,
In which he's aiming as an Ace to score.
And to be classed with those "Knights of the Air,"
Who in Freedom's name all things do and dare,
And if need for Country and Flag to die,
Like them in a last battle in the sky.

ROSE VILLAR, 550 West 184th St., N. Y. City.



THE PREHISTORIC FLYING CORPS.
Training Division Orders.—"Pupils should be encouraged to practise aerial fighting."

Synonymous Anyhow

Editor Plane News: Will zee monsieur be so kind as to tell me the American meaning of the word "bull"?—*Pvt. Frenchie.*

Dear Frenchie: The word is very hard to explain thoroughly without concrete example. To give you a vivid illustration we quote the words of Hun Hindenburg: "The war will be over before America can create an effective army!" Compree, Frenchie? Get the idea? Bull, Frenchie, is making people think something is that ain't and were but are not.

The Air Is Best

Hart Jenks, Kelly Field, Texas

Each living thing holds in its heart,
  Away from all the rest,
Some most loved joy, a thing apart;
  In mine, the air is best.

The lean wolf haunts his hunger-trail,
  The wren goes to her nest,
And I, through flame-bathed cloud
    fields, sail;
  For me, the air is best.

For you the noise, the joust, the grind,
  The city on her quest;
For me a ship astride the wind—
  For me, the air is best.

I've seen the glory of the plow,
  And growing things I've blest,
But ah, the air is calling now,
  Oh dear; the air is best.

I want no harvest labor yields,
  Of laughter, seek not zest,
Or love, the mighty sword it wields
  For me, the air is best.

Piled deep and free my dawn-cloud
    waits,
  In blazing brilliance drest,
To lure through the rose-love gates,
  Ah yes—the air is best.

Air Ditty

Aeroplane grown weary
Of return to earth that's dreary,
Vagabonds in the air
Serenading any star that's fair,
And from each like a troubadour
Rollics away as before.

Sometimes a minstrel star
Wanders forth from afar,
And passing by
Sings in the sky,
Cantatrice improvisatore
Like my aeroplane troubadour.

The chauntress wind grows fantastic
To prove her scale reach elastic.
When the wind gets that way
The plane must stop play
And seek the earth
To prevent the stars from mirth
At his antics.

—Robert M. McAlmon.

BOOKS ON AERONAUTICS

Christmas Presents for Boys Overseas Must be Mailed This Month. Send Him Books and Magazines and He Can Share Them with His Squadron

Book: starred out of stock. Editions importing.

TEXT BOOKS

Aeroplane Construction & Operation, Rathbun. $2.00.
Practical Aviation, Hayward. $3.75.
The A-B-C of Aviation, Pagé. $2.50.
Aeroplane Construction & Assembly, Leslie & King. $1.50.
Textbook of Naval Aeronautics, by Henry Woodhouse. $6.00.
Textbook of Military Aeronautics, by Henry Woodhouse. $6.00.
Practical Flying, by McMinnies. $1.50.
Aviator's Elementary Handbook, by A. DeGuiche. $1.00.
Manual of Army Aeronautics, 60c.
D'Orcy's Airship Manual. $4.00.
Manual for Aero Companies, Satterfield. $1.00.
****Air Navigation for Flight Officers***, by A. E. Dixie, R. N. $4.00.
Learning to Fly in the U. S. Army, by E. N. Fales. $1.50.
Aircraft Mechanics Handbook, by Fred H. Colvin. $3.00.
Aeroplane Construction and Operation, by John B. Rathbun. $2.00.
The Flyer's Guide, by Gill. $2.00.
Manual of Military Aviation, by Maj. H. L. Müller. $2.50.
Acquiring Wings, by W. B. Stout. 75c.
Mechanics of the Aeroplane, by Capt. Duchene. $2.75.
Military Aeroplanes by G. C. Loening. $4.75. 1918.
Eyes of the Army and Navy, Munday. $1.50.
Practical Aviation, by Hayward. $3.75.
The Aeroplane Speaks, by H. Barber. $3.00.
How to Fly, by Capt. D. Gordon E. ReVley. $1.00.
Termes D'Aviation, Glossary of Aviation Terms in French and English. $1.00.
Nomenclature for Aeronautics, Waterman. 25 cents.
Dictionary of Aviation in French and English, by R. M. Pierce. 60 cents.
Aviator's Pocket Dictionary and Table-Book, by A. De Guiche. $1.00.
Airplane Characteristics, Bedell. $1.60.
The A. B. C. of Aviation, by Victor Pagé. $2.50.

MAP SKETCHING, SIGNALLING AND GUNNERY

Military Sketching and Map Reading, Barnes. 75 cents.
Manual of Military Maps, by Hutchinson and MacElroy. $1.00.
Map Reading for Aviators, by C. H. Benson. 75 cents.
Handbook of Military Signalling, by Capt. H. D. Giddings. 60 cents.
Pocket Signal Chart, International Morse Code. 15 cents.
Lewis Machine Gun Handbook. 60 cents.
Vickers Machine Gun. 50 cents.
Machine Guns, by Hatcher, Wilhelm and Maloney. $2.50.
Signal Chart, U. S. Navy & Merchant Marine. 25c.

DESIGN, CONSTRUCTION AND OPERATION

The Aeroplane Speaks, by H. Barber. $3.00.
Aeroplane Construction and Operation, by John B. Rathbun. $2.00.
Aeroplane Construction & Assembly, Leslie & King. $1.50.
Principles of Aeroplane Construction, Kennedy. $2.00.
Airplane Characteristics, Bedell. $1.60.
Aeroplane Construction & Assembly, Leslie & King. $1.50.
Flying: Some Practical Experiences, by G. Hamel and C. C. Turner. $4.00.
Aeroplane Designing for Amateurs, by Victor Lougheed. $1.00.
Principles and Design of Aeroplanes, by Herbert Chatley. 50 cents.
Military Aeroplanes, by Loening. $4.75.
All the World's Aircraft. Jane. $7.50.
Aeroplane Design, by Barnwell. $1.00.
The Flyer's Guide, by Gill. $2.00.
****Resistance of the Air and Aviation***, Eiffel. $15.00.
Radiodynamics, by B. F. Meissner. $2.00.
Resistance of Air, by De Villamil. $3.00.
Flight Without Formulae, by Capt. Duchene. $2.75.
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(Continued from page 722)

the date of the latest available information, there were 32 squadrons at the front; of these 15 were pursuit, 13 observation, and 4 bombing. The first squadron equipped with American planes reached the front in the latter part of July.

Losses in Battle and in Training

Though the casualties in the air force were small as compared with the total strength, the casualty rate of the flying personnel at the front was somewhat above the artillery and infantry rates. The reported battle fatalities up to October 24 were 128 and accident fatalities overseas 244. The results of Allied and American experience at the front indicate that two aviators lose their lives in accidents for each aviator killed in battle. The fatalities at training fields in the United States to October 24th were 262.

Commissioned and Enlisted Strength

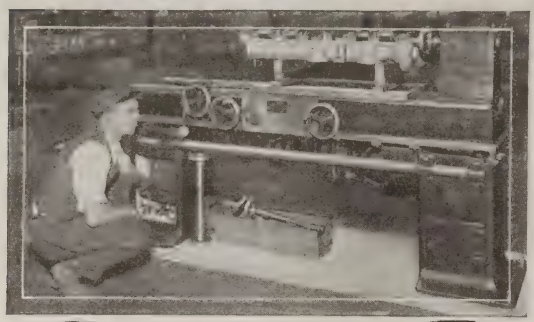
On America's entrance into the war, the personnel of the Air Service consisted of 65 officers and 1,120 men. When the armistice was signed the total strength was slightly over 190,000, comprising about 20,000 commissioned officers, over 6,000 cadets under training, and 164,000 enlisted men. In addition to the cadets under training, the flying personnel was composed of about 11,000 officers, of whom approximately 42 per cent were with the Expeditionary Force when hostilities ceased. The Air Service constituted slightly over 5 per cent of the total strength of the Army.

Secretary Baker's report included a communication just received from General Pershing in which he commented on aircraft and the Air Service as follows:

"Our entry into the war found us with few of the auxiliaries necessary for its conduct in the modern sense. Among our most important deficiencies in material were artillery, aviation, and tanks. In order to meet our requirements as rapidly as possible, we accepted the offer of the French Government to provide us with the necessary artillery equipment.

"In aviation we were in the same situation, and here again the French Government came to our aid until our own aviation program should be under way. We obtained from the French the necessary planes for training our personnel, and they have provided us with a total of 2,676 pursuit, observation, and bombing planes. The first aeroplanes received from home arrived in May, and altogether we have received 1,379. The first American squadron completely equipped by American production, including aeroplanes, crossed the German lines on August 7, 1918.

"It should be fully realized that the French Government has always taken a most liberal attitude and has been most anxious to give us every possible assistance in meeting our deficiencies in these as well as in other respects. Our dependence upon France for artillery, aviation, and tanks was, of course, due to the fact that our industries had not been exclusively devoted to military production. All credit is due our own manufacturers for their efforts to meet our requirements, as at the time the armistice was signed we were able to look forward to the early supply of practically all our necessities from our own factories."



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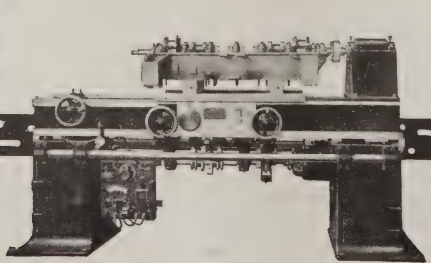
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(*Continued from page* 704)

The newly appointed pilots are Leon D. Smith, Carl B. Smith, Ira O. Biffle, Trent C. Fry, Dunn K. Steel, Dan Davison, Wm. W. Harrison, Edwin W. Hubbard, C. C. Eversole and D. I. Lamb. Eversole, Lamb and Hubbard are Americans and were attached to the Royal Flying Corps. The others are experienced fliers and instructors. The emergency pilots are Christopher C. Cole, Julian Sykes, Edgar F. Waters and Wm. Lindley.

Mechanics and mechanics helpers were employed as follows: Mechanics: Wm. L. Bramer, Chas. W. Denn, Jr., Joseph J. Brucato, Wm. C. Burmeister and T. E. Ilch. Helpers: Harold T. Dwyer, Joseph E. McConnell, Wm. H. Kitchen, Chas. B. Chamberlain and Stanley Oberly.

Capt. Lipsner Resigns

On December 6th Capt. Benjamin B. Lipsner resigned as Superintendent of the Aerial Mail Service. His letter, and Postmaster Burleson's acceptance, in full, will be found on another page of this issue.

An announcement of the reorganization of the Aerial Mail Service was made by the Post Office Department. This reorganization included the abolishment of Captain Lipsner's office of Superintendent of the Aerial Mail Service and the creation instead of two main sections—one on maintenance and equipment and the other on flying operations. First Lieut. J. Clark Edgerton, who was in the Aerial Mail Service during its operation by the army authorities and who has since been on testing and flying work in Bolling Field, has resigned from the Army and is appointed to take charge of flying operations of the Mail Service. He is a son of James A. Edgerton, Purchasing Agent for the Post Office Department, and is only twenty-two years old. Before he was engaged on recent testing work he flew mail planes between Washington, Philadelphia, and New York. Dr. L. T. Bassler, who served with General Pershing's staff in Mexico and subsequently as adjutant and instructor in the West Virginia Flying Corps unit, which went to France, is given the position of Chief of the Maintenance and Equipment Section. The change becomes effective immediately.

First Aerial Weather Forecast

Washington, Dec. 2.—The first official aerial weather forecast was made public to-day by the Weather Bureau in co-operation with the Aerial Mail Service of the Post Office Department.

"New York to Cleveland: Cloudy 8 P. M. Snow near Lake Erie. Winds moderate, northwest to north-northwest east of the Alleghenies up to 6,500 feet and moderate south winds west of Alleghenies, shifting to west-southwest at about 1,500 feet. Forecast: Snow to-day (Monday), with increasing northeast to north winds up to about 6,000 feet, backing to strong northwest above."

It is intended to extend the forecast for all the territory from New York to Chicago by December 15, by which time it is expected the Aerial Mail Service between these cities will be inaugurated.

Charles N. Kight Talks on Aero Mail Advantages

Extension of the air mail service throughout the country, using aviators and aircraft returned from overseas, was predicted by Charles N. Kight, aero mail division of the Post Office, at the weekly luncheon meeting of the Philadelphia Engineer's Club.

Urging Philadelphians to make more use of the aero mail service between this city, Washington and New York, the speaker declared time would be saved at an increase of but three cents over the present cost for special delivery mail. Aero mail, he declared, practically is in flight from the moment a letter is mailed.

Aero mail takes precedence over all other mail and immediate delivery is guaranteed upon its arrival at its destination. The cost of sending a letter to either Washington or New York by air craft is 16 cents. A special delivery letter would cost 13 cents and delivery would not be nearly so prompt.

Congress is to be asked for an added appropriation of $100,000 for the establishment of an air mail service between Washington and Chicago. Three hundred thousand dollars is to be asked for the maintenance of the aero mail service for the ensuing year. Use of the big air craft now overseas will, the speaker declared, cover the Washington-Chicago run in six and one-half hours.

"From June 15th up to the present time," said Mr. Kight, "since the Post Office has had absolute control of its pilots, we have made 100 per cent. flights, with but one slight mishap. Our pilots have covered 69,000 miles and have carried within that time 2,700,000 letters.

"Two hours and thirty-eight minutes is the time for our aero mail service between Washington and New York, and remember, we have to contend with the best rail service in the country for that distance. Using overseas aeroplanes this time can be reduced, for the larger craft will fly 150 miles an hour while the ones now used average but 100 miles.

"Support the aero mail service and thereby aid, through policing the air, in the protection of the country. Within a year and a half I venture to predict, both mail and passengers will be carried by air craft all over the country.

"The air mail service is here to stay. It is a permanent service established by the Government. Public patronage is demanded for the public good." Mr. Joseph A. Steinmetz declared it necessary that the country care for its thousands of returning aviators.

"There are thousands of men and aeroplanes overseas," he declared. "The aeroplane is here to stay. We have seen it grow from the fragile fabric of a dream of steel and canvas. The world held its breath when men flew 1,000 feet in air. Today they fly at a height of five miles and in the Polar currents. The upper air currents are now being plotted by daring aviators in anticipation of transatlantic flights.

"To gain supremacy in air it is necessary that we subsidize our mail fleet. I have sent scores of letters to our boys overseas and have found that they reached there three weeks ahead of the regular sail deliveries.

"Great air expeditions are being organized these days. Sea planes, such as the great craft used by the Navy, are being organized to fly up the mouth of the Amazon and to the headwaters in the Andes. Bases will be established every 300 miles. Rubber, mica, the tungsten groups and other rare minerals, all will be brought out by aeroplane. Gold will be brought out by the ton from far-off Siberia through this latter day mode of transportation."



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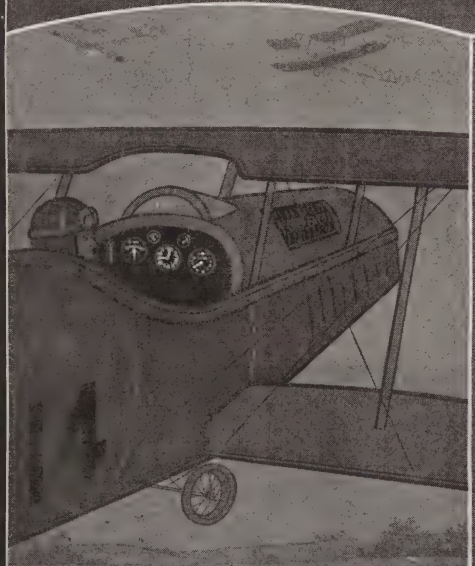
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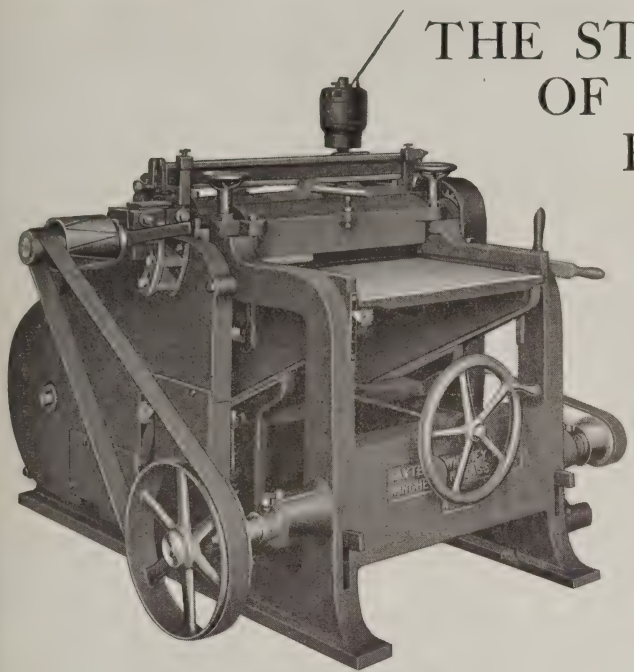
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(*Continued from page 725*)

J

Jensen, Ove F. ..... TFT
Johnson, Louis B. ..... ASM
Johnston, Frank A. ..... HHN
Janney, Samuel M., Jr. ..DMA; CJW; Note 1
Johnson, Leonard H. ..... Note 13
Jaeger, Otto ..... SLA; LDT
Jewell, Sidney L. ..... SMM
James, Edward David ..... CGC
Johnson, Earl S. ..... RSD
Johnson, Walter R. ..... AGC
Jackson, Wycliffe C. ..... KST
Jackson, Roger W. ..... CGC
Jahn, Thomas Foster ..... FLA
Jiskra, Joseph B. ..... GLC
Johnson, David S. ..... CGC
Johnson, O'Neal Makemson ..... RWT
Johnson, Earl Thomas ..... KST

K

Krapf, George W. ..... CJW
Kenyon, William S. ..... DMA
Kendrick, Robert Thomas ..... SLA; MAT
Knight, Arthur D. ..... KST
King, Ivan R. ..... AGC
Keller, Jacob F. ..... TFT
King, Alexander M. ..... PWM
Kemp, Louis W. ..... KST
Kraft, Lester L. ..... PWM
Keefe, Robert A. ..... CGC
King, Edward R. ..... AGC
Kuhns, Ralph H. ..... KST
King, Matthew L. ..... Note 11
Kultgen, John H. ..... LHV
Kerr, William L. ..... LHV
Kendrick, Robert T. ..... LDT
Kennedy, Daniel E. ..... CJW
Kelly, Frank V. ..... DAP
King, Edward H. ..... BFT
Kranz, Irwin B. ..... TFT
Kermott, Edward E. ..... TFT

L

Lane, Ralph Fielding ..... SBI
Selzer, Edgar Theodore ..... SLA; CRI
Ladley, Edwin S. ..... DMA
Landstrom, Adolph W. ..... Note 10
Larson, Ralph Robert ..... SLA; TMA
Leidig, Lawrence R. ..... LHV
Lawrence, Millard C. ..... PFO
Leutz, Otto, Jr. ..... SLA; CJW
Lindsey, Harold ..... HHN
Longanecker, Ira ..... DMA
Lee, Everett S. ..... WFO
Lynch, Harry H. ..... LHV
Logg, Charles P. ..... PFO
Leitner, Clarence W. ..... GLC
Lewis, Orman J. ..... GLC
Lindsey, Gorden J. ..... GLC
Larkin, Garret Francis ..... RWT
Long, Harry Shupe ..... RWT
Lyon, William L. ..... TFT
Linton, Gerald R. ..... BST
Lillie, Hiram B. ..... CJW
Lawson, Louis Allen ..... SLA; EOT
Levinson, Jacob ..... SLA; EOT
Lane, Charles A. ..... TFT
Lackey, Myron E. ..... SAG
Lehman, Ralph ..... PFO
Laughlin, William H. ..... BST
Littlejohn, J. F. ..... AGC
Longnecker, Jacob H. ..... AGC
Lauerman, Otto S. ..... TFT
Lunger, Clarence W. ..... DAF
Lundell, Floyd A. ..... GLC
Lusk, Walter C. ..... TFT
Leeth, Herman B. ..... CAF
Lowe, Larone ..... KST
Lathrop, Fred Burr ..... KST
Lusk, Walter C. ..... TFT
Lahey, William P. ..... EOT

M

Moss, Malcolm W. ..... LDT
Monticue, Verne M. ..... LDT
Morfitt, Neil L. ..... LDT
Marr, Kenneth, Jr. ..... DMA
Mitchel, Henry G., Jr. ..Note 3; PMT; Note 1
Mason, Stephen S. ..... UTA
Michener, Edgar Chester, Jr. ..... SLA; MAC
Morley, Bernard Dickson ..... SLA; MAC
Morgenstern, Edmund ..... SLA; MAC
Merwin, Ogle Charles ..... MAT
Mathews, Leo A. ..... TFT
Moffatt, James ..... TFT
Myers, Norman H. ..... TFT
Munk, Newel E. ..... AGC



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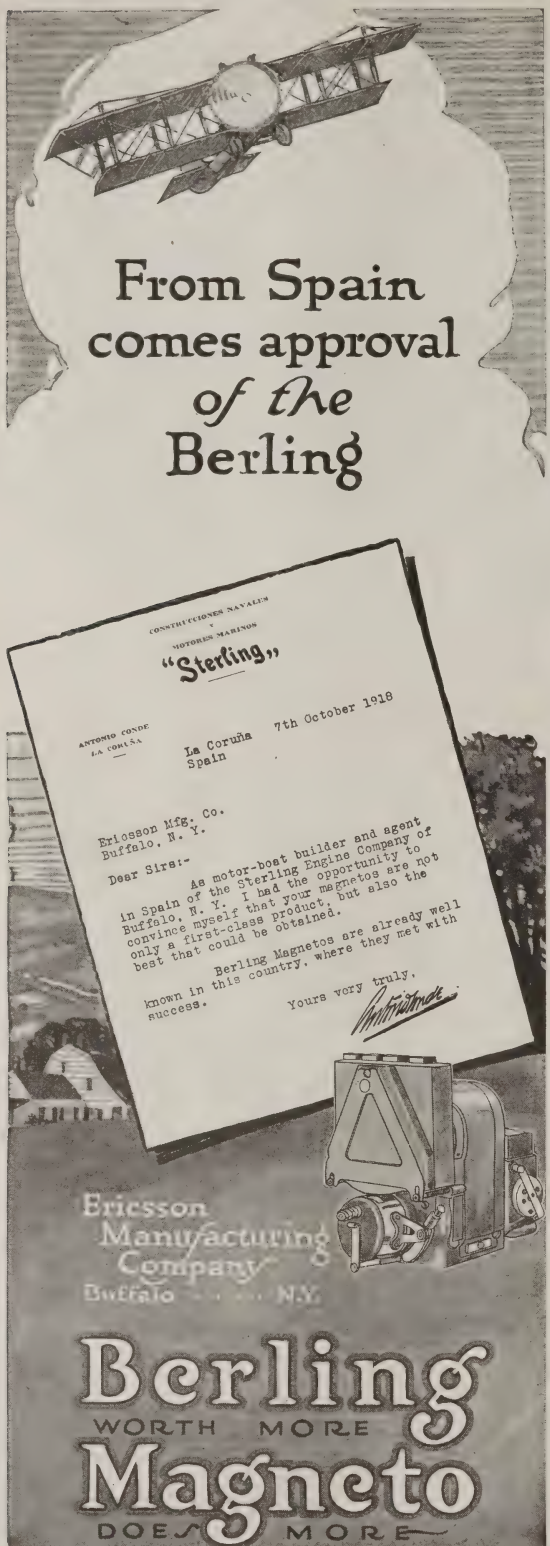
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Maynard, Elsdon Lyman ..... SLA; SAG
Mcckstroth, Henry L. ..... KST
Morton, Allen Waller ..... SLA; CFT
Mandeville, Frank Philip ..... SLA; EOT
Myers, Franklin D. ..... LHV
Morgan, Marion H., Jr. ..... MAC
Merrill, George B. ..... FRF
Mackie, Richard W. ..... BST
Micelli, Paul ..... HHN
Maranville, Clarence H. ..... FRF
Martin, Spencer Ferrin ..... ELA
Meyer, Alfred F. ..... KST
Murphy, Fred Parks ..... KST
Mahon, William L. ..... PFO
Mullen, Paul J. ..... LHV
Merrick, Marlowe M. ..... DMA
Merritt, Wendell C. ..... LDT
Morley, James E. ..... LDT
Madel, Fred, Jr. ..... BST
Maloy, John S. ..... TFT
Mucklestone, Melville ..... TFT
Monorieff, Howard F. ..... KST
Madarass, Jesse A. ..... RSD
Matthews, George B., Jr. ..... KST
Moore, William R. ..... RWT
Merker, Walter C. ..... LHV
Maher, Cornelius C. ..... TFT
Morse, Ruper G. ..... BST
Murray, James O. ..... UTA
Morse, James J. ..... OSU
Milderberger, Ethan A. ..... AGC
Maher, Raymond J. ..... TFT
Merritt, Edward K. ..... HHN
Myers, Devereux M. ..... GLC
Mahony, Lewis H. ..... DMA
Messer, Glenn E. ..... DMA
Marr, Kenneth, Jr. ..... DMA
Milburn, John G. ..... FLA
Meyer, Frederick R., Jr. ..... RSD
Mueller, Charles P. ..... KST
Moorman, Ivan G. ..... LHV
Masson, Charles A. ..... CFT
Miller, Archie ..... CLA
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Merrill, Reginald G. ..... CUI
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Morley, Bernard D. ..... PFO
Montgomery, Edward G. ..... HHN
Meyer, Henry F. ..... SAG
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THE NATIONAL TECHNICAL AND TRADE AUTHORITY

THE EDITORIAL CONTENTS

Printing the largest amount of editorial material, the editorial contents of AERIAL AGE include:

1. Editorials presenting always constructive suggestions concerning the substantial upbuilding of the American aeronautic industry.
2. Comprehensive and complete Trade and General news of the week from every point of the compass.
3. Technical contributions from leading authorities in the aeronautic world on aeroplanes, aero-motors and every other phase of aeronautics.
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10. A specially appropriate department in the French and English languages, giving valuable information and table, which our men who go overseas find most advantageous.
11. Last, but not least, a page of aeronautical humor in verse, prose and illustration.

ITS CLIENTELE—AERIAL AGE is read:

1. By **the Executive Heads** of every aeronautical concern in the country who relies upon its contents to inform him concerning the constantly increasing progress of the aeronautic industry.
2. By **the Executive, Engineering and Purchasing Military Authorities** of the United States and the Eighteen Allied Countries, and nine Latin-American countries who have severed their connections with Germany.
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AERIAL AGE WEEKLY

Vol. 8, No. 15 DECEMBER 23, 1918 10 CENTS A COPY



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The New York, Cleveland, Chicago Aero Mail Inaugurated

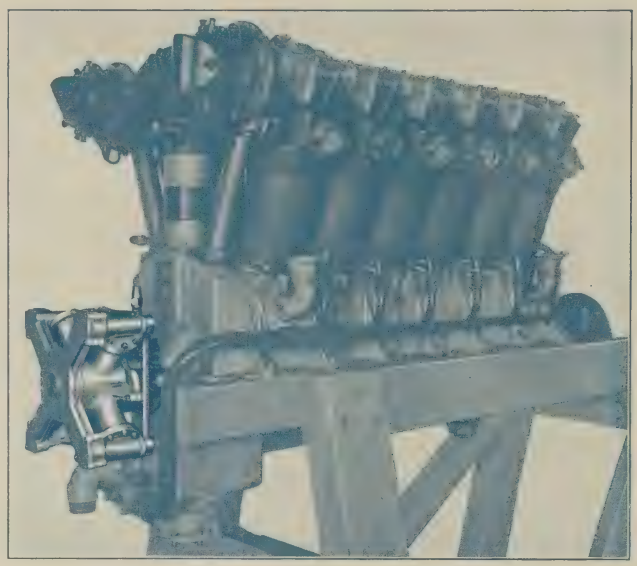
How to Efficiently Use the 20,000 Liberty Motors

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AERIAL AGE WEEKLY

VOL. VIII DECEMBER 23, 1918 No. 15

TABLE OF CONTENTS

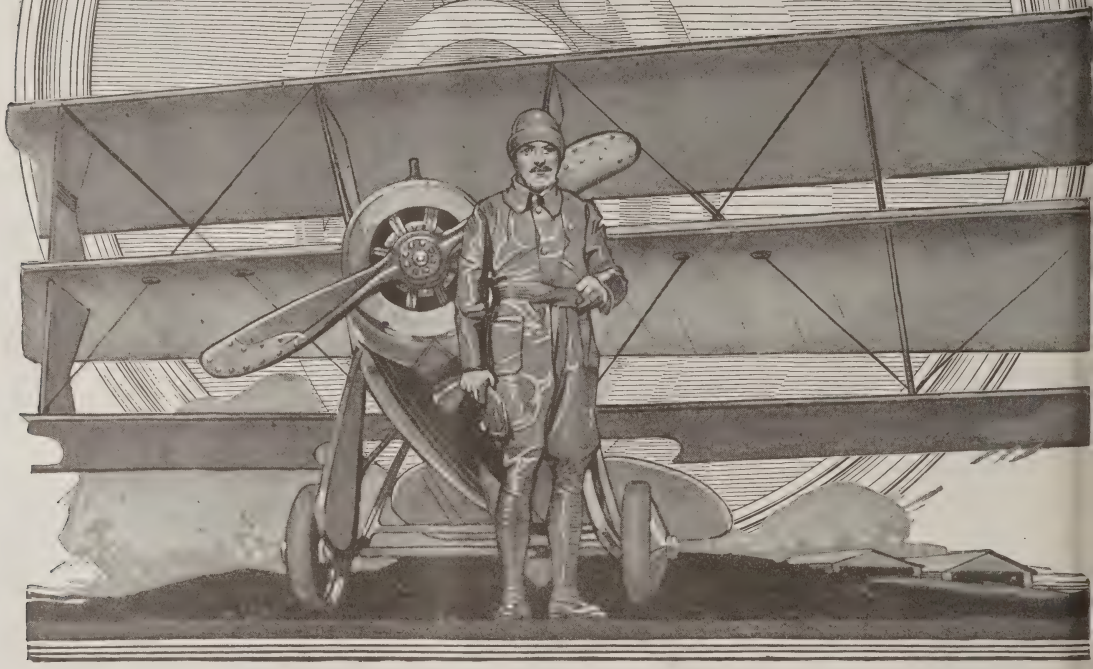
PAGE

How to Efficiently Use the 20,000 Liberty Motors 753
The New York-Cleveland-Chicago Aero Mail 753
Aero Club of America Renews Efforts to Get Proper Aerial Laws. 754
Congress Incensed Over Delay in Turning Military Planes Over to Aerial Mail Service 754
Capt. Lipsner Plans Extensive Aerial Transportation Lines 754
The News of the Week..... 755
The Aircraft Trade Review..... 757
U. S. Aerial Mail 758
The Martin K III Single Seater... 759
The Liberty Motor 762
The Hispano-Suiza Aviation Motor 766
Report of the Bureau of Aircraft Production 774
Naval and Military Aeronautics.... 777
Foreign News 780
Elementary Aeronautics and Model Notes 781
Aeronitis 783

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Dec. 23, 1918

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, DECEMBER 23, 1918 NO. 15

HOW TO EFFICIENTLY USE THE 20,000 LIBERTY MOTORS

By G. DOUGLAS WARDROP

WHILE I was in Detroit addressing the Society of Automotive Engineers, I received a large number of requests for information as to what the prospects are of using the twenty thousand Liberty Motors which will have been produced when production on present contracts is completed. I have since taken up the matter with the Government and aeronautic authorities and this investigation has lead to defining clearly the immediate prospects of the American aeronautic industry and American aeronautics in general. The result of this general inquiry, together with the prospects explained in Detroit, are being summarized herewith. The result of our inquiry shows that not only the twenty thousand Liberty Motors can be put into use during the coming eight months, but there will actually be a demand for as many more motors of different types.

This statement is based on facts. Knowing exactly what still remains to be done for national aerial preparedness, we know, for instance, that besides maintaining the Army, Navy, and Marine Corps, we still have to establish Naval and Military Air Stations in the United States and its territories, and that hundreds of aircraft are needed for our coast defenses, which have never had aircraft.

AERIAL AGE has published the reports of the Secretary of War, General Kenly, and the Navy Department, which tell exactly the aeronautic program needed for our national defense.

We have printed articles showing the extensiveness of the aerial mail plans to be put into effect during the coming year.

Over Two Millions for Aerial Mail Lines

Appropriation of $2,185,000 for purchase of aeroplane and maintenance of air-line service for the Post Office Department, which is an increase of $1,885,000 over the $300,000 originally estimated by the Department, is recommended in the Post Office appropriation bill reported to the House by Representative Moon, of Tennessee.

The bill carries recommendations for a total appropriation of $359,657,577. This is about $2,000,000 less than the appropriation for the present fiscal year, which was $361,477,577. The estimates of the Post Office Department for the next fiscal year amounted to $368,782,577.

There are a score of other important developments, each promising to require from a hundred to several thousand aeroplanes this year, such as the establishment of aviation sections in the police of the different cities. The fact that a single aerial policeman could have minimized the many losses of the Halifax fire, the recent Minnesota fire, and of numerous other such fires, floods, etc., as well as eliminating entirely the water pirates who prey on shipping wherever there is water commerce, will soon bring about legislation forcing each city to have an aviation section to its Police Department.

The Forestry Department, the Coast Guard, and other Government departments are also establishing aviation branches.

We know likewise of hundreds of sportsmen and others who are planning to purchase aeroplanes for use in the United States, Canada, South and Central America.

One of these plans to establish aerial passenger and express lines, headed by Captain Benjamin B. Lipsner, the energetic ex-superintendent of Aerial Mail Service, is announced elsewhere in this issue. Captain Lipsner and his public-spirited backers will use a number of large seaplanes and the manufacturing business from this one air line alone will, probably, be large enough to keep a factory going for several months.

Considering the above, which are only few of the high points of the prospects of the American aeronautic industry, we can truly state that the future is bright and that if the progressive manufacturers and leaders in the aeronautic movement join efforts by close co-operation, the aeronautic industry can be put on its feet and on a permanent self-supporting basis within the coming twelve months.

NEW YORK, CLEVELAND, CHICAGO AERO MAIL

THE first trip of the permanent Aerial Mail Line between New York-Cleveland-Chicago took place on December 18th.

The start was made soon after six o'clock from Belmont Park. Leon D. Smith piloted the first de Haviland Liberty plane which started just as day was dawning.

As AERIAL AGE goes to press Pilot Smith is on his way to Chicago.

Full account of the trip will be given next week.

Among the authorities present at the start were: Second assistant Postmaster-General Otto Praeger, from Washington; Postmaster Patten, of New York; L. T. Busler, chief of Maintenance and Equipment; J. Clark Edgerton, chief of Flying Operations; Alan R. Hawley, president of the Aero Club of America; Henry Woodhouse, Captain Robert A. Bartlett, and Steffanson, famous explorers, Charles Jerome Edwards, G. Douglas Wardrop, managing editor of AERIAL AGE; Ralph T. Hale, Norman H. White, Norman H. White, Jr., Evan J. David, business manager of FLYING; Leroy B. Gulotta, editor of AIR POWER; K. M. Turner, F. Gates Porter, M. Parker, the postmasters of Brooklyn and Belmont Park.

The progress made by aeronautics in the past three years has been enormous, and trans-Atlantic and trans-Pacific flights may be expected in the near future.

A few days ago an American aeroplane carried 50 passengers in a flight, and British, French, and Italian aeroplanes have carried up to 40 passengers in one flight. A dispatch from Italy reports that there is under construction an air liner which will carry 100 people for trans-Atlantic flights, and having beds and restaurant accommodations for the passengers.

Another aeroplane, carrying the famous British General Salmond, flew from Asia to Africa, a distance of close to 3,000 miles, and the Chilian aviator, Lieutenant Godoi, on December 11th, flew over the Andes, thereby completing the stupendous conquest of the mountains by aviators, who have now flown across practically every mountain range in the world, including the classic Great Atlas!

Verily this is the dawn of the Aerial Age, when those of us who have assisted the development of aeronautics for the past 15 years will see things happen such as we would never have dared to dream.

AERO CLUB OF AMERICA RENEWS EFFORTS TO GET PROPER AERIAL LAWS

THE creation of a substantial permanent committee to draft a series of laws covering national and international aerial navigation was authorized by the Board of Governors of the Aero Club of America.

This was done upon thé recommendation of the temporary committee of the Club, which reported to the Board of Governors today, urging prompt action.

This subject has been studied and followed by a committee of the Club, consisting of the Hon. Murray Hulbert, Director of the Port of New York; Alan R. Hawley; W. W. Miller; Rear Admiral Robert E. Peary; Rear Admiral Bradley A. Fiske; Henry A. Wise Wood; Henry Woodhouse; Alberto Santos-Dumont; John Hays Hammond, Jr.; W. W. Young; Colonel E. Lester Jones; Emerson McMillin; Charles Jerome Edwards; Augustus Post.

Members of this committee have followed every phase of development of aerial laws in Europe, and have had opportunity to study the effectiveness of the British Aerial Navigation Acts of 1911 and 1913, as well as the French, Italian and German aerial laws.

They have also studied the problems of national aerial navigation and have come to definite conclusions as to the necessity of having federal registration of aircraft, which they believe should be similar to the federal registration of ships.

The committee points out that all aerial navigation acts of European nations were intended to restrict the circulation and use of aircraft. They were essentially military measures, restructing aerial navigation to certain zones within nations.

What must be done now is to shape laws to govern international aerial navigation based on broad fundamental principles which will meet the conditions arising from the general use of large aircraft for the transportation of mail, express and passengers, as well as international air travel. It is pointed out that unless attention is given to this subject now, there is danger that half measures or restrictive laws may be adopted, and there is even danger of states adopting state registration laws, which would be absurd, since aircraft travel so fast that their employment for flying across the continent will soon be common. Therefore federal registration is recommended.

The Committee on Aerial Laws is to be appointed by Mr. Alan R. Hawley, the President of the Aero Club of America, within a few days.

CONGRESS INCENSED OVER DELAY IN TURNING MILITARY PLANES OVER TO AERIAL MAIL SERVICE

CONGRESS'S great interest in the aerial mail service was demonstrated on December 17—the fifteenth anniversary of the first flight—when the subject came up for discussion in the House of Representatives.

The remarkable record made by the Post Office in the past six months in running the Aerial Mail Service daily on schedule time, rain or shine, has created country wide demand for the extension of the service and the Post Office had arranged for this extension to take place immediately upon the signing of the armistice when the stopping of shipments of planes overseas would give the needed planes and motors for the mail service.

Under the provision made by Congress last year in the military appropriation bill the War Department is to turn over to the Post Office for the Aerial Mail Service planes and motors which cannot be used for military purposes. Acting under this act Secretary Baker, two weeks ago, ordered one hundred DeHavilands and twelve Handley-Pages turned over to the Post Office and some of these machines were to be used immediately for the extension of the Aerial Mail Service. But one delay followed another and, finally as the planes were not delivered by December 17, Congressman Moon, the chairman of the House Committee on Post Office and Post Roads, to get prompt action introduced a resolution ordering the War Department to deliver the planes and motors now, to save the large cost of storing them away.

Congressman Moon stated in Congress that the War Department had discretion as to turning over its aeroplanes to the Post Office. and that they had refused to let go of them. This statement aroused the wrath of several members, among them Representative Robbins, republican, of Pennsylvania, who said it was time Congress put a stop to allowing departments to run Congress.

"It seems to me that the Departments are ignoring the laws that Congress passes," said Mr. Robbins. "We sit here like a lot of dupes and supinely let these various departments run over us. It is time we asserted ourselves. We should make it mandatory upon the War Department to turn over these aeroplanes for this service instead of appropriating over $2,000,000 for the Postmaster General to buy aeroplanes that are already available and of no use to the War Department. The war is over now, and unless these machines are used for carrying the mails they will rust out and disintegrate."

The same view of the situation was taken by Representative Sumners, democrat, of Texas. He insisted that it was time to use "horse sense" and that it was ridiculous to buy more aeroplanes and let those now available in the War Department be put to useless employment.

"If the Secretary of War will not turn these machines over," said Mr. Sumners, "he should be compelled to do so. We ought to stop spending money uselessly.

Resolution to Force Delivery

Representative Madden defended the proposal to have the Post Office Department buy aeroplanes that the transcontinental mail service may be established promptly. He did not oppose the amendment offered by Mr. Moon, however, to have the army aeroplanes turned over to the Post Office Department, but insisted that the department should have them by whatever means it was necessary to employ to get them.

After the point of order against the Moon amendment had been sustained by the chair it was offered in an amended form by Representative Garrett, democrat, of Tennessee, and provided as follows:—

> That the Secretary of War is hereby directed to deliver immediately to the Postmaster General 100 de Haviland fours, 100 Handley-Page planes, 10 Glenn Martin day bombers, all planes completely assembled, with spare parts. Also 100 Liberty motors, with spare parts, 50 Hispano-Suiza 300-horsepower motors and 25 Hispano-Suiza 150-horse power motors. The same is to be out of any equipment that the War Department has on hand or under construction, the War Department to be credited with the equipment turned over.

The Garrett amendment cut the appropriation from $2,185,000 to $500,000 and provided that none of this sum is to be used for purchase of new machines, but merely for maintenance and operation. It is expected that this amendment finally will be agreed to when the bill comes up for final action. The discussion to-day was in committee of the whole and must be approved later when the bill is finally voted on.

CAPTAIN LIPSNER PLANS EXTENSIVE AERIAL TRANSPORTATION LINES

THE energetic Capt. Benjamin B. Lipsner, who recently resigned as superintendent of the aerial mail service, announced on December 17 that a syndicate had been formed to back him in establishing an aerial passenger and express service. The enterprise will have a capital of $1,000,000.

He also declared that unless some one should do so before him he will make the first trans-atlantic flight June 15, following the route taken by the steamship George Washington, which carried President Wilson to France. A seagoing plane to make the flight, he continued, now is in course of construction and it will be built so it will be able to fly, rain or shine. As to the service in this country he added:

(*Continued on page 761*)



THE NEWS OF THE WEEK



600 Naval Airmen Return

Norfolk, Va.—More than 600 officers and men of the naval aviation forces who have been serving overseas arrived at the Hampton Roads naval base December 15 on the transport Susquehanna, which was sixteen days crossing the storm-swept Atlantic. In spite of rain and mist, the men were welcomed by a big crowd.

Among the arrivals was Franklin K. Lane, Jr., son of the Secretary of the Interior, who was greeted by his father, mother and sister.

Major Hitchcock Among Those Honorably Discharged

Major Thomas Hitchcock, sportsman and polo player, has been honorably discharged from the air service at his own request. He is now in Aiken, S. C., with his family.

His son, Thomas Hitchcock, Jr., of the Lafayette Escadrille, who became an ace before being shot down, is with his father, recovering from his wounds.

The Navy Fliers

In his annual report Secretary of the Navy Josephus Daniels pays high tribute to the Aviation Branch of the Navy. The expansion of Naval Aviation, it is stated, has been of gratifying proportion and effectiveness. Statistics show the total enlisted and commissioned personnel on July 1st, 1918, numbered approximately 30,000. Of this number, 823 were trained naval aviators. There were 2,052 student officers, 400 ground officers, 7,300 trained mechanics, and 5,400 mechanics in training.

Declaring that Naval Aircraft had been a big factor in the war, Secretary Daniels in his report declares that plans are being made for its permanency and development. The Secretary paid tribute to the Ordnance Bureau of the Davis Nonrecoil Aircraft Gun, which is declared to be "A Great Milestone in Aircraft Armament."

Airships Can Cruise Now for 4,000 Miles

London.—For the immediate future, according to further extracts from the reports just completed by the Civil Aerial Transport Committee of the Air Board, the commercial airshap offers a great advantage over the aeroplane, particularly concerning passengers where comfort and ease of navigation and a high ratio of disposable litt are vital considerations.

Airships now exist, the report says, with a range of more than 4,000 miles, and they can travel at a speed of seventy-eight miles an hour. By running their engines slower a maximum range of 8,000 miles can be obtained.

On first speed, Cape Town, South Africa, is today aerially only a little more than three days from Southampton, while this ship could fly across the Atlantic and return without stopping.

The committee points out that the future airship will soon develop a speed of 100 miles an hour, that it will be fitted with ample saloons, staterooms, with an elevator to a roof garden, and will be able to remain in the air for over a week.

Limits Stunts in Aeros

Because many aviators in this country had taken to acrobatics since the armistice was signed, resulting in an increased accident list, the War Department recently ordered there should be no fancy flying lower than 1,500 feet. The acrobatics, it was stated, had been performed largely in connection with celebrations near cities, towns and buildings. Strict discipline will be enforced against any violating the new order.

New Insignia for Instructors

Washington.—Army aviation instructors have been authorized by the War Department to wear on the left arm a sleeve decoration consisting of gilt wings the same size as those in the insignia on the collar decoration.

This award, it was announced, "is made in appreciation of the services of the several hundred fine fliers who have been kept at home for use on the flying fields of this country in turning out the quota of pilots asked for by the Allies.'

Aviators Can Talk 25 Miles by Radio Phones

Camp Meade.—Aviators can now talk twenty-five miles through the air to radio telephone men on the ground.

Announcement of the rapid improvement of the wireless telephone, which permits such use of the radio outfit, has been made by signal corps officials here.

"Even in the worst of weather we have no difficulty in talking six miles over the wireless telephone," said private William Kunst, one of the wireless experts at the camp. "In clear weather, when atmospheric conditions are excellent, we can talk twenty-five miles over the phones," he declared.

Flies Over Highest Andes

Buenos Ayres.—Lieut. Dagoberto Godoy of the Chilean army crossed the Andes Mountains at their highest point in a Bristol aeroplane, donated by the British Government. The aviator left Santiago, Chile, and crossed the Tupungato range at an altitude of 19,700 feet, landing at Mendoza, Argentina.

Lieut. Godoy is the first Chilean and the second man recorded as crossing the Andes by aeroplane. The first flight across the mountains was made last April by Lieut. Cendelaria of the Argentine army, who crossed at an altitude of nearly 11,000 feet.

Fly from Egypt to India to Confer About Air Route

London.—Major Gen. Salmond, commanding the Royal Air Forces in the Middle East, accompanied by Captain Ross Smith, has arrived at Karachi, on the Baluchistan border, and is in conference with the Government of India regarding the establishment of an aerial service to India.

These aviators have just completed a flight from Cairo to Karachi, 2,548 miles, in thirty-six hours actual flying time. Their route was by way of Damascus, Bagdad, Bushire, Bandar Abbas, Sarbaz and Karachi.

The machine used for the purpose had previously been flown from England to Egypt and took active part in final operations against the Turks in Palestine.

General Salmond will continue his journey by air to Delhi.

British Arranging Tours by Air Routes

London.—The first aerial commercial service in Great Britain is already in the last stages of development, with the initial route connecting London and Harrogate and the speed to be 120 miles an hour.

Holt Thomas, managing director of the British Aircraft Manufacturing Company, said:

"It will be a summer service at first, and we will use the single engined war aeroplanes, with comfortable covered cabins holding four passengers. We are also opening air routes all over the world in conjunction with local companies. In France we will operate in connection with a French company, and already arrangements for such a service are practically completed in Norway, Denmark, Italy, India and Africa. Later we will extend the service to Japan, China and the West Indies."

Arrangements already have been made by the British Air Service to keep Paris in close touch with London during the peace conference. Any important data required at the conference will be forwarded from London to Paris by aeroplanes.

Promotions and Commissions

Washington.—The decision made by Secretary of War Baker, withholding all recommended promotions and commissions in the Reserve Corps and United States Army, has excited very unfavorable comment. It would seem that all recommendations for promotions and commissions that were on file in the War Department as a result of hard labor and faithful work should be acted upon favorably, and the desired honor granted to all recommended if filed with the adjutant general prior to the date of the armistice. Not since the war started has there been such bitter disappointment expressed on any subject of like nature as on this matter. As many of the prospective recipients of the advanced honors are about to be disconnected with the service—the cost to the government would be but a mere trifle and in many cases the promotion and discharge would be simultaneous—or could be made so.



The famous veteran aviator Carl Batts, who was the first to loop 136 times consecutively, his father, John T. Batts and brother Lieut. W. H. Batts

Report of Trans-Continental Map-Making Tour

In a wire report dated Tucson, Arizona, December 6th, to the Division of Military Aeronautics, Major Albert D. Smith, commanding the squadron of five planes on the way East from Rockwell Field, San Diego, California, said that the work of map-making and location of landing fields for the Southern trans-continental air route was proceeding satisfactorily. One plane was lost in a fog over the Arizona desert on the first day out, and in the forced landing that resulted this plane suffered such damages that it had to put back to Rockwell Field. Part of Major Smiths report follows:

"In compliance with instructions, five Curtiss JN. 4-H planes departed from North Island at 2:30 P. M. on December 4th. One plane became separated from the squadron on account of a heavy desert fog lying low along the east side of the mountain range. This plane was forced to land at Ellentro, damages resulting, and the following morning it returned to San Diego. The four other planes landed at Calexico, Camp Beacon. This field is considered too small for practical uses, but the Calexico Chamber of Commerce will gladly enlarge the field if requested. The four planes proceeded on their way, starting from Calexico at 12:00 noon December 5th. Navigated by compass, the squadron crossed the desert. No possible landing fields were seen on this course.

"The squadron picked up the Southern Pacific railroad tracks at Yuma. No landing field is available at this place at the present time, although one can be arranged. Following the Southern Pacific to Gilabend, few available landing fields were noted on this course. At Gilabend the squadron left the route of the Southern Pacific and took a Northeastern course by compass direct to Phœnix. Landing fields are available along the Gila River for nearly the entire distance between Gilabend and Phœnix. All the planes landed at Phœnix safely on the fair grounds, which was small even for a squadron of this size. However, at my request the field on the ground was enlarged to proper size. The city of Phœnix is very anxious to assist in every possible way, even to the extent of erecting a hangar, if needed. The city of Phœnix has asked that the landing field here be named 'Luke Field.'

"Upon examining planes here it was found necessary to change one propeller, which we were able to do, having carried two extras along with us. Minor adjustments were also made on other planes.

"On the sixth the weather was cloudy the entire day, with light showers.

"Leaving at 2:45 P. M. December 7th, the squadron, resuming its flight towards El Paso, took a southeastern course by compass, locating suitable landing fields under us for practically the entire distance to the Southern Pacific railroad tracks at Casasgrand. From this point the squadron followed the Southern Pacific tracks to Tucson, locating landing fields in the valley adjacent to the railroad for the entire distance.

"Tucson has a perfect landing field available. Two hundred acres are leveled and rolled for our use and the city is willing to erect a hangar. This field is 2½ miles from the city.

"We will probably land at Deming, New Mexico, for supplies, having encountered a twenty-five mile wind from the east since leaving Calexico."

The Wireless Telephone

The development of voice control of aeroplanes in flight recently demonstrated publicly for the first time by Colonel C. C. Culver before President Wilson and others provides an interesting story. The idea of giving command by voice to a fleet in the air was first conceived by Colonel Rees and Colonel Culver in October, 1910, while on duty at the International Aviation Tournament at Belmont Park. In August of the same year Colonel Culver and H. M. Horton, (now Captain in the Air Service) established communication by radio telegraph from an aeroplane in flight to the ground at an aeronautical meet at Sheepshead Bay, New York. Captain Horton built the transmitting set and Colonel Culver the receiving set.

Five years later Colonel Culver was sent to the Aviation School, San Diego, California, for the purpose of studying the practicability, and for the purpose of working on the general program, of radio for aeroplanes. For more than a year he worked on various devices. Telegraph apparatus was designed and built which enabled the establishment of communication from aeroplane to ground, from distances up to 140 miles. On September 2, 1916, a message was transmitted from one aeroplane to another in flight for the first time. It was about this time that the development of radio telegraph set for aeroplanes was undertaken.

Colonel Culver continued his experimenting and in February, 1917, a trial of the radio telephone set resulted in the transmission of the human voice from aeroplane to ground. On May 22nd of the same year General George O. Squier, Chief Signal Officer, called into conference Colonel Reese of the Flying Corps, Dr. F. B. Jewett of the Western Electric Company and Colonel C. C. Culver, U. S. A., for the purpose of discussing Air Radio Telephone Communication. In order to bring the problems in connection with the development of voice control in concrete form to the attention of the radio telephone engineers in the country, a memorandum was given to Dr. Jewett covering the general requirements of an air Radio Telephone Set. General Squier then organized a Radio Development Section of the Signal Corps, in charge of Lieut.-Colonel Slaughter. A private exhibition of the demonstration of telephonic communication from an aeroplane in flight was given on August 22nd, before Secretary of War Baker and Chief of Staff General Hugh L. Scott at Langley Field, Va. In the Fall of the same year Colonel Culver was sent abroad, taking with him sets of various types of apparatus, in order to demonstrate to the officers of the United States and Allied forces the practicability of the idea. On the return of Colonel Culver to the United States in the present year, under the immediate supervision and with the whole-hearted support of Major-General Wm. L. Kenly, Director of Military Aeronautics, there has been continuous progress made in the working out of tactical problems through the use of the wireless telephone and the development of its application to various air service activities.

The A B C of Aviation

The A B C of Aviation, compiled by Captain Victor W. Page of the Signal Reserve Corps, A S., is a most complete and practical treatise outlining clearly the elements of Aeronautical Engineering with special reference to simplified explanations of the theory of flight, aerodynamics, and basic principles underlying the action of balloons and aeroplanes of all types.

A non-technical manual for all students of aircraft, including instructions for lining up and inspecting typical aeroplanes before flight and also gives easily understood rules for flying.

This sells at $2.70 postpaid, and is obtainable at The Aeronautic Library, Inc., at 299 Madison Avenue, New York City.

Aeroplane Characteristics

Aeroplane Characteristics, compiled by Frederick Bedell, is a systematic introduction for flyer and student and for all interested in aviation. It explains in a most comprehensive manner the principles of aeroplane sustentation and stability, the characteristics of an aeroplane in flight, air resistance and power characteristics. There are several diagrams included in this volume. This book sells at $1.75 postpaid, and is obtainable at The Aeronautic Library, Inc., 299 Madison Avenue, New York City.

Aeroplane Construction and Assembly

Aeroplane Construction and Assembly, compiled by J. T. King & N. W. Leslie, is a most instructive manual on aeroplane construction and rigging.

It gives the mechanic a practical understanding of the work he will be expected to carry out.

It is an elementary and comprehensive volume for the beginner, taking in flying, materials used, structural features, assembling and alignment of same.

It also contains a very valuable nomenclature of aeronautical terms, and a line drawing of an aeroplane descriptive of all its parts and how to locate them easily.

This book sells at $1.65 postpaid, and is obtainable at The Aeronautic Library, Inc., 299 Madison Avenue, New York City.

Third of the People Will Travel in Air in Ten Years

"Dirigibles for scouting and observation," answered Leo Stevens, foremost of balloonists, chief instructor and expert now at Fort Omaha, when asked what next would develop in army ballooning. "Dirigibles will make 100 miles an hour and aeroplanes travel 250 miles an hour in two years," Mr. Stevens continued. "I predicted in 1906 that dirigibles would cross the Atlantic in a few years and they will."

"You don't care where your free balloon drifts?" he was asked, relating to his trip this week to Topeka.

"Oh, yes, I do care," he spoke up quickly. "I'm one of the few men who thinks he can go about where he pleases if he finds the air current he is in or a current above or below is going in his direction. There are as many air currents as there are points of the compass; some do not have a drive behind them."

Since he raced with Santos Dumont, Stevens has been a "hopeless enthusiast" in ballooning. He prefers its "smooth motion" to that of the aeroplane. "You cannot observe much from the plane," he says. "It is like some one throwing gold out all the way. I can see more from an aeroplane with my naked eye than with the glasses. But the aeroplane is the defender of the kite balloon and they work together."

It was nine years ago that Mr. Stevens did his first work for the Government through his offer to General Allen. The army had no balloons; he happened to have ten of different sizes, two of them dirigibles.

Mr. Stevens praises the business men who got into ballooning. The first twenty of these, who went into the army, including Captain C. J. Glidden, he taught.

"Within ten years many wealthy people," forecasts Mr. Stevens, "will be living in the air part of the time and owning balloons, power balloons and aeroplanes and taking 1,000 and 1,500-mile trips with no trouble at all. Thirty per cent of the people will travel through the air ten years from now," and Mr. Stevens digressed to tell how beautiful it is never higher than four miles up with the sunshine there all the time.

"The sausage balloon or kite balloon has played a most important part in the past war," Mr. Stevens declares, "directing the firing of the cannon. The pilot balloonists made at Omaha were the only ones ready to get into the war."

Some of them were 40 to 60 years old; one might think past the age of adventure and getting the idea of ballooning. But they did it.

"What shall I do next? I don't know what the Government wants of me. Chances are I shall go back to private life. I have taught personally 600 men as much as I know; there are 6,500 trained men in the ground aviation work of the balloon corps."



The Glenn L. Martin twin Liberty engined bomber that flew from Pittsburgh to Washington, a distance of 175 miles in one hour and fifteen minutes

The AIRCRAFT TRADE REVIEW

New Standard Aircraft Club Opened

On Monday, December 9th, the new clubhouse of the Standard Aircraft Club was formally opened with a dinner, followed by a dance.

The club is a reconstruction of the big hangar that was built to house the Langley, the first Handley Page machine to be built by the Standard Aircraft Corporation.

In it are bowling alleys, swimming pool, billiard rooms, writing rooms and all the conveniences of a real club.

Change of Dates of Automotive Engineers Annual Meeting

The time of the Winter Meeting of the Society of Automotive Engineers, which was to be held January 12-14, has been changed to February 4-6. These latter dates have been set as a matter of convenience to the S. A. E. members who desire to attend also the New York Automobile Show to be held during the first two weeks of February at Madison Square Garden. The S. A. E. members are engaged in automotive engineering at all the automobile, truck, tractor, aeroplane, and motorboat points in this country, as well as many such manufacturing centers abroad.

This Carry Through Meeting of the S. A. E. to be held in February will be the occasion of illuminating technical sessions on the different automotives, and on fuel for internal-combustion engines. A whole half-day session will be devoted to consideration of gasoline, kerosene, benzol and other fuels. Representatives of the Government will present their latest data as to supplies and the results of recent intensive research of a startling nature. Men of acknowledged authority will discuss this matter from the standpoint of engine design. Many other timely subjects will be discussed. Members returned from the front will relate their experiences, and particulars never before made public concerning war automotive apparatus will be given in papers by members and others in Government service.

The S. A. E. Victory Dinner will be held on February 6 at the Hotel Astor. It is expected that in attendance and interest this will break all records of the Society.

New Balloon Gas for Army and Navy

Washington—Discovery of an inert, non-inflammable gas for balloons, dirigibles and other lighter-than-air craft was revealed by the Navy Department December 9 in a statement explaining expenditures for its production now being made jointly with the army.

The department said the use of this new element, officially termed "argon," will eliminate the hazard of fire and explosion that always has accompanied balloon operations where hydrogen has been used to inflate the gas bags.

The gas from which "argon" is obtained comes from the wells at Petrolia, Tex., owned by the Lone Star Gas Company, the statement said, and a ten-inch pipe line to cost $1,050,000 is being laid for a distance of ninety-four miles from the wells to a plant at North Fort Worth, where the gas will be compressed into cylinders for shipment to the balloon fields.

High-proof gasoline is obtained in a ratio of about five gallons per 1,000 cubic feet of gas, it was said, and after the 1 per cent. of "argon" is removed by agreement with the Lone Star Company, the remainder of the gas is turned into the city mains of Fort Worth and Dallas.

The department estimates that the plant at North Fort Worth, designed by the Navy Bureau of Yards and Docks, and which will cost $900,000, will be completed by next April 1.

War Risk Insurance Information

A compensation application blank for a person disabled in the service (Form 526, Treasury Dept., BWRI) should be furnished to every disabled officer and enlisted man and every officer and enlisted man claiming disability at the time of his separation from the service. Assistance should be rendered in filling out the application, and complete information as to the proof required in support of his claim should be supplied to the claimant. Care should be taken in answering Question 5 on page 2 of application blank that a statement is made as to whether the claimant was accepted for general military service or for special or limited service only. [See also last sentence of Par. 9, Cir. No. 73, W.D., 1918.]

The compensation application blank, when properly filled out and executed by the officer or enlisted man, will be forwarded immediately by the camp personnel adjutant to the Compensation Section of the Bureau of War Risk Insurance with the copy of the report of the physical examination of the officer (Form No. 395-1, A.G.O.) or of the enlisted man (Form No. 135-3, A.G.O.) attached thereto. If the officer or enlisted man does not desire to execute an application for compensation the notation "Officer (soldier) did not desire to execute Form 526, BWRI," will be written or stamped on the copy of Form No. 395-1, A.G.O., or Form 135-3, A.G.O., as the case may be. The copy of the report of the physical examination of the officer or enlisted man will then be forwarded by the personnel adjutant without letter of transmittal directly to the Compensation Section of the Bureau of War Risk Insurance. (See last sentence of Par. 2, Cir. No. 23, W.D., 1918.)

The proof called for in paragraphs 3, 6, and 7 of the instructions on page 1 of the application blank should be incorporated in the blank affidavit on the last page of the application blank whenever possible. If the affidavits of two persons to the required facts cannot be secured when the application is executed by the officer or enlisted man, he should be advised that they must be obtained on his return home and forwarded to the Compensation Section of the Bureau of War Risk Insurance, with a statement giving his full name, Army serial number, if an enlisted man, grade and organization in the service and date of discharge or separation therefrom.

The claimant should be advised that so much of the proof called for in paragraphs 3, 4, 5, 6, and 7 of the instructions on page 1 of the application blank as is not incorporated in affidavits on the last page of the application at the time the application is executed, must be secured by him on his return home and forwarded immediately to the Compensation Section of the Bureau of War Risk Insurance in support of his claim.

The advice and assistance of the camp war risk judge advocate should be fully utilized in the preparation of applications for compensation.

By order of the Secretary of War:

PEYTON C. MARCH,
General, Chief of Staff.

WATERPROOF WATCH

THE war has been instrumental in bringing about the creation of an absolutely "water and dust proof watch."

The many hundreds and thousands of wrist watches which went "bad" while in use by the men of the Overseas Forces caused an investigation to determine the reason for the short life of the wrist watch.

After countless movements had been examined and tested, Mr. Depollier's men reported that in the majority of instances the watches had become useless because of the inadequate protection afforded by the watch casing. Water, dust and poison gas had all percolated into the interior of the watch, rendering the delicate works useless and generally a total loss. Movements themselves, when manufactured by a reputable maker, appeared to be without fault and therefore the designing and creating of a casing "which could not fail,' even under the stress of such strenuous service as it would be put through by the Overseas Forces, was finally undertaken by Mr. Depollier.

The patent records of Europe and the United States show that for over fifty years many attempts have been made to produce a waterproof watch, watches which all ended in being merely moisturepoof, and at that, resulting in failure, for the water and moisture inevitably percolated through the case by capillary attraction.

Mr. Depollier states that it took him more than twelve months to discover the reasons why previous makers had not produced a real waterproof watch which would stand the wear and tear of practical and constant usage.

While many attempts had been made to produce such a casing, none was able to withstand varying climatic conditions, and neither did the complicated design of the case permit easy access to the regulator or the watch hands. It seemed to be the limit of the manufacturers' ability to produce watches only temporary moisturepoof for exhibition purposes.

Constant demands from Aviators, Marines, the Army and Navy, and men engaged in out-of-doors pursuits necessitated the creation of this new water and dustproof watch. Mr. Depollier immediately recognized this necessity and was sufficiently encouraged to experiment toward the production of such a watch-case, a case without wearing parts, with no rubber, cement, paraffine or other waterproofing material which would dry, crumble or devitalize with time. Obviously such a case must also be so designed as to be "foolproof" as well as water and dustproof, for the watch would have to be wound once every twenty-four hours and yet prove impervious to water, dust, alkaline, gas or other injurious foreign substances.

In the booklet describing the Depollier water and dustproof watch the construction is described as follows:

"The Depollier Field and Marine Watch has, as a packing for the back and bezel, a washer which is soaked with a water-repelling saturant, and the back and bezel are screwed down. Portions of the back and bezel press against the washer and squeeze the saturant out into a reservoir, which receives the overflow, keeps the washer saturated, and prevents it from getting dry, or becoming devitalized, or glazed. In other words, the washer is like a lamp wick. It has a reservoir to draw the saturant from, thus permitting the washer to retain its resilience. This produces a watch case which will retain its waterproof quality indefinitely.

"The adoption of an unbreakable, non-inflammable glass necessitated in itself a separate invention, the 'double-clinched bezel,' for it had been found that sudden climatic changes from a warm room to the freezing air of the winter months contracted the cellulose material used as a glass to such an extent that it became loose and more frequently came entirely out of the bezel of ordinary design, leaving the watch-dial unprotected.

The double-clinched bezel overcame this harmful effect, and while it not only grips the glass above and below around the entire circumference, it renders the contact between glass and bezel the only practical water and dustproof bezel.

The effect of these remarkable improvements in the designing of a watch case has had a marked tendency to disprove the unconsciously adopted feeling that "all the qualities of a good watch are in the movement." The War proved that regardless of the high type of movement, it must be adequately protected by its casing.

The Depollier waterproof watch, known as the Depollier "Field and Marine" Watch, is subjected to rigid tests before the movements are fitted, and again after this operation they are given a further individual pressure test under water before leaving the inspectors.

To the out-of-doors active man, sportsman, traveler, seafaring man, or man engaged in a pursuit where he is in an atmosphere of dust or grit or dampness, the Depollier water and dustproof watch is the only watch qualified to withstand exposure to such conditions. It protects the movement from the salt air, ice, dampness, alkaline dust and heavy winds carrying always minute particles of dirt and dust.



Three views of the Depollier Waterproof Watch

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
L. T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations



PILOTS

Ira O. Biffle
Irving Graeb
Trent C. Fry
Leon D. Smith
L. V. Smith
Dunn K. Steele
Lyman W. Doty
Carroll C. Eversole
Dan Davison
Dana C. DeHart
Edwin W. Hubbard
D. I. Lamb

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Geo. R. Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AVIATOR-MECHANICS

Christopher C. Cole
Julian Sykes
Wm. L. Lindley
August E. Carlson

New York-Chicago Aero Mail

Postmaster General Burleson has issued an official order directing the inauguration of the aero mail service between New York, Cleveland and Chicago on Wednesday, December 18. The planes to fly the route will be distributed to the various stations the end of this week and trial trips will be made over the entire route to acquaint the aviators with the landmarks of their new territory. The plane will leave the landing field at Elizabeth, N. J., at 6 o'clock in the morning, the mail being dispatched from New York City Post Office at 4 o'clock. The start from Chicago will also be made at 6 o'clock in the morning.

On a 10-hour schedule the mail should arrive at New York at 4 p. m. and on a 9-hour schedule at 3 p. m. It should arrive at Chicago at 3 p. m. on a 10-hour schedule, and at 2 p. m. on a 9-hour schedule. In order to maintain a 10-hour schedule the actual flying time must be at the rate of 75 miles an hour. With the actual flying time of the planes at the rate of 80 miles an hour a schedule of 9 hours can be maintained. With the 135 miles per hour DeHaviland and 135 miles per hour Curtis R-4 machines it is expected to be able to maintain a 9-hour schedule except in days of severe head winds.

Arrangements have been made to dispatch mail on train 140 leaving Washington at 9.25 p. m., which will include dispatches from Washington, D. C., Baltimore, Md., Philadelphia, Pa., Wilmington, Del., and Trenton, N. J., due at Elizabeth at 5.40 a. m., which, together with mail from the Elizabeth, N. J., Post Office, will be taken to the field for dispatch by aeroplane schedule at 6 a. m.

Mail from Newark, Jersey City, Brooklyn and New York City will arrive at the aviation field at Elizabeth by 5 o'clock in the morning.

Mail from St. Paul, Minneapolis, Milwaukee and points nearby Chicago should be dispatched so as to reach Chicago about 2 a. m. for eastern air mail dispatch at 6 a. m.

Letters by aeroplane may be registered. The rate of postage is 6 cents an ounce, with either the distinctive aeroplane stamp or an ordinary 6-cent stamp marked "By Aeroplane." Persons desiring their letters to be given special delivery service instead of regular carrier service after the arrival of the aeroplane may add to the aeroplane postage 10 cents for special delivery.

Over Two Millions for Aero Mail Lines

Appropriation of $2,185,000 for purchase of aeroplane and maintenance of air-line service for the Post Office Department which is an increase of $1,885,000 over the $300,000 originally estimated by the department, is recommended in the Post Office appropriation bill reported to the House by Representative Moon of Tennessee.

The bill carries recommendations for a total appropriation of $359,657,577. This is about $2,000,000 less than the appropriation for the present fiscal year, which was $361,477,577. The estimates of the Post Office Department for the next fiscal year amounted to $368,782,577.

Xmas Cards By Aero Mail

Christmas cards may be mailed by aeroplane service for 6 cents on or after December 15th. This is the first Christmas that it will be possible to send Christmas messages in this way.

Performance of Aviators During the Month of November, 1918

Total possible number of flights 104
Total possible mileage 11,336
Total perfect (uninterrupted) flights made 102
Total interrupted flights made 2

Pilot	Perfect Flights No.	Perfect Flights Miles	Forced Landings Interrupted Flights	Forced Landings Uncompleted Flights	Total No.	Total Miles
Dana C. DeHart	28	3,052	..	..	28	3,052
Robt. F. Shank	16	1,744	..	..	16	1,744
Max Miller	32	3,488	..	..	32	3,488
Edw. V. Gardner	12	1,308	..	2	14	1,526
Louis Gerston	4	436	..	..	4	436
Lawton V. Smith	10	1,090	..	..	10	1,090
Total	102	11,118	..	2	104	11,336

Aerial Mail Operation for the Month of November, 1918

Date 1918	Miles Flown	Hours of Flying Hrs.	Min.	Mail Carried A.	O.	Percent of Performance	Arrival Wash.	N. Y.
Nov.	1	2		3		4	5	
1	436	5	58	26½	609	100%	4.30	2.25
2	436	5	54	40	509	100%	3.35	2.40
4	436	6	03	50	572	100%	3.54	2.10
5	436	5	37	32½	531	100%	2.55	2.59
6	436	5	49	31	603	100%	2.48	3.12
7	436	5	30	35	598	100%	3.00	2.50
8	436	5	36	35½	605	100%	2.45	3.05
9	436	6	33	44	575	100%	4.10	2.25
11	436	5	38	41	444	100%	3.01	2.56
12	436	5	18	31½	576	100%	2.43	3.03
13	564	7	14	29½	666	100%	3.10	2.40
14	436	5	44	30	567	100%	3.48	2.20
15	436	5	34	31½	589½	100%	3.40	1.55
16	436	6	20	30½	507	100%	4.12	3.05
18	201	3	04	31	529	50%	1.25P.M.	2.50
19	436	5	51	35	652	100%	4.00	2.00
20	436	6	34	34½	305	100%	4.05	2.40
21	436	5	51	29½	582	100%	3.45	2.40
22	436	5	48	35½	626	100%	320	235
23	654	9	18	38	821	100%	3.25	3.08
25	872	12	30	30½	123½	100%	4.01	2.42
26	654	8	46	34	893½	100%	3.21	2.53
27	436	6	49	30	624	100%	4.08	2.50
28	436	5	21	31½	508	100%	3.26	2.47
29	436	5	24	28	615	100%	3.40	2.00
30	436	6	02	41	623	100%	4.32	1.50
	12,101	164	06	887	15,966½			

Note: Number of hours of dead flying for the month, 10 hrs. 41 min.

Explanation of Tabulation:

1. *Miles flown:*

Leg from Washington to Philadelphia ..... 128 Miles
Leg from Philadelphia to New York ..... 90 Miles

Miles flown for the day, whether one, two, three or four legs of the trip have been made. The aim is to get exactly the number of miles flown in connection with the mail service each day. Therefore, mileage of partial trips should be indicated.

2. *Hours of flying:*

To include the actual hours and minutes the machine is in the air with mail.

3. *Mail carried:*

In this column, under A., give pound of aeroplane mail; and under O., give pounds of ordinary mail.

4. *Percent of performance:*

Round trip Washington-New York consist of four legs, each leg valued at 25% if completed by aeroplane and not by train before close of day.

Otto Praeger, Second Assistant Postmaster General.

THE MARTIN K-III SINGLE SEATER



SOME of the distinctive features of the Martin K-III, 45 h.p., single-seater, are retractable landing chassis, the K-bar cellule truss, wing end ailerons, and shock-absorbing rudder, which have been patented by Captain James V. Martin, the veteran aeronautic engineer. These features are interesting solutions of difficult aerodynamical and constructional problems and show the tendency of modern design toward the attainment of efficiency with low power rather than the employment of great power to overcome the disadvantage of uncertain design.

The K-III was designed as an altitude fighter, and is equipped with oxygen tanks behind the pilot's seat and provision for electrically heating the pilot's clothing. The seat is so located that excellent vision is obtained; vision vertical circle from dip of 5° dead ahead through an arc of 180°; horizontal circle 360°, transverse circle from dip of 27½° through an arc of 235°.

Captain Martin is opening offices at 299 Madison Avenue, New York City, where plans are already under way for building the K-III to sell for $2,000. The machine can light upon and start from a country road and can travel 22 miles on one gallon of gasoline, making it an economical means of carrying mail and light express in rural free delivery; for carrying newspapers, passengers, etc. In fact the cost of operation and maintenance is not much greater than for a Ford automobile, but the work is done ten times faster.

Dimensions

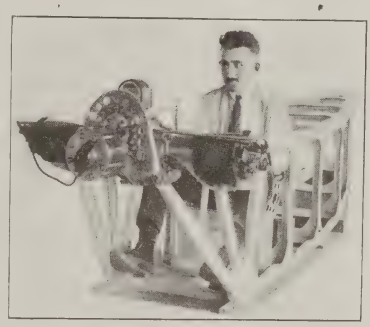
Span, upper plane (without ailerons)	15′ 0″
Span, lower plane	17′ 11¼″
Chord, both planes	3′ 6″
Gap between planes	4′ 6″
Length overall	13′ 3½″
Height overall	7′ 4¼″

Areas (Sq. Ft.)

Upper plane (without ailerons)	52.50
Lower plane	47.80
Ailerons	5.00
Stabilizer	9.50
Elevators	6.66
Rudder	4.88

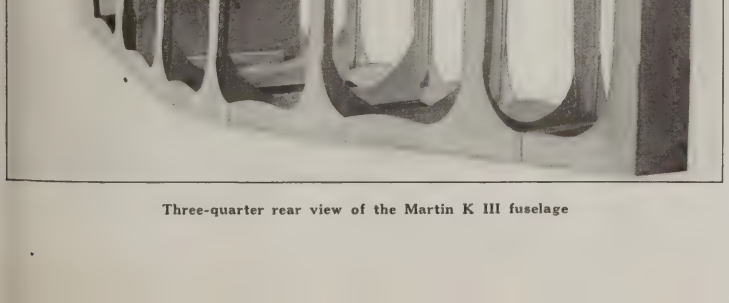
Weights (Lbs.)

Engine	85.50
Wings	60.75
Ailerons and supports	9.50
Chassis and retracting mechanism	16.38
Wheels	17.50



Engine mounting, Martin K III Scout

Struts, wires and K bars	8.25
Oil and gasoline tanks	9.75
Rudder and tail skid	7.75
Damper and elevator	14.50
Fuselage, complete	106.50
Propeller and hub	13.62
Total weight	350.00



Three-quarter rear view of the Martin K III fuselage

Performance (Estimated)

Altitude (Ft.)	Time (Min.)	Speed (M.P.H.)
0	0	135
5,000	3	113
10,000	6	112
15,000	11	111
20,000	18	108
25,000	28	97

(With 60 h.p., 100-lb. engine—speed 145 m.p.h. at 10,000 feet.)

Endurance at 10,000 feet:

At full power	222 miles
At minimum power	216 miles

Main Planes

The planes have neither stagger nor dihedral.

The aerofoil of main planes is known as the "Ofenstein 1." At 40 m.p.h. the Ofenstein wing section has a lift-drift ratio of 22 to 1.

Upper plane is in a single continuous span. Wing ends are at right angles to the leading edge, and are finished off with a semi-circular termination which varies in radius as the wing varies in thickness. The half-round wing ends are characteristic of all the aerofoils of the Martin K-III.

Principal wing spars for main planes are centered 14½″ back of leading edge, where the trusses carrying the lift are direct instead of bridged between the ribs.

The front of main wing beam is coincident with the most forward travel of the center of pressure.

The lower plane is in two sections, and attachment made to the fuselage. Wing ends are raked at an angle of 15 degrees.

Interplane bracing is of the "K-bar" cellule truss type. The head-resistance is reduced 4 per cent through the elimination of struts and wires.

The percentage of inter-cellule interference with the K-bar truss is 15% as compared with 25% in the standard truss; a total reduction of 40%. Of this reduction, 16% is due to the elimination of struts and wires while 24% is due to the increased gap obtained without subsequent weakening of truss or increase of structural resistance.

K-struts centered 14′ from one another. The vertical member is 4′ 3½″ long; greatest section, 1¼″ by 4½″. The angular members of K-struts are attached to rear wing beams located 18″ back of main beams. These members are of steel tube faired with sheet aerometal.

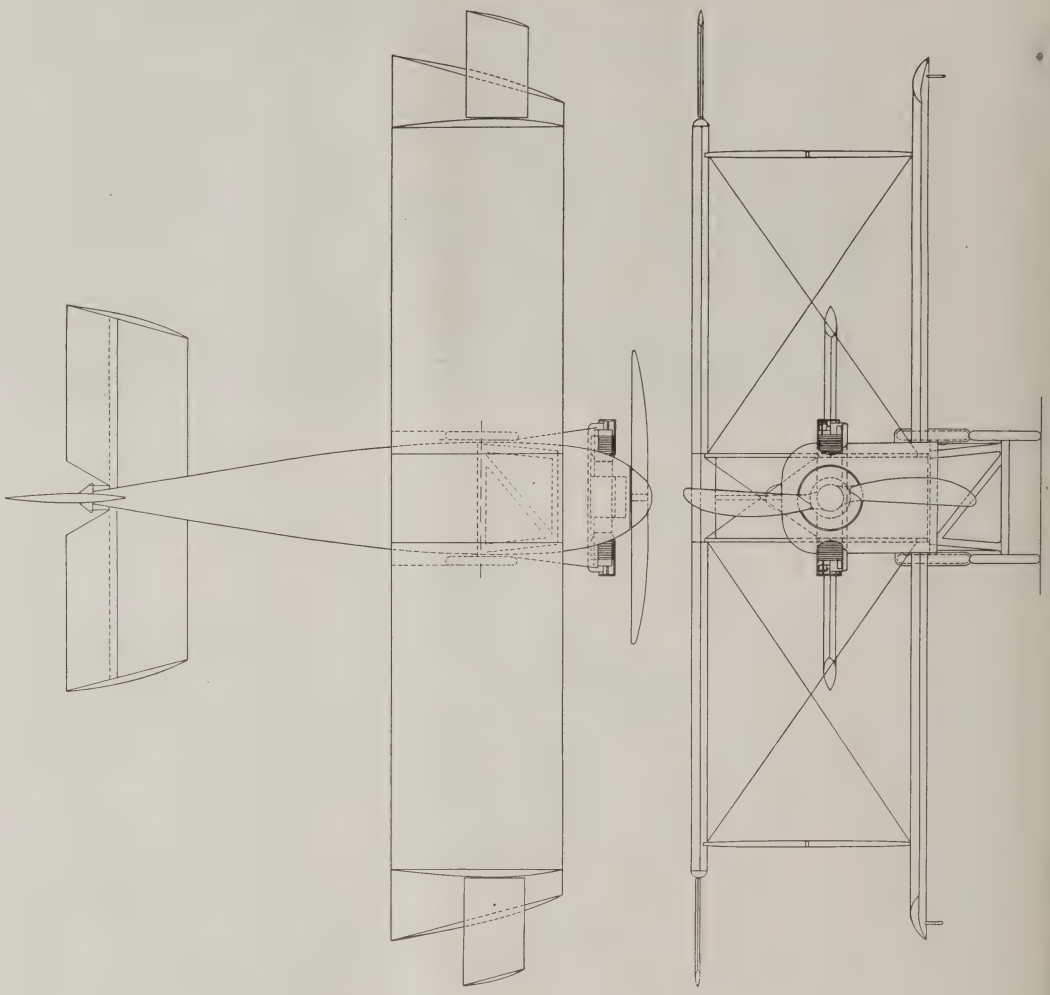
The vertical member of the strut is not subject to any bending moment at the juncture of the inclined members, for the upper member is in tension and the lower in compression, thereby neutralizing the forces at that point. The mid-strut fitting is designed with a view to equalizing the moments and relieving the vertical member of all except the usual direct compression.

Flying and landing wires are 3/16″ diameter. Center section cross-bracing is with ⅛″ diameter wire.

The wing-end ailerons are an unusual departure from customary aileron disposition. They have a righting influence per square foot of area of 4 to 1 with the added advantage that they do not impair the efficiency of the aerofoil to which they are attached.

The ailerons have a symmetrical double convex surface and are so balanced that their operation requires very little effort.

Ailerons are operated by means of a sliding rod running through the upper plane. Two cables running up the center panel struts cause the rod to slide from side to side. At the wing ends, the bar fits into a tubular collar attached to the ailerons. The collar is provided with a spiral slot or keyway through which a pin from the rod projects. The sliding movement of the rod causes a rotary movement of the aileron collar. This method does away with all exposed actuating members.



THE MARTIN
45 HP ABC ENGINE
K III SCOUT

Scale of Feet
1 2 3 4 5

McLaughlin

THE MARTIN K III SCOUT

(*Continued from page 759*)

Fuselage

Overall length of fuselage from engine plate to rear termination, 10′ 10 7/16″. Maximum depth, 3′ 0¼″ (not including streamline head rest); maximum width, 2′ 2⅛″.

The center of gravity is located 2′ 7½″ back of the engine plate.

Veneer of ply-wood is used for the internal construction of the fuselage.

In flying position, the top of the rounded turtle deck is practically horizontal. The upper longerons as well as the lower have an upward sweep towards the rear. The fuselage terminates in a vertical knife edge 18″ high.

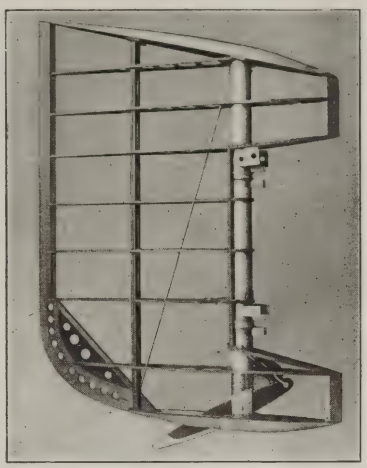
Internal bracing of the fuselage is with solid wires looped over clips at the ends of cross-bracing members. Wires are run in series of four each, grouped in ribbon form. Each wire has a tensile strength of 250 lbs. each; at the cross-braces, they run over a 3/16″ radius. Only eight groups of wires and eight turnbuckles are required in the internal bracing system.

The cowling and propeller spinner are of "aerometal," having the tensile strength of sheet steel at one-third of the weight of steel.

Where engine cylinders project from the body, half-conical formers carry out a streamline.

The fuselage is designed to stand a load of 105 lbs. per sq. ft. of horizontal tail surface. Factor of safety, six.

Instruments carried are: Altimeter, tachometer, gasoline gage and oil gage.



Martin K III rudder and tail skid

Tail Group

The horizontal stabilizer has a span of 7′ 6″ and width of 2′ 6″. Ends are raked at a 15° angle.

The stabilizer is located in line with the center of thrust. It is fixed at a non-lifting angle and supported from below by a pair of steel tube braces.

Elevators are 12″ wide and have an overall span of 7′ 10″. For rudder clearance, the inner ends of elevators are raked 30°.

Rubber covering between stabilizer and elevators closes the gap between the surfaces, giving a smooth, unbroken outline.

There is no fin.

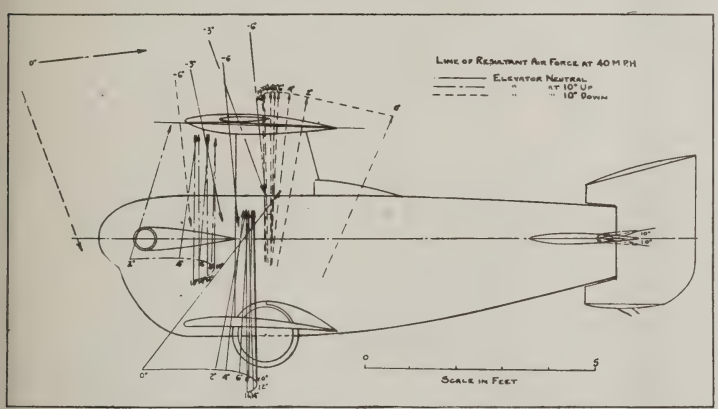
The rudder is provided with balanced areas above and below the fuselage.

The tail skid is contained within the rudder. It is provided with rubber elastic shock-absorbing cord similar to the customary practice. It is especially effective when taxying on the ground. The combining of the rudder and tail skid does away with considerable weight and air resistance while adding to the effectiveness and simplicity of the construction.

The rudder is 1′ 10″ wide; maximum height, 3′ 5″; balanced portions project 8″ forward of the principal rudder area.

Flexible 3/32″ cable is used for operating the rudder, by means of the usual foot bar.

The elevators are actuated by means of a single ⅜″, 20-gauge steel tube from the control stick to a lever projecting downward from the center of member forming the elevator leading edge. The fuselage terminates beyond the elevator leading edge, providing space for the enclosure of the operating lever.



Graphic results of wind tunnel test of the Martin K III Single-Seater

Landing Gear

Ackerman spring wheels are used for the landing gear; these have 2″ tires, and are 20″ in diameter. The two wheels weigh 17½ lbs. Wheel track, 2′ 5″. When the chassis is extended, the underside of the fuselage at the forward end is raised 2′-3″ above the ground. When drawn up during flight, only the wheels are exposed.

The front of axle and the two forward struts have flat front faces, so that when in fiying position, these members fit flush into the fuselage bottom.

A hand-operated worm gear, operated during flight, causes the chassis to be retracted with practically no effort on the part of the pilot.

The landing gear has a factor of safety of 20.

Engine Group

The power plant consists of an air cooled two-cylinder opposed "Gnat" A. B. C. engine, developing 45 h.p. at 1950 r.p.m.

Fuel consumption, .56 lbs. per h.p. per hour; weight, 50.4 lbs. Oil consumption, .017 lbs. per h.p. per hour; weight, 1.55 lbs.

The fuel tank is located in the upper main plane above the fuselage. It has a capacity of 9.03 gallons, sufficient for a flight of two hours.

(*Continued from page 754*)

"Believing that the time is here when aircraft can be used to great advantage and saving of time for carrying passengers and express, a group of prominent and public spirited Americans have asked me to establish and take complete charge of the first permanent passenger and express aerial lines.

"I agree with them that it would be a splendid achievement and that it would be very appropriate to take this initial step December 17—the fifteenth anniversary of the first aeroplane flight made by Orville Wright at Kitty Hawk, N. C.

"It is our intention to put the first of these lines in operation May 15, 1919. We have gone into the details of the plan very carefully, as we realize that the demand for aerial transportation lines no doubt will be very extensive."

Captain Lipsner said the planes would be capable of carrying forty passengers of their weight equivalent in express matter; that rates would be nominal and within the reach of all; that a regular schedule of arrival and departure would be maintained and that all modern conveniences would be offered to patrons, such as wireless telephony, stationery and all latest scientific appliances.

The company will carry its own insurance for passengers and cargo.

A regular schedule of departure and arrival will be maintained. At a later date announcement will be made of what rebate will be offered for every minute the air craft is late.

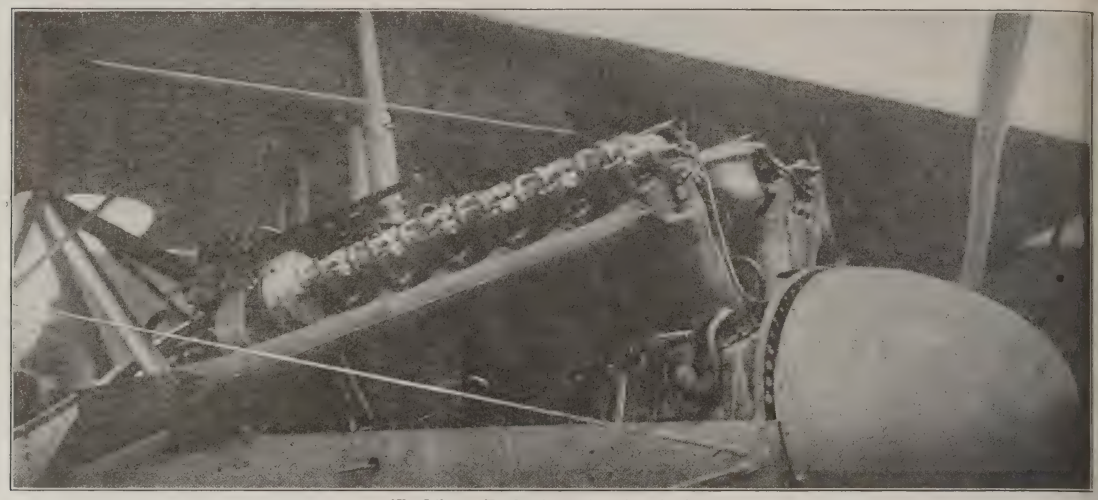
Perishable goods and express will be carried during the first year's operation.

Aeroplanes can be chartered for special trips or for certain altitudes.

Only the most expert aviators will be employed.

Pilots will receive an interest in the company besides substantial salaries, the interest only in force when all rules and regulations are strictly obeyed.

Representatives and officials of the press and aeronautical bodies will be taken on the first round trip flight.



The Liberty Twelve in an American Biplane

THE LIBERTY MOTOR

By G. DOUGLAS WARDROP, M. S. A. E., A. S. M. E.

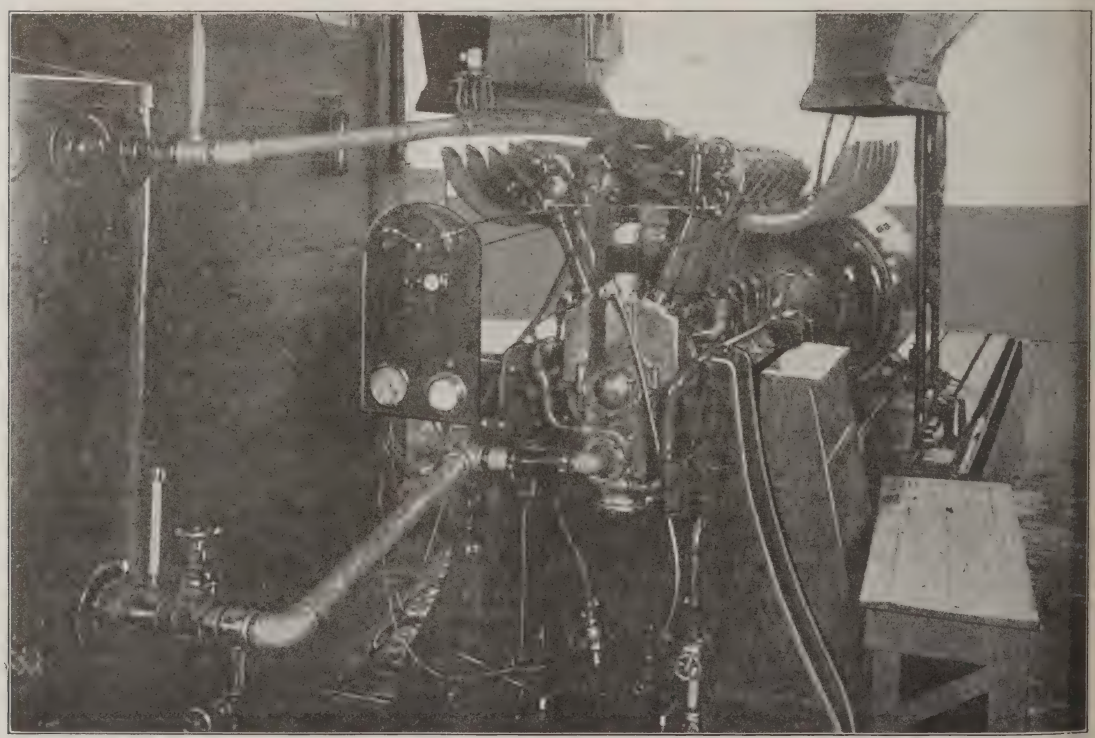
(*Continued from last issue*)

Oiling System

THE oiling system in the Liberty Twelve is an interesting feature, as will be seen from the illustration.. The crankshaft is hollow, and in the center of each main bearing a radial hole is drilled through the shaft into the hollow center. This hole in the shaft registers with the corresponding hole in the bearing bushing, once every revolution of the shaft, at which time a small quantity of oil is forced through into the hollow crankshaft. A passage leads from each hollow main bearing to the adjacent crank pin, which is also hollow. A radial hole is also drilled through each crank pin and carries the oil out on the surface of the pin. Oil grooves and passages in the connecting-rod bushings insure proper lubrication for both the forked and plain connecting rods.

The excess oil thrown off the rapidly-moving connecting rod ends forms a mist which lubricates the piston pins and the cylinder walls.

Part of the oil conducted to the main crankshaft bearing at the propeller end of the engine goes through a passage around this bearing and up through pipes to the propeller end of the camshaft housings. From the end of the camshaft housings it is led around the end camshaft bearing to a passage drilled diametrically through the bearing



Liberty Twelve on a Sprague dynamometer testing stand at the Trego Motors Corporation plant

midway of its length. Once every revolution of the camshaft a hole drilled through the camshaft into its hollow center registers with the oil passage through the bearing.

Thus once every revolution a small quantity of oil is forced into the hollow camshaft.

The oil is led through the camshaft and out through holes drilled in it to each camshaft bearing. The excess works out of the ends of these bearings and collects in small reservoirs to a depth of about ¼". The cams, in revolving, dip into this oil and splash it over the cam rollers and into pockets in the rocker-lever shafts. From these pockets it is led through the hollow rocker shaft to the rocker-shaft bearings.

The excess oil eventually finds its way to the gear end of the camshaft housings, over the gears and down the driveshaft housing into a chamber just above the oil pump.

The excess oil thrown off in the crankcase by the connecting rods collects in this same chamber when the engine is inclined so that the propeller end is high. If the propeller end of the engine is low, this oil collects in a small sump or chamber at the propeller end of the crankcase.

Immediately above the oil delivery pump is located an oil return pump consisting of three gears, and driven by the same shaft as the delivery pump. The function of this oil return pump is to draw excess oil out of the crankcase and return it to the oil reservoir. One-half of this pump draws oil from the sump at the propeller end of the crankcase and the other half draws oil from the sump at the distributor end of the crankcase. Both halves of the pump deliver oil to the connection on the left side of the oil pump body marked "Oil Out," from which point it returns to the oil reservoir.

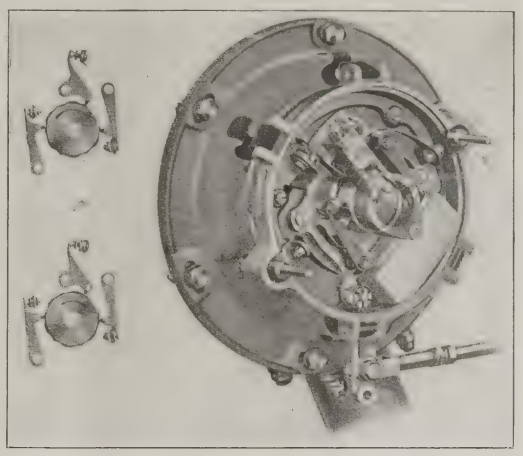
Electric Ignition

As was stated in our last issue, the ignition system used on the Liberty Twelve is known as the generator-battery type. Described in detail, the system comprises two independent braker and distributor mechanisms or heads, identical in every respect and each one firing all twelve cylinders. These distributors are supplied with electrical energy from two sources. For starting and for idling speeds up to 650 r.p.m. current is drawn from a specially constructed four-cell storage battery. The battery is very light and carries very little liquid or electrolyte (barely enough to fill a hydrometer syringe besides what is absorbed by plates and separators). Nevertheless, it has sufficient capacity to ignite the engine at full speed for three hours. It is so constructed that, even though it be turned upside down, it will still continue to function properly.

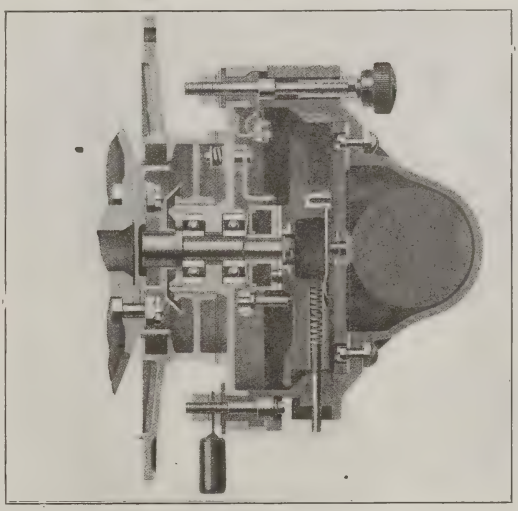
In addition to the battery, a positively driven generator is provided, so geared that it runs at one and one-half times crankshaft speed. Electrical energy for starting and idling speeds is supplied by the battery. As the engine speed is increased the generator "builds up" and its output grows greater, until at about 650 r.p.m. the generator voltage equals that of the battery. The maximum generator output exceeds the requirements for ignition so that at speeds above 650 r.p.m. the direction of flow of current is reversed and the excess output of the generator goes to recharge the battery. With an almost discharged battery the rate will be about 10 amperes, but will diminish as the battery voltage rises until the battery is completely charged, when the charging rate will be just sufficient to maintain it in a properly charged condition.

The generator is controlled by a "voltage regulator" which prevents the output exceeding a pre-determined figure. In view of this fact, the generator will supply current for ignition indefinitely, without the battery, so long as the engine speed is not allowed to drop below 500 r. p. m.

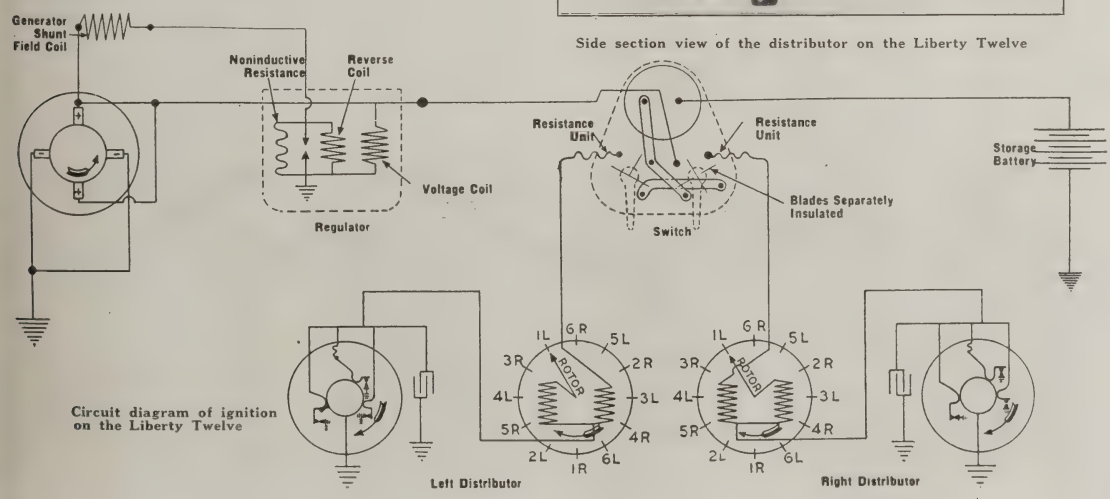
A duplex ignition switch is provided which will permit either one or both distributors being turned "on." This switch is so constructed that



The distributor mechanism of the Liberty Twelve

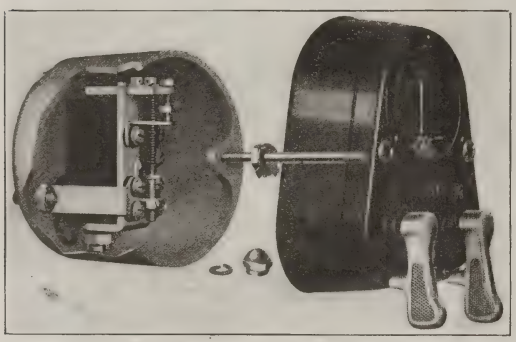


Side section view of the distributor on the Liberty Twelve



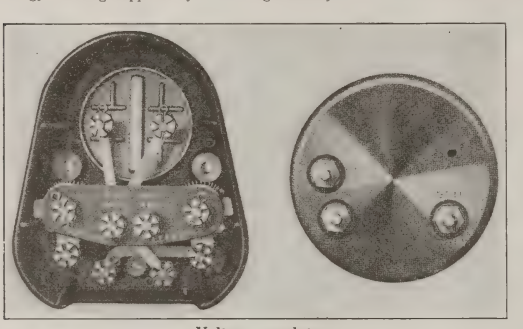
Circuit diagram of ignition on the Liberty Twelve

either set of ignition alone can be used without connecting in the generator. In starting, only one side should be used, as, with both switches "on," the generator is connected to the battery. Under these conditions the discharge from the battery through the generator before the engine is started would be an excessive drain on the battery. It is essen-



The voltage regulator on the Liberty

tial that both switches be "on" at all flying speeds. The ignition switch has an ammeter incorporated in it and this ammeter should be watched occasionally, as it indicates the amount of current flowing to or from the storage battery. If the ammeter shows a discharge at any speed above 650 to 700 r. p. m. with both switches "on," it is an indication that something is wrong with the generator circuit and that all electrical energy is being supplied by the storage battery. If the ammeter stands



Voltage regulator

at zero under the same conditions it indicates that the storage battery is not receiving a charge, but that the ignition is being carried by the generator.

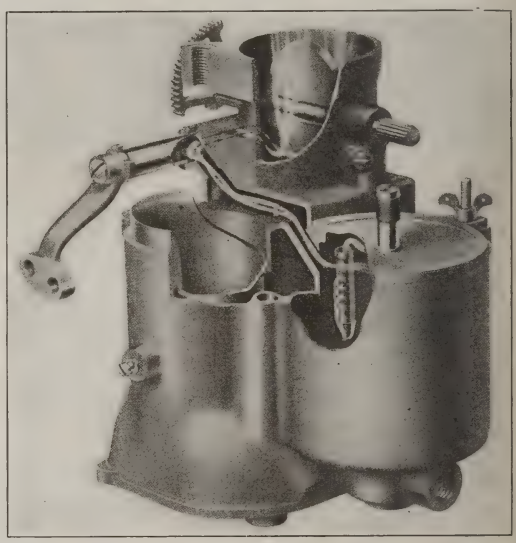
To return to the distributors—the circuit-breaker mechanism for each head is identical with that used in any high-grade magneto, with two exceptions, as follows:

Two main circuit breakers, connected in parallel, are provided instead of one. The two breakers are timed to operate simultaneously and are provided in duplicate as a precautionary measure.

An auxiliary circuit breaker, the function of which is to prevent the production of a spark when the engine is turned backward or "rocked" is also provided. This auxiliary breaker is connected in parallel with the other two through a resistance unit which reduces the amount of current flowing through it. The breaker is so timed that it opens slightly before the other two when the engine is turned in a forward direction. The opening of the main breakers then results in the production of a spark. When the engine is turned in a backward direction the two main breakers open first and no spark is produced, due to the fact that the current continues to flow through the coil through the auxiliary breaker, but in diminished quantity, due to the resistance unit. By the time the circuit is opened at the auxiliary breaker the intensity of the magnetic field of the coil has weakened to such an extent that no spark is produced. A transformer coil is incorporated in the Bakelite cover of each distributor head.

The Part of Zenith in the Liberty Aircraft Engine Programme

The first important decision of those engineers who were called upon to design an aeroplane engine which would uphold America's Air Pro-



Section diagram of the Duplex Zenith Carburetor

gramme was to incorporate only those things in their engine that were of proven and established quantity. It was therefore only natural that in considering the important matter of carburetion that the Zenith engineering force was called upon to design the Liberty Engine Carburetor.



The first Liberty tested on Pikes Peak. In the group are L. J. Hall, of the Hall-Scott Co.; Lynn Reynolds, U. S. Inspector; V. I. Shobe, of the Zenith Carburetor Co.; Ferdinand Jehle, of the Aluminum Castings Co., and E. L. Graham, U. S. Inspector

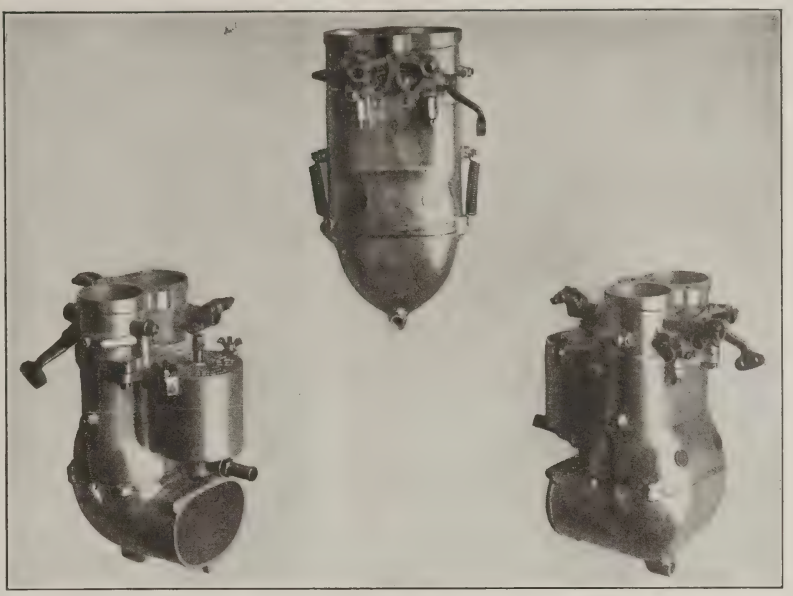
The Zenith organization, always progressive, were pioneers in aeronautical carburetion. Their early experience was with Anzani, whose aero engines created a sensation in the early days and made possible some of the most important advances in the science of flying heavier-than-air machines. In America the Zenith was long ago adopted by Curtiss, and the unvarying reliability of the Zenith instruments assisted greatly the Curtiss advance to undying fame in aeronautics.

When the great war broke out in Europe Zenith was used, among others, on the aeroplane engines built by Salmson, Isotta Fraschini, Renault, Peugeot, Clerget and Lorraine-Deitrich, and was quickly adopted as standard equipment on the Hispano-Suiza engine, which leaped to a first place in the yet unbeaten Spad machine.

It is easy to understand how the combined efforts of Zenith factories located in France, England, Italy and America, interworking in their experiences, should lead to the development of the last word in carburetion. With all this experience, and results of combined efforts before this, the Zenith designers, V. R. Heftler and H. de

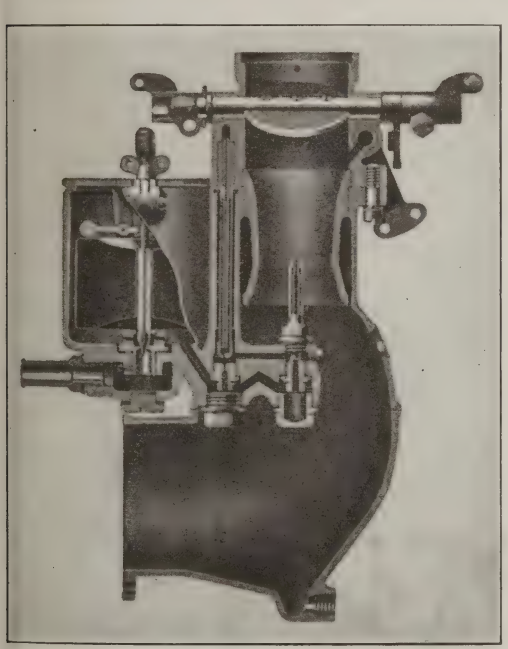
Boischevalier, developed a carburetor which met with the instant approval of the engine designers and which, when tested on the first Liberty Engine in July, 1917, justified the faith put in them and their product.

Immediately after the successful 50-hour test of Liberty 12 Engine No. 1 at Detroit, an experimental expedition composed of E. J. Hall, one of the Liberty Engine designers; Lynn Reynolds, of the National Advisory Committee for Aeronautics; E. L. Graham, I. A. & A. E.; V. I. Shobe, of the Zenith Carburetor Company; S. Smith, of the Hall-Scott Motor Company, and Ferdinand Jehle, of the Aluminum Castings Company was sent to Pike's Peak, Colorado, to make tests of the Liberty Engine at various altitudes. These were very carefully conducted and were run at altitudes above sea level of from 6,000 feet at Colorado Springs, to 14,109 feet at the summit of the peak. They demonstrated effectively the suitability of the engine for its destined purpose, and, incidentally, justified the selection of the Zenith carburetor. A very noteworthy fact is that the carburetor adjustment, which was determined as giving maximum power and efficiency on the electric dynamometer test at the Packard factory in Detroit, approximately 200 feet above sea level, gave the best results on the summit of Pike's Peak, 14,109 feet above sea level. This is only possible with a carburetor of plain tube construction and having the natural automatic compensating feature made possible by the Zenith system.



Three views of the Zenith carburetor equipment on the Liberty

After exhaustive tests had resulted in the final details of adjustment and installation production was started at the Zenith factory. The Zenith



Section diagram of the Zenith carburetor

manufacturing department, already experienced in high-class accurate workmanship and productive ability, carried on the good work started by the engineering department, and with such success that by November 1st, 1918, when Liberty Engine production had reached its peak, there had been delivered to the engine manufacturers a quantity of these instruments which was in excess of requirements to the extent of a month and a half of engine production according to the schedules then in effect.

Two of these carburetors are used on each Liberty 12 Aircraft Engine, they being of Duplex type, i. e., each having two carbureting chambers, or barrels, supplied from common air and fuel sources. Each barrel has a venturi tube for measuring its proper amount of air; one main or variable flow jet, and one compensating or constant flow jet. These are of non-adjustable type, being fixed once and for all, two carbureting chambers, or barrels, supplied from common air and fuel sources. Each barrel has a venturi tube for measuring its proper amount of air; one main or variable flow jet, and one compensating or constant flow jet. These are of non-adjustable type, being fixed once and for all, and so close are they calibrated that each and every Liberty Engine has its carburetors fitted with the same sized jets. With the exception of the altitude adjustment, which is incorporated in the design of Zenith aeronautical instruments to take advantage of the lesser air density met with at high altitudes and thus perform the important function of saving fuel and increasing the radius of action of the aeroplane, these carburetors have identically the same principle of operation, and same disposition of jets and venturi, as is used in Zenith commercial instruments.

The altitude adjustment mentioned above consists merely of a valve, connected so as to be manually operated by the pilot, which, when opened, puts the interior of the carburetor barrels below the throttle, where a partial vacuum exists, in communication with the fuel chamber. The suction from the barrels reduces the pressure in the fuel chamber and thus causes a decrease in the amount of fuel passing through the jets. At approximately 18,000 feet altitude this adjustment makes possible a saving of about 30% in fuel consumption, or, in other words, increases the radius of action of the aeroplane by 30%.

Immediately preceding the signing of the Armistice the Zenith company had developed a carburetor which was adopted as standard equipment for the Eight-Cylinder Liberty Aircraft Engine, and which was slightly later to replace the original model on the Twelve-Cylinder engine, that was as much ahead of the original Liberty Engine carburetor as it was ahead of other aeronautical carburetors at the time of its adoption. Aeroplane development resulting in greater climbing angles and higher ceilings made necessary equal developments in carburetion to meet these newly imposed requirements. The two points of carburetion mostly affected were, first, the ability to function properly when tilted to extreme angles; and second, to have an extended range of altitude adjustment. Still utilizing the same proven principles of operation, but by changing manufacturing details and relative positions of jets, and by a new float mechanism design, these requirements were not only met, but were exceeded. With a carburetor of this type a Liberty Engine was successfully operated at maximum power higher than that obtained with the original instrument at fore and aft angles of tilting of 50°. A tilting of 45° sidewise is also possible with the engine on a stationary stand. (In flight this sidewise tilting, as met with in banking, does not affect the normal functioning of the instrument, due to the "bicycle balance," or the neutralizing of the force of gravity by the centrifugal force.) It is well worthy of mention that, with this new type of instrument, the power of the Liberty Engine was increased, and the fuel consumption was considerably decreased. In addition, and of importance, the heat loss through the jackets was appreciably reduced.

THE HISPANO-SUIZA AVIATION MOTOR

By E. H. SHERBONDY

The following article is one of the chapters of the first Textbook of Aero Motors written by the author and being published by the Century Company.

The author is the well-known authority on internal combustion engines and aeronautic engineering. He has made a thorough study of problems of aeronautic engineering, especially of power plants, and has applied his vast knowledge of engineering, including matallurgy, and his remarkable inventive genius to work out their solution. He has achieved remarkable results and this Textbook represents the only work issued so far which deals with all the elements of the problems of applying the internal combustion motors to aircraft.

Mr. Sherbondy is a consulting member of the Naval Consulting Board, consulting engineer to the Aeroplane Engineering Department of the Bureau of Aircraft Production, and well known as the author of important works on internal combustion engines and aeronautic and automobile engineering.

THE Hispano-Suiza motor is the product of the brains and genius of Marc Birkigt, a Swiss civil engineer, who commenced his motor work in the design and construction of the now famous Hispano-Suiza motor cars, at Barcelona, Spain, about 1906.

A factory was established shortly afterward in Paris, and the majority of the work was carried out there, as the factory was near to the material and skilled labor markets.

When the French government established the present system of tax rating on motor cars, in which the horsepower was considered a function of the bore only, certain motor car firms commenced the construction of small bore, long stroke motors, in this way increasing the horsepower for a given cylinder bore and evading the taxation. Competitions were inaugurated for motor cars, having as their basis, limiting the cylinder displacement.

The Hispano-Suiza Co. rapidly entered a place of first rank by winning many of these competitions and assured for themselves an enviable reputation amongst continental motor constructors.

When the Great War commenced, the Germans had already developed the now famous steel cylinders Mercedes and Benz motors, whose performance from every standpoint was far superior to aviation motors built in other countries.

The French at this period had developed the rotary steel cylindered, air cooled motors to a high degree of reliability, but their fuel and oil consumption was then and is now excessive.

The need for a non-rotating high powered motor was met in the Hispano-Suiza motor which were found so satisfactory and so far superior to other non-rotating motors offered for trial at that time, that the French, British and Italian Governments placed orders for large quantities of these motors.

Such important firms as Peugeot in France and Wolsely in England, gave up the building of motors of their own design to take up the construction of the 150 H. P. Hispano.

The Hispano motor has since been developed in a large number of sizes and types, for military aviation purposes, and fifteen different manufacturing companies in different part of the world have constructed more than 50,000 of these motors.

The design and construction is unique in many particulars, as will be seen from the following description.

The motors are built with eight cylinders, with cylinders forming a 90° V in every case. This angular setting of the cylinders results in absolutely uniform turning effort on the crankshaft, the power impulses being equally spaced from one another, at 90 degrees.

The motor is unbalanced only in the horizontal plane, but the magnitude of the unbalanced forces is so small as to not be noticeable in the actual operation of the motors.

The motors have been built in both direct and geared down types and operated at various speeds from 1450 R.P.M. to 2200 R.P.M.

The 150-180-200 and 220 H.P. types all have identically the same cylinders. The bore and stroke are respectively 120 x130 mm. or 4.72x5.12 inches. The variation in the H.P. is obtained by fitting large carburetors and induction pipes, the use of higher compression ratios and higher speeds in the high power types.

There have also been built in limited quantities, the 400 and 450 H.P. types with 16 cylinders. The various types, and characteristics of other sizes are given in the Table I.

Table 1

Type	Normal H.P.	Normal R.P.M.	Max. H.P.	Max.R.
150	150	1450	200	2000
180	180	1540	250	2240
200	200	1870	210	2200
220	220	1970	238	2200
400	400	1870	500	2240
450	450	1970	476	2200

Fig. 2 shows the Brake Horsepower curves of the 150, 180, 200 and 220 H.P. types, as well as the 400 and 450 H.P. types.

For the 150 H.P. type a 48 D. C. Zenith Carburetor is used, on the other types of higher H.P. the 58 D. C. Zenith Carburetor is used.

The 400 and 450 H.P. motors both have the crankshaft geared to the propeller shaft, through parallel trans of helical reduction gears, as is indicated by the diagram Fig. 3. It will be noticed that the crankshaft is divided into two independent units. By this artifice, the shaft size is kept the same as in the 200 H.P. type motor, the torque magnitude being only 50% of what it would be if a single crankshaft were used for the sixteen cylinders.

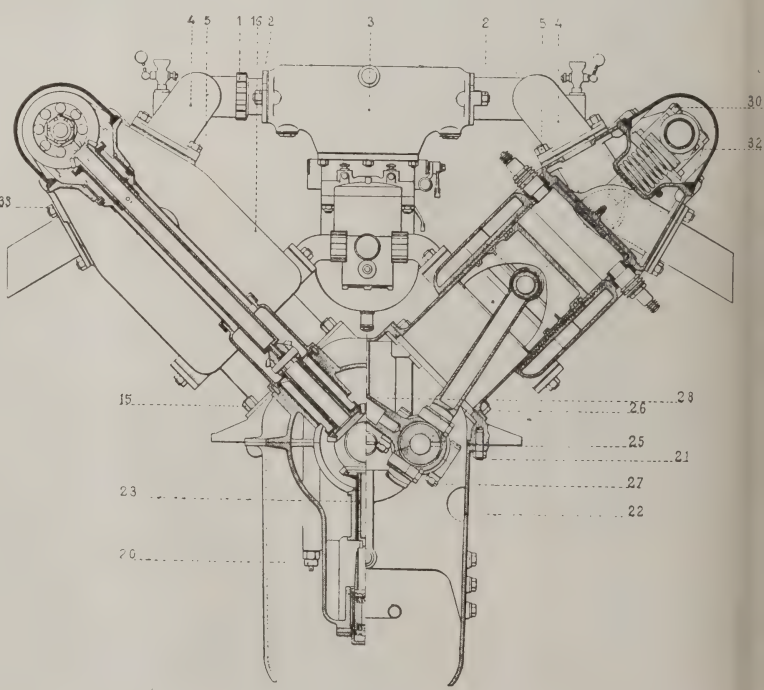


FIG. 1.

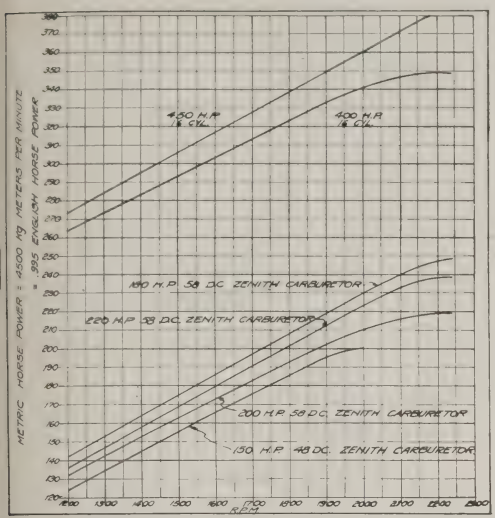


FIG. 2

Fig. I is a section taken at right angles to the motor crankshaft of the 150-180-200-220-H.P. types.

The Cylinders

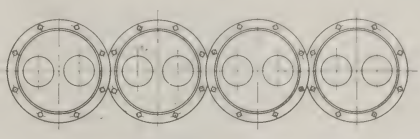
The cylinders are machined from hollow steel forgings of .40 carbon steel and weigh when rough about 40 lbs. for the smaller motors. Their finished weight is about 11 lb.

The cylinder form is a hollow barrel, with a closed end, into which the valve ports are cut. The cylinder walls have, when finished, an average thickness of 2 mm. or .078, and they are externally threaded from the closed end down, and the cylinder head is 5 mm. or .187 inches thick and the bolting flange, by which the cylinders are retained on the crank case is 6 mm. or .2362 inches.

The steel cylinder barrels are assembled in groups of four by screwing them into the cast aluminum water jackets, which are tapped to receive them. The steel barrel is put in the aluminum jacket after which the valve ports are machined in place, being located from the valve stem guides in the aluminum jacket. The bolting flanges are so designed as to interlock with one another when in place as is illustrated in Fig. 4.

After machining and putting in the steel barrels and valve seats the cylinder jacket is cleaned with alcohol and then given three coats of enamel inside and out, the bore is then given the final size by grinding.

It will be seen that a number of advantages accrue from this form of construction. Welding and the attendant possi-



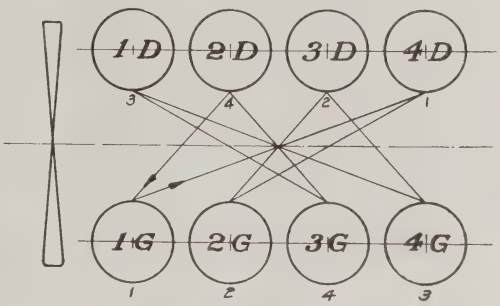
METHOD OF INTERLOCKING BOLTING FLANGES

FIG. 4

bility of distortion are done away with, and the desirable features of great strength, together with minimum weight, is attained.

Some very ingenious processes have been devised to make the accurate production of these cylinders possible.

The lower portion of the camshaft housing and the oil



FIRING ORDER HISPANO SUIZA 8 CYL. MOTOR

FIG. 5

drain passages are formed in the top exterior of the jacket.

The intake and exhaust ports are both 51 mm. = 2 inches in diameter.



The French Spad biplane equipped with Hispano-Suiza motor

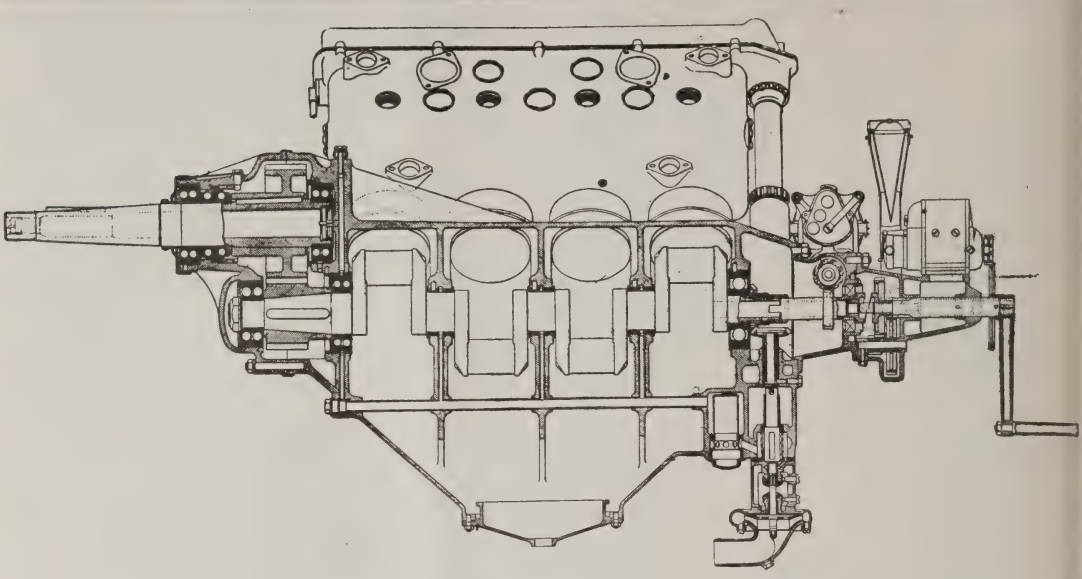


FIG. 6.

The exterior appearance is extremely clean cut, as can be seen from the accompanying illustrations.

The Pistons

The pistons are aluminum alloy sand castings, thoroughly well ribbed to assist in cooling. The piston head is flat and has an average thickness of 7 mm. (.2/5″). The piston skirt has an average thickness of 3 mm. (.118″), and carries three rings 5 mm. (.196″) wide, which are made of cast iron. Four narrow rings two in each of two grooves are placed above the gudgeon pin center and one below. The latter acts as an oil scraper ring. The location of the gudgeon pin center varies following the different compression ratios used.

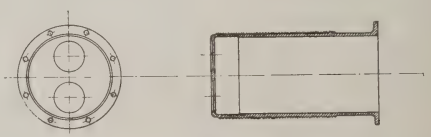
The Gudgeon Pins are of Chrome nickel steel 30 mm. (1.181″) outside diameter and 22 mm. (.866″) inside diameter and are prevented from turning in the piston pin bosses by a single grub screw.

Connecting Rods

The connecting rods are of the forked type. The body of each rod is a tube 27 mm. (1.06″) outside diameter and 21 mm. (.826″) inside diameter, made by drilling straight through. They are made of B. N. D. Chrome Nickel steel, famed throughout the world for its wonderful physical properties. The top and bottom of the rods are profile milled to shape and polished all over.

The gudgeon pin bush in the small end of the rod is of phosphor bronze 57 mm. (2.24″) long, and has a wall thickness of 2.5 mm. (.09″).

The rods are 227 mm. (8.93″) centers, somewhat less than two piston strokes. Short connecting rods are the rule in aviation motors, since they enable the motor to be kept compact and light, although the secondary unbalanced forces in the motor are increased thereby.



HISPANO STEEL CYLINDER BARREL

Fig. 7

Crankshafts

The crankshafts are of the five main bearing type; the end bearings in the geared motors being single and double

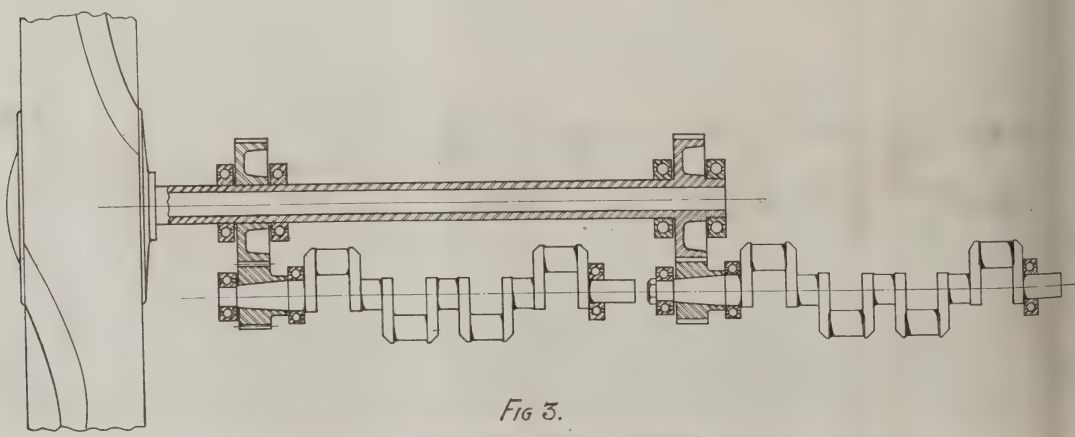


FIG 3.

DIAGRAM OF HISPANO SUIZA 16 CYLINDER PROPELLER SHAFT AND CRANK SHAFTS.

row ball bearings, the three intermediate bearings being babbitt lined bronze shells.

In the direct type motors only one single row bearing is used at the distribution end of the crankshaft, the use of which considerably reduces the length of the motors. The other bearings are of the plain type.

The average diameter of the main bearings in the motors of the 120 mm. (4.72") series is 58 mm. (2.28") and the crank pins are 50 mm. (1.98") diameter and 64 mm. (2.51") long.

The Distribution

The valves are placed in the top of the cylinder and are arranged in a single line parallel to the axis of the motor.

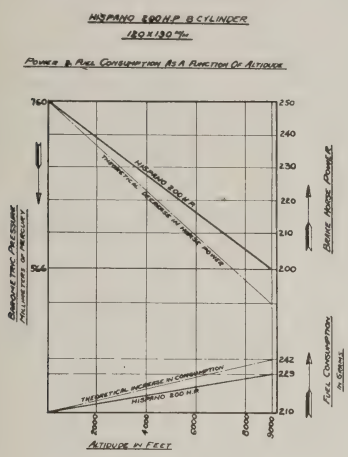


Fig. 8

A single camshaft serves to operate all the valves in each group of cylinders. The camshaft is carried in three bronze bearings, front bearing 40 mm. (1.57"), center bearing 60 mm. (2.36") long, rear bearing 52 mm (2.04") long, all 34 mm. (1.33") in diameter. A 28 mm. (1.10") hole is drilled through the shaft and serves as an oil gallery for the distribution of oil to the bearing surfaces and cam faces. The cam faces are 16 mm. (.629") wide, and are undercut on the back side of the cams.

Each cam acts directly on the valve stem, into the end of which is screwed a case hardened contact plate, which is prevented from turning by means of tandem plate, face keyed to the valve stem and knurled to engage the lower face of the case hardened cam contact plate. Adjustment of the clearance (which is exceedingly large 2 to 3 mm. (.07"-.11") is easily made by means of a special wrench furnished for the purpose.

The camshaft is driven by means of a pair of bevel gears 2.5 module, 15 mm. (.59") face, having a ratio of

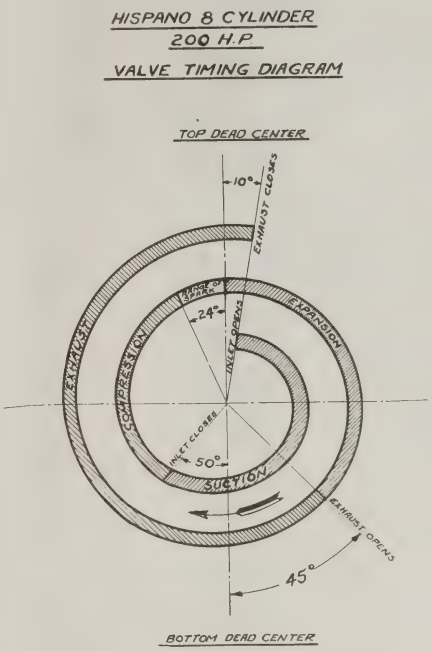
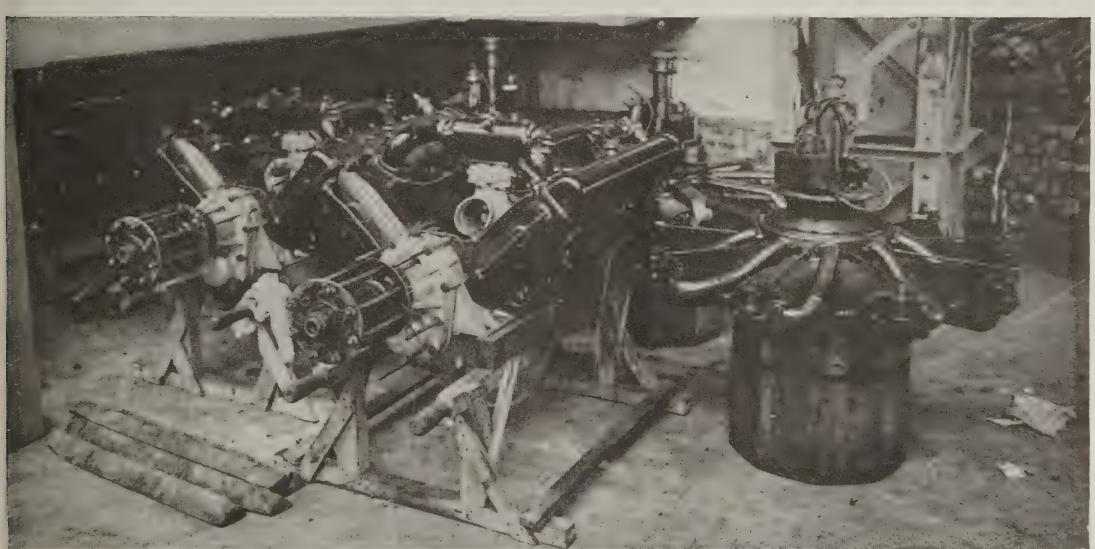


Fig. 9



Two Hispano-Suizas and an Anzani in the French factory ready for shipment

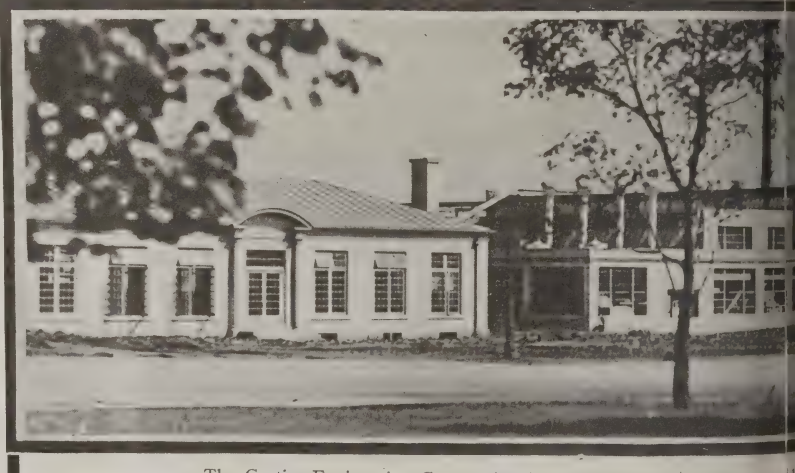
"THE OP

Curtiss Achievements"

1—The design and construction of the fastest fighting airplane ever flown. Th Government records credit this triplane, which was built for the U. S. la known as model 18-T, with 160 miles per hour, carrying full military loac and passenger. This is 15 miles per hour faster than any speed ever claim an airplane, a truly epoch-making achievement, made possible by the develo of our new model K motor.

2—The design and construction for the Navy of the largest flying boats in the w colossal crafts capable of carrying five tons useful load. It was one of these that recently carried fifty passengers.

3—The design and construction for the U. S. Navy of the fastest and most e Seaplane in service anywhere. This craft which is known as the Curtiss mode with Liberty motor, made an official speed of 126 miles per hour with full m load, armament, ammunition, pilot and passenger.



The Curtiss Engineering Corporation is today the center of aeronauti Glenn H. Curtiss and his engineers have been busy in drafting rooms, re of suitable commercial types. Aircraft especially designed for sportsman's workmanship and performance as Curtiss military planes have proved them

CURTISS ENGINEERIN

Member o

BOOK"

The Great War

velopment and construction of a 12 cylinder, 400 H.P. motor of an entirely
l much lighter type, known as the Curtiss model K-12. These motors have
me exhaustive tests and are already in production.

velopment and construction of the Curtiss model K-6, a new and much
5 cylinder motor. These engines develop 160 H.P. and possess greatest en-
and reliability.

velopment and construction on a large scale of the Curtiss OXX motors,
J-N-4. training planes, which were used almost exclusively by the United
nd Canada and largely in England for the training of American and
aviators. The training of over seven-tenths of the original land and
flying pilots, most of whom entered the service and formed the nucleus
nited States Training Forces.



s instead of being decreased will be increased by the coming of peace.
els and shops in perfecting designs and carrying forward the production
peace-time purposes are already available and are as superior in design,

ION, Garden City, L. I.

15 to 36. The inclined pinion shaft is operated at high speed to reduce the torque.

The arrangement of the accessory drives varies in the different types of motors as will be seen by perusal of the several sectional drawings accompanying this description.

The Crankcase

The aluminum crankcase is cast in two halves split horizontally through the plane of the crankshaft axis. The upper half is a very light shallow casting made possible by the use of short piston stroke and short connecting rods.

It is milled off on either side at angle of 45 degrees from vertical to receive the cylinder blocks.

All of the distribution gearing is of the bevel gear type excepting on the reduction gear motors where the magnetos are driven by a pair of spiral gears mounted in a bracket extending from the forward end of the crankcase.

The lower half of the crankcase carries the lower bearing seats and oil gallery pipes which feed the main crankshaft bearings. This casting is very deep, forming an oil reservoir having a capacity of 10 litres (2.6 gals.) in the eight cylinder 120 mm. (4.72″) type.

The two halves of the crankcase are bolted together by means of long, through bolts on either side of the main bearings as well as a series of bolts through the crankcase flanges.

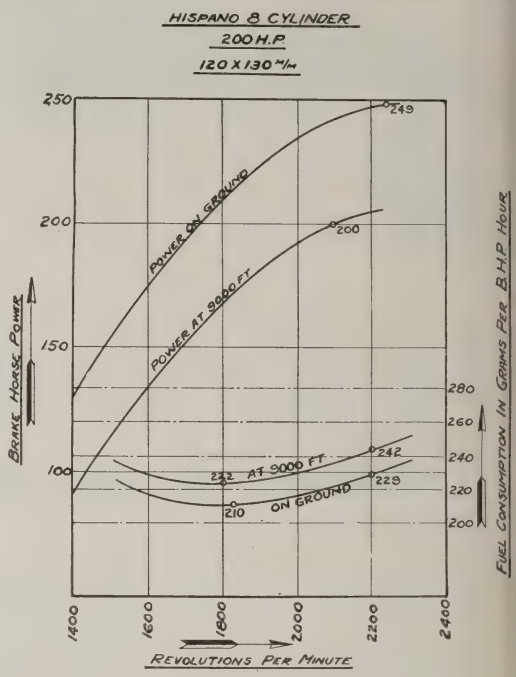
The Valves

The valves are 55 mm. (2.16″) head diameter. The port diameter is 51 mm. (2″). The valves stems have two diameters, the lower portion adjoining the head is 10 mm. (.393″), the upper portion or guide portion is 15 mm. (.59″) in diameter and is drilled out to take the cam contact plate, which is screwed into the stem. The intake and exhaust valves are made of chrome-tungsten steel and are interchangeable.

Two concentric helical springs are used to seat the valves; this practice is universal in aviation motors. The valve guides are machined from bronze bars and are screwed into the aluminum cylinder jacket. They are interchangeable with one another.

Air Pumps

A low pressure pump is built into the camshaft housing cover and is operated by one of the cams, to provide pressure on the fuel tanks.



Tachometer

A tachometer connected is provided on the distribution end of one of the camshafts.

Lubrication

The oil occupation varies according to the type of motor as is indicated in Table 2.

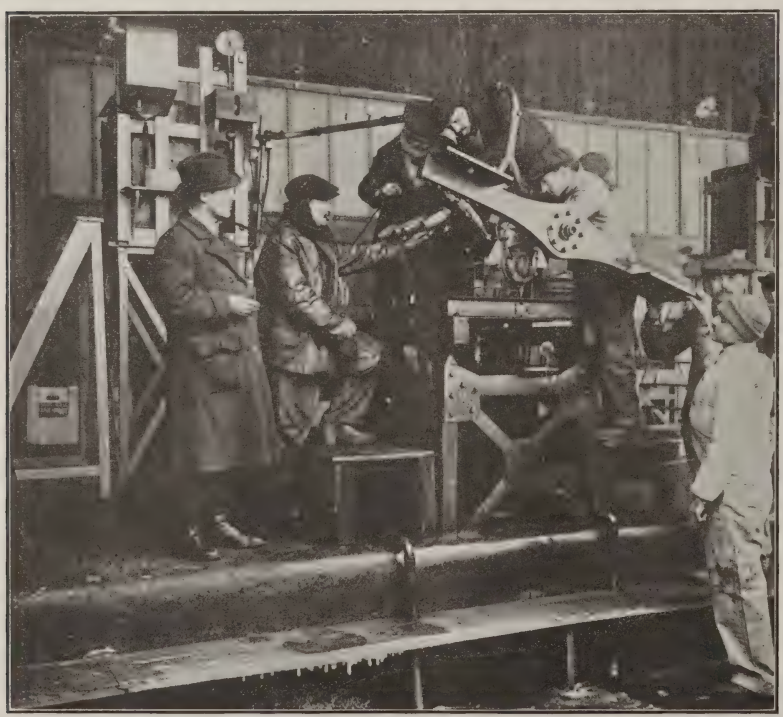
Table 2. Oil Consumption

Type	Litres per hr.	Gals. per hr.
150 H.P.	2	.528
180 H.P.	3	.792
200 H.P.	4	1.057
220 H.P.	5	1.321

The 120 mm. (4.72″) bore motors can be operated from two to three hours on the quantity of oil carried in the motor, but it is usual to provide an oil tank and to circulate the oil from the motor through the tank and back to the motor, thus getting the benefit of cooling the oil.

The pressure of the oil pump discharge in 5 kg. per sq. centimeter; the discharge line is 14 x 16 mm.; the suction line is 14 x 16 mm.; the leads to the main branch are 6 x 8 mm. The two leads to the cam shafts are 6 x 8 mm.; the groove around the main bearing bushings is 7 mm. wide and 4 mm. deep. Oil pump operates 1 1/5 motor speed. The reduction gear shaft radial and thrust ball bearings are oiled by the oil which is forced through the reduction gears. This oil also lubricates the ball bearings on the front end of the crank shaft (reduction gear end). The cam shaft bearings, cams and tappets are oiled by oil coming through the hollow camshaft which is under pressure.

Pistons, piston pins and rings are oiled by spray thrown off the crank shaft. The crank pins are oiled by pressure through three



A Hispano-Suiza undergoing block test in France

holes in each pin; 5 mm. center hole and a 4 mm. hole on either side of the center. See also size of the holes on the crank thrust, crank bearings and pins.

The distributing gears are oiled by the oil returning from the cam shaft housing to the under pan through the vertical shaft housing.

Oil Supply Tanks

If a tank is placed immediately underneath the motor the oil flows from the crank case into the tank through a 58 x 60 mm. tube. The suction pipe from the tank to the pump should be 14 x 16 mm. The air pipe from the crank case pipe should be 8 x 10 mm.

If the tank is in the top of the plane, the pipe from the drain plug is 20 x 22 mm.; the pipe from tank to pump to oiling points is under 5 kg. pressure and should be 14 x 16 mm.

Ignition

Ignition is provided by two spark plugs per cylinder set to fire synchronously. The current is supplied and distributed by two independent high tension magnetos which are cross-wired to the spark plugs, so that in the event that one unit is put out of operation, the motor will continue to fire on all eight cylinders.

The firing order is given in the diagram Fig. 5.

A hand starting magneto is provided to supply current when starting the motors. The current from this magneto is carried to the high tension distributors on the main operating magnetos and thence to the spark plugs.

Starting

Starting the motor is usually accomplished by swinging the propeller, but in certain cases, a reduction gear hand start is provided which engages the crankshaft at the end opposite the propeller.

Table 6 is a longitudinal section for the 200 and 220 H.P. types of motor, clearly illustrating the hand starting reduction gear and the propeller reduction gear.

Table 3 gives the principal characteristics of the reduction gears used in the 200 and 220 H.P. types.

Table 4 gives the H.P. weight, fuel and oil consumption and compression ratios used in the various types of motors.

The Cooling System

The motor is provided with a single centrifugal water pump having a single inlet and two discharge pipes. The water is led into the bottom of the aluminum jackets and out of the top, in contrast with the German method of pumping water through the top of the jackets only.

The centrifugal water pump has an inlet of 35 mm. in diameter and two discharges of 25 mm. each. Water enters the cylinder blocks at the bottom in the front end and discharges from the rear end at the top. The inlet and outlet holes of the jacket are both 28 mm. in diameter. The water space between the cylinders in the center is 12 mm. The radiator usually has a capacity of 40 L. The pump speed is 1 1/5 times motor speed, and the discharge is about 100 litres (26.5 Gal.) per minute at 1400 R.P.M.

When mounted in a plane, this motor is equipped with a thermostat to govern water temperatures; inlet temperature of 50 degrees centigrade; outlet 65 degrees centigrade; maximum permissible temperature 85 degrees centigrade.

Carburetors

Both Claudel and Zenith carburetors are fitted to Hispano motors, in every case comprising a single hermetically sealed float chamber and two independent mixing chambers into which are fitted various sized choke tubes and jets following the type and size of motor to which they are adapted.

In order to obtain the best possible motor performance, at each altitude the carburetors are equipped with a manually operated barometric control called the altimeter, by the use of which the mixture can be maintained at the best proportions of air to fuel. The actual function is to vary the pressure reigning in the float chamber and so reduce the effective head on the gasoline nozzle.

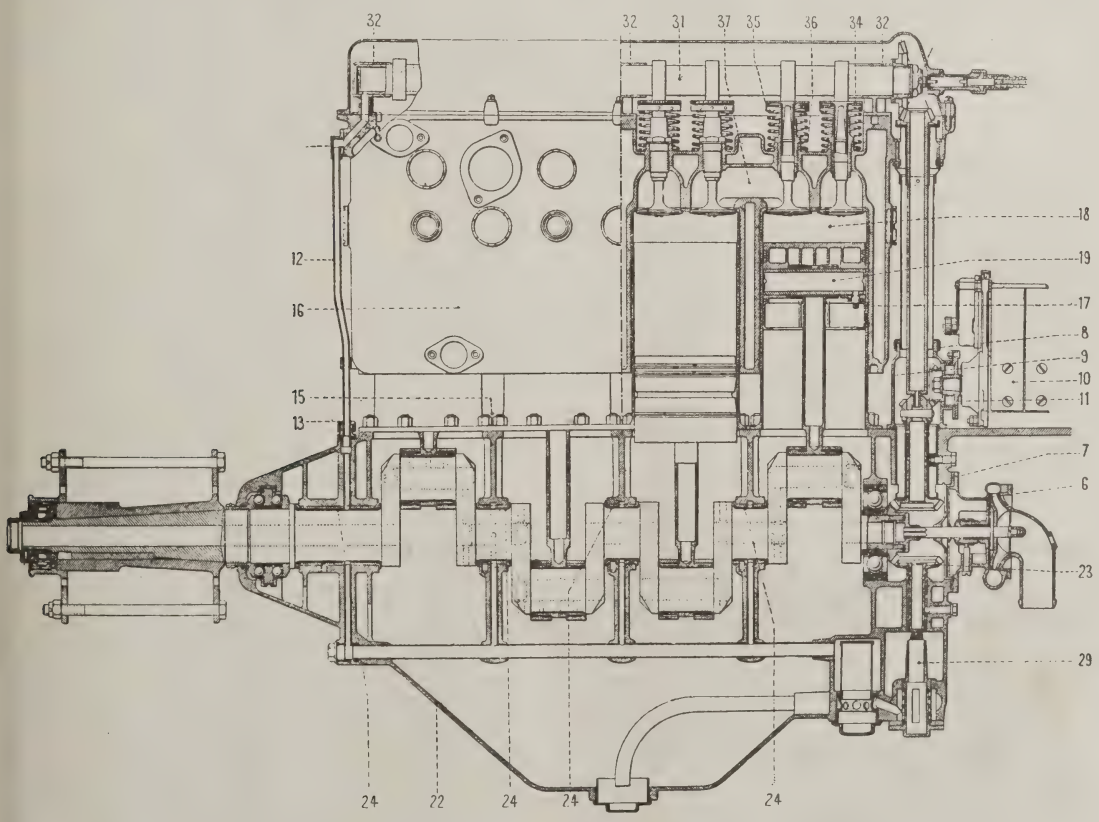


FIG. 10.

REPORT OF THE BUREAU OF AIRCRAFT PRODUCTION

By JOHN D. RYAN, Director

(May 24 to June 30, 1918.)

I.

CREATION OF THE BUREAU OF AIRCRAFT PRODUCTION.

Under date of May 20, 1918, by executive order of the President and by General Order No. 51 of the War Department, the Bureau of Aircraft Production was established.

The bureau was described as "an executive agency" which "shall exercise full, complete, and exclusive jurisdiction and control over the production of aeroplanes, aeroplane engines, and aircraft equipment for the use of the Army."

The order provides that such person as shall at the time be chairman of the Aircraft Board shall also be the executive o..cer of the Bureau of Aircraft Production. He is designated as "Director of Aircraft Production," and the order provides that he shall, under the direction of the Secretary of War, have charge of the activities, personnel, and properties of said bureau.

II.

AIRCRAFT BOARD.

From the date of the creation of the Aircraft Board by act of Congress approved October 1, 1917, to May 24, 1918, the Aircraft Board acted in an advisory capacity to the Secretary of the Navy and to the Chief Signal Officer of the Army, with respect to the purchase, production, and manufacture of aircraft, and made recommendations as to contracts and their distribution in connection with the foregoing.

The Navy has continued to function in its relations to the Aircraft Board in substantially the same manner as heretofore.

The board acts as a clearing house for information regarding aviation as between the Army and the Navy. The executive order of May 20, 1918, which gave to the Bureau of Aircraft Production the jurisdiction and control of the production of aeroplanes for the Army, recognizes the existence of the Aircraft Board in designating the chairman of that board as head of the Bureau of Aircraft Production, and neither enlarges nor diminishes the duties and functions of the board.

The Aircraft Board consists of the following:

Civilian members.—John D. Ryan, chairman; R. F. Howe, vice-chairman; and W. C. Potter.

Army Members.—Maj. Gen. W. L. Kenly, Col. E. A. Deeds, and Col. R. L. Montgomery. (Last two temporarily relieved.)

Navy members.—Rear Admiral D. W. Taylor, Capt. N. E. Irwin, and Lieut. Commander A. K. Atkins.

III.

ORGANIZATION OF THE BUREAU OF AIRCRAFT PRODUCTION.

In order to carry out the program and provide the equipment, the bureau is divided into seven main divisions:

(*a*) Executive.
(*b*) Engineering.
(*c*) Production.
(*d*) Spruce Production.
(*e*) Procurement.
(*f*) Finance.
(*g*) Advisory and Consulting.

The Executive Division directs the activities of the bureau.

The Engineering Division is responsible for the design of new models of aeroplanes and engines and all accessory equipment, necessary to meet the military requirements, and when developed to furnish models and drawings to the production department for the producing of quantities called for by the program.

The Production Division is charged with responsibility for the supervision of the production and inspection of all aircraft, including materials and parts therefor, for the investigation and selection of sources of supply, and for the conduct of all relations with contractors, with the exception of the production engineering, the execution of contracts, and matters of financial administration.

The activities of the Production Division are carried on by decentralization through district offices, which are established in various sections of the country where concentrated aircraft production is being carried on. By this means direct contact with the manufacturers is obtained and decisions can be rendered with the least possible delay.

It is of interest to note that aircraft requirements emanate from the Director of Aircraft Production for complete aeroplanes, engines, and accessories, and are set forth in an authorized program furnished by the Office of the Secretary of War, which states that certain types of aeroplanes and aeroplane engines in certain monthly quotas of each type are required, these types having previously been determined largely by the Air Forces overseas.

In connection with production, it is of interest to note what has been accomplished:

Aeroplane engine production.

	Total shipments to May 24	Shipments May 24 to June 30, inclusive	Total to June 30, inclusive
Liberty engines:			
Army type	622	994	1,616
Navy type	482	293	775
Total	1,104	1 287	2,319
Foreign combat engines:			
Gnome	179	30	209
Hispano-Suiza 150-horsepower	1,607	581	2,188
Hispano-Suiza 180-horsepower	.....	6	6
Hispano-Suiza 300-horsepower	2	.....	2
LeRhone 80 horsepower	6	62	68
Total	1,794	679	2,473
Training type:			
Curriss OX5	4,258	1,216	5,474
Hall-Scott A7a	2,053	130	2,183
Lawrence	66	48	114
Total	6,377	1,394	7,771
Grand total engines	9,275	3,360	12,635

The foregoing figures show shipments from the factory.

In addition to this production, a certain percentage of spares have been included in the shipment of each type of engine.

Combat engines, consisting of the Hispano-Suiza 180 horsepower, and the Liberty 12, are in large quantity production, while the Hispano-Suiza, 300 horsepower, and the Liberty 8 are approaching actual production, and the output of each plant is being pushed to the utmost limit, as it is realized that this country is called upon to supply a large percentage of the requirements of the Allies in addition to equipping planes which are produced in this country. Sufficiently extensive tests of these engines have been made to warrant a feeling of assurance that they will be satisfactory in service.

Battle-plane production.

Total battle-planes produced to May 24, 1918..... 148
Total battle-planes produced May 24 to June 30, 1918..... 393

Training planes.

Total training planes produced to May 24, 1918..... 5,091
Total training planes produced May 24 to June 30, 1918..... 523

In addition to this shipment of aeroplanes there is a percentage of approximately 80 per cent parts shipped as spares for battle-planes and approximately 100 per cent as spares for training planes.

In order to show in further brief detail what has been accomplished in developing the manufacturing resources of this country in quantity production, a list is given below showing in part orders now placed and quantities shipped first up to May 25th, second up to June 29, 1918:

Articles or Material	Quantity ordered up to—		Quantity freighted up to—	
	May 25	June 29	May 25	June 29
Service planes:				
Observation and day bombing—				
DeH-4	8,000	8,000	155	529
Bristol fighter	2,000	2,000	11	24
Night bombing—				
Handley Page	[1]500	[1]500	.....	.....
Caproui	500	1,000	.....	.....
Monoplane pursuit SE-5 (Auth)	1,000	1,000	.....	.....
Service Engines:				
U. S.-12 Army type	20,000	20,000	628	1,615
U. S.-12 Navy type	2,500	2,500	482	775
Bugatti	2 000	2,000	.....	.....
Hispano 180-horsepower (Auth)	3,000	[2]3,000	.....	.....
Hispano 300-horsepower	3,000	3,000	2	2
Elementary training planes:				
Jn-4-D	3 700	3 975	2 837	2 972
SJ-1	1,600	1,600	1,600	1,600
Advanced training planes:				
JN4-H training	402	402	402	402
JN-4-HG and JN6-HG-2	427	517	83	321
JN4-HB and JN6-HB	250	254	16	100
JN6-H observation	100	100	.....	.....
JN6-H pursuit	125	125	.....	.....
S-4-B	100	100	100	100
S-4-C	400	400	30	73
Penguin	300	300	36	50
VE-7 (Auth)	1,600	1,600	.....	.....
Engines:				
Elementary training engines—				
OX-5	7 950	7 950	4 340	5,474
A7a	2,250	2,250	2,054	2,178
Hispano 150-horsepower	3,500	3,500	1,685	2,188
Gnome 100-horsepower	242	242	[3]177	[3]209
LeRhone 80-horsepower	2·500	2,500	7	68
Lawrence 28-horsepower	450	450	65	114
Raw materials:				
Mahogany (1,000 feet)	26,409	26,728	2 219	3,257
Walnut (1,000 feet)	3,354	5,093	853	1,123
Spruce (1,000 feet)	107,204	107,204	[4]17,355	[4]26,260
Oak (1,000 feet)	281	281	261	281
Birch (1,000 feet)	632	632	561	633
Cherry (1,000 feet)	.....	676	.....	338
Fir (1,000 feet)	50,234	50 234	[4]5,926	[4]8,346
Linen (1,000 yards)	3,187	3,187	2,548	2,863
Cotton (1,000 yards)	15,934	17,476	1,876	2 948
Cotton tape (1,000 yards)	4 256	6,566	2 096	2 359
Acetate dope (1,000 gallons)	204	410	108	234
Propellers (spares):				
Training	30 988	31 312	14,761	19,948
Combat	4,925	6 925	176	1,373

Articles or material	Quantity ordered up to—		Quantity freighted up to—	
	May 25	June 29	May 25	June 29
Instruments and accessories:[6]				
Air pressure gauges	10,000	10,000	4,889	6,273
Air speed indicators	13,500	13,500	1,789	2,115
Altimeters	33,600	43,600	7,996	10,108
Clocks	15,500	20,500	8,484	10,900
Compasses	12,200	12,200	2,145	4,228
Fire extinguishers	11,100	11,100	6,105	7,827
Gunners' safety belts	5,000	5,000	.....	309
Map cases	2,500	2,500	.....	4
Navigation lights (sets of 3)	.....	5,000	.....	150
Negative lenses	6,500	6,605	.....	1,825
Oil pressure gauges	10,000	10,000	4,965	8,103
Oxygen apparatus	6,000	6,000	88	641
Oxygen helmets	10,000	10,020	.....	16
Oxygen tanks	10,000	10,000	44	9,409
Panels (sets of 2)	.....	7,500	.....	.....
Radiator thermometers	12,500	12,500	6,489	7,831
Standard safety belts	4,025	9,525	3,777	4,688
Tachometers	25,000	25,000	10,191	12,433
Voltage regulators	.....	2,500	.....	.....
300-watt generators	.....	2,500	.....	.....
Machine guns:				
Lewis	39,200	39,200	6,081	10,370
Vickers (ground)	12,000	12,000	7,005	8,245
Vickers (aircraft)	(1)	(1)	8	56
Marlin	38,000	38,000	20,744	22,353
Browning	20,000	20,000	.....	.....
Ordnance accessories:				
Synchronizing devices—				
C. C. interrupter gears	1,250	4,750	604	1,229
C. C. generator	2,500	2,500	.....	.....
Mechanical interrupter gears	635	635	135	160
Gun mounts:				
Single flexible ring	10,000	15,000	6,530	8,435
Gun sights:				
Ring	13,200	13,200	4,523	7,050
Wind vane	10,499	12,999	4,326	6,849
Unit	8,000	8,000	628	1,323
Auxiliary	11,000	11,000	.....	.....
Gun yokes:				
Single Lewis	11,000	11,000	.....	.....
Double Lewis	11,000	11,000	.....	.....
Duplex trigger control	11,000	11,000	.....	.....
Single gun stems	9,202	9,202	4,004	4,653
Unit sight brackets	11,000	11,000	.....	.....
Bombs:				
Incendiary—				
Mark I	112,116	112,116	1	207
Mark II	122,886	122,886	2	8
High capacity drop—				
Mark I	132,000	132,000	.....	70
Mark II	70,000	70,000	102	299
Mark III	220,000	220,000	.....	432
Mark IV	73,733	73,733	.....	.....
Mark V	20,988	20,988	.....	.....
Barlow, heavy	28,000	28,000	12	12
Dummy drop, Mark I	85,000	85,000	8,662	10,008
Bomb accessories:				
Bomb sights—				
Low altitude, Mark I	100	100	100	100
High altitude, Mark I-a	15,000	15,000	135	579
Bomb releases:—				
Mark I	(2)	(2)	(2)	(2)
Mark II	(2)	(2)	(2)	(2)
Mark V	2,420	2,420	1,051	1,051
Mark VIIB (traps only)	100	100	.....	100
Barlow, heavy	250	250	19	182
Flares—				
Wing tip	(2)	112,165	.....	.....
Airplane, Mark I	(2)	50,083	.....	.....
Flare brackets, holders—				
Wing tip	22,000	22,000	.....	.....
Airplane, Mark I	(2)	(2)	.....	.....
Very pistols	22,500	22,500	.....	.....
Photographic equipment:				
Observation cameras	965	965	491	665
Enlarging lanterns	463	463	463	463
Camera guns	709	1,409	347	358
Unit section equipment	97	97	97	97
Cradles	.....	909	.....	175
Hangars:				
Steel, 66 by 100	735	735	36	258
Steel, 66 by 140	234	234	202	234
Steel, 100 by 110	315	315	.....	90
Canvas	2,500	2,500	1,736	2,160
Balloons:				
Kite, type "R"	1,077	1,102	124	180
Balloon essentials:				
Ferrosilicon (tons)	1,320	1,320	810	954
Caustic soda (tons)	942	942	661	713
Hydrogen cylinders	107,800	107,800	63,350	66,000
Cable (feet)	1,120,200	1,143,390	1,007,292	1,119,492
Winches	53	55	21	23
Balloon equipment (units)	87	87	87	87
Balloon equipment	8	8	8	8
Special clothing:				
Pilots and observers—				
Goggles, Nos. 1, 2 and 3	20,669	20,669	16,349	19,349
Soft helmets and caps	13,976	13,976	13,976	13,976
Special clothing—Continued				
Pilots and observers—Continued				
Hood, French type	13,000	13,000	3,003	9,003
Chin guards, No. 4	7,476	7,476	7,476	7,476
Sweaters, No. 5	10,576	10,576	8,364	9,894
Winter flying suits	13,012	13,012	8,735	10,255
Summer flying suits	1,000	1,000	1,000	1,000
Moccasins, No. 8	16,500	16,500	9,757	14,981
Gauntlets, No. 9	4,603	4,603	1,600	4,588
Gauntlets, No. 10	4,603	4,612	2,200	4,612
Aviator coats	12,327	12,255	12,255	12,255
Face masks	3,003	3,003	3,003	3,003
Antisinking aviator coats	.....	825	.....	771
Knitted scarfs	12,000	13,000	2,000	6,000
Hard helmets	6,600	6,600	4,500	6,600
Chauffeurs and motorcyclists—				
Goggles, No. 21	16,286	16,286	16,286	16,286
Soft helmets and caps	19,334	19,334	19,334	19,334
Trousers, No. 29	19,286	19,286	16,286	19,286
Gauntlets	50,000	50,000	50,000	50,000
Coats, No. 28	19,286	19,286	16,286	19,286
Flying students—				
Goggles, Nos. 1 and 2	8,195	8,195	5,593	8,195
Hard helmets, Nos. 17 and 18	6,540	6,540	4,040	6,540
Sweaters, No. 5	5,700	5,700	1,500	2,700
Summer flying suits	4,440	6,440	2,190	4,088
Aviator coats	4,743	4,743	4,743	4,743
Construction squadrons—				
Boots, knee	5,025	5,025	3,750	5,025
Boots, hip	5,525	5,525	4,250	5,525
Coats, oil skin	6,750	6,750	6,750	6,750
Trousers	6,750	6,750	6,750	6,750
Hats	6,750	6,750	6,750	6,750
Balloon companies—				
Soft helmets	1,152	1,152	1,152	1,152
Sweaters	1,152	1,152	1,152	1,152
Winter flying suits	1,376	1,376	224	224
Moccasins	1,376	1,376	224	1,376
Face masks	1,152	1,152	1,152	1,152
Leather coats	1,376	1,376	224	1,376
Knitted scarfs	1,152	1,152	1,152	1,152
Leather vests	1,152	1,152	.....	.....
Leather breeches	1,152	1,152	.....	.....
Miscellaneous orders—				
Mechanician suits	85,700	85,700	80,103	85,700

(1) Included in above (2) No orders placed

[1]Program is for 1,000.
[2]1,000 ordered, 2,000 additional authorized but not ordered.
[3]Includes 46 from the Navy.
[4]Balloon fabric and airplane fabric.
[5]These figures taken from inspection returns.
[6]Does not include quantities shipped to allies.

Some idea may be gained from this list of the task of developing and getting into production the various products required by the Air Service, most of them never before having been produced in this country and representing a new art, to develop which both engineers and skilled workmen have to be trained and made proficient.

The manufacturers selected are entitled to the greatest credit for the cooperation and activity they have shown in turning over their existing facilities, and in many cases adding to these facilities in order to meet the requirements.

Recognition is also given to the hearty assistance accorded this bureau by other Government departments.

Special Allied Missions.

A special French Engineering Mission and a special Italian Engineering Mission have been brought to this country and are now engaged in the development of experimental aeroplanes of various types, which will be carefully tested and put into immediate production if satisfactory to the Air Service. The manufacturing facilities of this country are being rapidly developed for the production of complete battle-planes in quantity, and also for the production of finished parts, which will be sent overseas for assembly.

IV.

Spruce Production Division.

The output of spruce on the Western Coast is being rapidly increased, and in order to give an intelligent picture of the methods used in bringing about these results, the following figures on output are of particular interest:

Spruce.

	Feet
Total spruce shipped up to May 24, 1918	56,711,044
Total spruce shipped May 24 to June 30	8,413,542
Grand total spruce shipped	65,124,586

Fir.

Total fir shipped to May 24, 1918	19,216,012
Total fir shipped May 24 to June 30	6,181,737
Grand total fir shipped	25,397,749

Of the total shipments of spruce, 2,530,824 feet were shipped direct to England from the southern district.

Of the total fir shipped, 7,055 feet consisted of wing beams completely finished.

SPRUCE PRODUCTION PERSONNEL.

	On May 24	One June 30
Commissioned personnel	459	538
Enlisted personnel	12,382	17,697
Civilian personnel	71	70
Total	12,912	18,305

SPRUCE PRODUCTION CUT-UP PLANT.

In addition to the activities of the Spruce Production Division in getting spruce through regular lumber camp channels, a cut-up plant has been located on a government reservation at Vancouver, Wash. Work on this cut-up plant was begun December 24, 1917, and completed February 7, 1918.

The inception of the idea of a cut-up plant to supplement the sawmills was due chiefly to the necessity of manufacturing rived cants by those not having saw mills. The cut-up plant is now being used for the manufacture of aeroplane lumber from the entire log.

Machinery of the most modern type has been secured and scientific methods of manufacturing air craft material adopted. Circular head saws are being used in four of the six units of the mill, and band saws in the other two.

The logs and rived cants are shipped to the plant and are handled by the band saws, and the other units take the flitches from the sawmills in the woods. It is estimated that the cut at the mill can be run up to 9,000,000 feet per month.

In the plant the logs are cut to dimensions, which does away with the waste incident to transporting lumber across the country.

DRY KILN.

A dry-kiln plant of the Tidman pattern has been erected adjacent to the cut-up plant. The tremendous amount of material lost through checking in transportation and improper kiln-drying methods has been done away with by the installation of this plant. It is estimated that the saving in freight will pay for the erection of this plant within twelve months.

The plant consists of twenty-four modern kilns, each having a charge capacity of about 30,000 feet. The time of drying depends upon the size and condition of the wood, averaging form 12 to 30 days. The output of the dry-kiln plant averages 40,000 feet daily.

V.

FINANCES.

Total appropriations, obligations, and disbursements as of May 31 and June 30, 1918, for all aviation purposes and not confined to production:

Appropriations.

Increase for aviation, Signal Corps, 1918	$640,000,000.00
Signal Service of the Army, 1917-18, Aeronautics Act June 15, 1917	31,846,067.16
Signal Service of the Army, 1918, Aeronautics Act May 12, 1917	10,800,000.00
Total	$682,646,067.16

	To May 31, 1918	June 1 to June 30, 1918	Total to June 30, 1918
OBLIGATIONS			
Airplanes and spare parts	$195,193,636.18	$22,401,604.97	$217,595,241.15
Engines and spare parts	249,188,596.81	4,967,050.40	254,155,647.21
Balloons and accessories	11,071,431.52	274,249.28	11,345,680.80
General equipment	79,048,280.52	2,458,740.82	81,507,021.34
Acquisition of plants	2,595,599.83		2,595,599.83
Experimental and research	2,973,817.20	264,810.99	3,238,628.19
Total	540,071,362.06	30,366,456.46	570,437,818.52
Construction of buildings and flying fields, including purchase and lease of land, United States and abroad	68,956,838.35	2,961,061.64	71,917,899.99
Training, operation, and maintenance	92,358,991.33	17,035,930.40	109,394,921.73
Total	161,315,829.68	19,996,992.04	181,312,821.72
Grand total	701,387,191.74	50,363,448.50	751,750,640.24
CASH DISBURSEMENTS			
Airplanes and spare parts	76,257,253.08	7,464,198.94	83,721,452.02
Engines and spare parts	69,520,425.62	8,169,015.43	77,689,441.05
Balloon and accessories	1,718,082.71	422,397.47	2,140,480.18
General equipment	35,498,567.20	6,718,528.52	42,217,095.72
Acquisition of plants	1,036,952.54		1,036,952.54
Experimental and research	1,261,094.24	353,378.78	1,614,473.02
Total	185,292,375.39	23,127,519.14	208,419,894.53
Construction of buildings and flying fields, including purchase and lease of land, United States and abroad	57,642,578.62	4,666,352.26	62,308,930.88
Training, operation, and maintenance	82,335,163.18	20,254,400.05	102,589,563.23
Total	139,977,741.80	24,920,752.31	164,898,494.11
Grand total	325,270,117.19	48,048,271.45	373,318,388.64

It is of particular interest to note that there has been disbursed in cash up to June 30 a total of $208,419,894, covered by Air Service material, and a total of $164,898,494 for buildings, flying fields, training, and maintenance. Of this amount there have been cash disbursements of approximately $1,000,000 for experimental work on engines and planes at the McCook Experimental Field, Dayton, Ohio, and a cash disbursement of approximately $350,000 up to June 30 for special gas at the Fort Worth, Tex., Experimental Plant. In addition to this, there has been a total expenditure of approximately $200,000 in completing the development of the present battle planes so as to take advantage of American manufacturing methods and quantity production.

VI.

PERSONNEL.

One of the most difficult problems which continually faces the director of this bureau is the securing of the proper personnel to carry on the activities of this very specialized industry, about which so little was known in this country at the time war was declared. With the other activities of the Government, the problem grows more serious each day.

In order to convey an idea of what this problem is, a detailed set of statistics is given showing the enlisted, commissioned, and civilian personnel—first, in Washington, and, second, in the district offices or plants where aircraft is being produced.

Personnel in Washington (excluding Spruce Production Division).

RANK OR STATUS	May 24, 1918 Men	May 24, 1918 Women	June 30, 1918 Men	June 30, 1918 Women
COMMISSIONED				
Colonels	1		2	
Lieutenant colonels	4		5	
Majors	16		18	
Captains	66		73	
First lieutenants	111		101	
Second lieutenants	116		120	
Total commissioned	314		319	
CIVILIAN				
Executives	21		24	
Volunteers	9		8	
Production experts	238		187	62
A. M. engineers	74		76	
Inspectors, A. and A. E.	97		86	
Expert cost accountants	14		18	
Stenographers	82	248	51	300
Typists	45	135	48	141
Clerks	133	270	144	290
Catalogue and index clerks		55		62
Laborers	30		31	
Messengers	117	59	150	23
Watchmen	61		56	
Charwomen		68		69
Telephone operators		19		20
Elevator operators	6		6	
Miscellaneous	107	7	140	7
Total civilians	1,034	861	1,025	974
Combined totals	1,895		1,999	
Grand total	2,209		2,318	

NOTE:—No master signal electricians, sergeants, corporals or privates were assigned.

Personnel outside of Washington (excluding Spruce Production Division).

RANK OR STATUS	May 24 1918	June 29 1918
COMMISSIONED		
Colonels	1	1
Lieutenant colonels	4	1
Majors	11	6
Captains	65	29
First lieutenants	149	127
Second lieutenants	125	130
Total commissioned	355	294
CIVILIAN		
Executives	1	
Volunteers		
Production experts	124	128
A. M. engineers	97	154
Inspectors, A. and A. E.	2,260	2,367
Expert cost accountants	57	84
Stenographers	114	130
Typists	4	6
Clerks	133	133
Catalogue and index clerks		
Laborers	1	2
Messengers	35	34
Watchmen	1	
Charwomen		
Telephone operators	7	8
Elevator operators		
Miscellaneous	78	130
Total, civilians	2,912	3,176
Grand total	3,267	3,470

NOTE:—Prior to Aug. 1, 1918, all enlisted men were of the Division of Military Aeronautics detailed for special duty in the bureau. They comprised master signal electricians; sergeants, first class; sergeants; chauffeurs, first class; chauffeurs; corporals; cooks; privates, first class; privates.



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Air Service Headquarters, Fayetteville, N. C.
Note 3—Report to Air Service, Detroit, Mich., to the officer in charge.
Note 4—Report to Honolulu, T. H., to the Hawaiian Dept. for duty with the 6th Aero Squadron.
Note 5—Report to Aberdeen, Md., to Commanding Officer of the 271st Aero Squadron.
Note 6—Report to Chief of Tech. Section Dayton, Ohio.
Note 7—Report to Dist. Mgr. Aircraft Prod., Dayton, Ohio.
Note 8—Report to Bureau of Aircraft Prod., Air Building, Dayton, Ohio.
Note 9—Report to Students' Army Training Corps., Boston, Mass.
Note 10—Report to Commerce Building, Houston, Texas.
Note 11—Report to Chamber of Commerce Building, Indianapolis, Ind.
Note 12—Report to Air Training Radio Warehouse, Houston, Texas.
Note 13—Report to Aircraft Acceptance Park, Elizabeth, N. J., and wire DAP.
Note 14—Report to Emerson Field, Camp Jackson, Columbia, S. C.
Note 15—Report to Dist. Mgr. Aircraft Finance, 360 Madison Ave., N. Y. C.

Special Orders Nos. 270 to 279 Inc.

Mc

McClelland, Harold M. ..... LDT
McAuliffe, Roland Joseph ..... SLA; RWT
McCullough, Charles B. ..... HHN
McCabe, Harold Annis ..... SLA; AAD
McMath, Robert R. ..... DMA
McDanel, Wilson F. ..... TFT
McCaffrey, Harold W. ..... AGC
McLaughlin, John E. ..... TFT
MacRae, Nelson ..... DMA
McGranahan, Joseph Francis ..... SLA; EOT
McCue, John B. ..... CAF
McPike, George V. ..... ELA
MacMichael, John H., Jr. ..... TFT
McCarron, Henry A. ..... CAF
McLaughlin, William Patrick, Jr. ..... ABC
McGregor, Kenneth C. ..... CFT
McNulty, William Gerard ..... FLA
McFarland, Brigham Wheeler ..... RWT
McCabe, George M. ..... EOT
McGinty, Leonard G. ..... KST
McAleenan, Arthur ..... AGC
McCarthy, Carl Daniel ..... CJW

N

Norris, George L. ..... DAP
Newbold, Edwin E. ..... AGC
Netcher, Charles ..... CGC
Naughton, Thomas J. ..... DMA
Newbury, Frank J. ..... EOT
Neighbors, Sidney ..... Note 13
Norton, Dudley S. ..... Note 6

O

Olmstead, Robert S. ..... DMA
O'Neil, Arthur Jeremiah ..... SLA; EOT
Otto, Thomas Osgood ..... Note 11
Owens, Leo E. ..... HHN
Overlees, Milor Haskell ..... SLA; KST
O'Donnell, William M. ..... FLA
Olson, Norman O. ..... LDT
O'Brien, Edward Thomas ..... RSD
Owecy, Walter Bradley ..... SLA; ELA
Olds, James H. S. ..... HHN
O'Connor, James E. ..... RSD
Oberrender, Graaf R. ..... BST
O'Connell, Jack J. ..... TFT

P

Peterson, David McK. ..... CAF
Porter, H. E. ..... CAP
Prior, Roger W. ..... MIT
Palmer, Charles A. ..... RSD
Prentiss, Paul H. ..... CAF
Pennefather, James S. ..... Note 15
Pickett, Roy W. ..... CGC
Pfau, George H. ..... DMA
Palmer, Sumner C., Jr. ..... HHN
Penfield, Charles C. ..... KST
Pettle, Vincent F. ..... AGC
Pratt, Clifford V. ..... ABC
Parish, Cheaney L. ..... Note 14
Parrish, Isaac N. ..... KST
Parmelee, Charles R. ..... LDT
Panzer, Carl H. ..... AGC
Pierce, Hugh M. ..... PFO
Pawson, James M. ..... TFT
Phinney, Burton V. ..... TFT
Pillsbury, William G. ..... TFT
Prince, Earl P. ..... TFT
Powers, Myron ..... SLA; TMA
Plummer, David Clarence, Jr. ..... TMA

Patterson, Owen H. ....BST
Peterson, Elrey G. E. ....CJW
Palmer, Milwood J. ....FRF
Phillips, Wendell ....TFT
Peace, Harley M. ....RWT
Pinneo, Ormond Louis ....SLA; SAG
Percy, Le Roy P. ....ELA
Poole, Albion W. ....LDT

R

Riedal, George D. ....DMA
Reed, Harold B. ....ABC
Reed, Paul S. ....LHV
Russell, Clinton W. ....KST
Replogle, Ferel O. ....DAP
Richardson, Elmer C. ....RWT
Robie, Frederick ....TFT
Robinson, Gwynn ....AMV
Ramsey, John R. ....EOT
Rollins, Joseph R. ....DMA
Reel, Herbert W. ....UTA
Ray, Martin H. ....DMA
Roberts, George Downing ....SLA; MAC
Robb, Louis ....KST
Ryan, Asa W. ....RSD
Rayburn, Allan B. ....LDT
Rady, William J. ....AGC
Rogers, Harry S. ....RWT
Ruby, Orville W. ....RSD
Rixford, Halsey L. ....LHV
Reardon, Charles S. ....ELA
Rice, Samuel W. ....BST
Rose, Elmer J. ....HHN
Riley, William Edward ....ABC
Robinson, Adrian A. ....LDT
Rieder, Louis C. ....SLA
Randall, Norman L. ....AGC
Riherd, Maurice B. ....RSD
Ramsdell, Glenn L. ....LDT
Reid, James D. ....PWM
Rowe, Maurice B., Jr. ....TFT
Roe, James A., Jr. ....GLC
Rooney, Francis L. ....PFO
Robie, Frederick ....TFT
Richards, Harrison H. C. ....HHN
Reinhard, Henry A. ....CGC
Reid, William H. E. ....TFT
Reynolds, George Edwin ....TMA
Rogers, Gardiner M. ....UTA
Rutledge, Irwin B. ....TFT
Rothstein, Arthur ....TFT
Rinker, Harry M. ....GLC
Rieder, Louis C. ....TFT
Roberts, Hamilton H. ....CGC
Reimann, Benjamin C. ....AGC
Richard, William E. ....LDT
Russell, Arthur C. ....ELA
Richman, G. Raymond ....PFO
Rankin, John W. ....KST
Riley, William Edward ....ABC
Regan, Paul T. ....PFO
Riley, Howard W. ....PWM
Reddy, Phillip J. ....KST

S

Smith, Clarence A. ....DMA
Scully, William Augustine ....DAP
Stevenson, Arthur William ....HHN
Sanders, Lewis R. ....LHV
Schultz, Lloyd G. ....RSD
Schank, Harry E. ....AGC
Spiner, Louis H. ....FRF
Stormes, Herbert A. ....LHV
Simon, Gerald H. ....CGC
Smith, Harold Worden ....SLA; CWT
Schenk, Lawrence ....DMA
Swope, Philip Williams ....SLA; KST
Seitz, George H. ....AGC
Sholts, Forrest H. ....EOT
Sparrow, Carroll M. ....DAP
Smith, Fred Lester ....KST
Smith, Carl M. ....MIT
Simons, John W., Jr. ....PMT; DMA; Note 1
Shellstrom, F. C. ....FRF
Spink, Ernest William ....SLA; PMT
Scanlan, Francis H. ....RSD
Swiler, Carlton P. ....PWM
Schenck, Ralph Eugene ....AGC
Sidenberg, George Monroe ....SLA; KST
Smedley, Harry Simms ....SLA; KST
Simon, Harry Edward ....SLA; SAG
Shuman, William Darlington Mullin ....SLA
Showalter, Roy R. ....CGC
Swathern, Fred A. ....KST
Steele, James McKinley ....RSD
Steele, Dudley M. ....CAP
Stollenwerck, Edward Carroll ....WFO
Schemerhorn, Maurice T. ....LHV
Sherwood, Horace M. ....TMA
Shaw, Burton Alfred ....CFT
Sullivan, Matthew M. ....KST
Schoaf, Ralph F. ....HHN
Shadow, Willis A. ....PFO
Shangraw, Clayton C. ....SRC
Sampson, Edward W. ....UTA
Smith, Franklin ....RSD

T

Tucker, Morris Langdon ....SLA; PWM
Taylor, Wilberforce ....SLA; SAG
Tracy, Shelley E. ....CRI
Tower, Roderick ....DMA
Tobelman, Gustave Henry ....SLA; KST
Teague, Earl A. ....LHV
True, Leland G. ....AGC
Taylor, William A. ....DMA
Thomas, Hayward C. ....KST
Towers, Edward J. ....CJW
Thompson, Alexander C., Jr. ....CGC
Thompson, Alexander Raymond ....SLA; CFT
Thompson, Paul E. ....BFT



Cadet J. W. Warshauer, a New Yorker, who joined the Canadian Air Force when recruiting for the U. S. Air Service was closed

Taylor, Newell E. ....SAG
Townsend, Ervin N. ....TFT
Talbot, Clarence P. ....TFT
Thompson, Wilber S. ....TFT
Throneberg, Otto ....AGC

V

Vaughan, Charles Curry ....SLA; CFT
Volk, Charles F. ....FRF
Vaughan, Raymond E. ....DMA
Valentine, Everett Milton ....SLA; CFT
Vernon, John S. ....LHV
Vickery, Merritt A. ....GLC
Valentine, Louis A. ....TFT

W

Waldo, Herbert S. ....AGC
Wiles, Richard E. ....RSD
Wells, Frank W. ....FRF
Whiting, Frank S. ....E T
Wasson, Clarence Jackson ....SLA; KST
Waples, Glenn Cecil ....SLA; KST
Williams, Philip ....SLA; KST
Wilson, Floyd Charles ....SLA; KST
Wheaton, Sidney Levi ....SLA; EOT
Woodward, Mark R. ....FRF
Wheeler, Harry C. ....RSD
Walburg, Harry E. ....AGC
Walter, Frank H. ....CJW
Wright, Ray E. ....CJW
Wright, Frank W. ....RSD
Worthington, James R. ....FRF
Walsh, Raycroft ....MJA
Wood, Edward H. ....FRF
Waterhouse, Frederick B. ....RSD
Worsham, George Atkinson ....SLA; EOT
Webster, David L. ....LHV; DAP; Note 1
Williams, Charles H. ....UTA
Wiles, Richard E. ....DAP
Welty, James A. ....AGC
West, Conrad R. ....AGC
Wieman, Henry K. ....CJW
Walker, Kenneth N. ....BST
West, Stewart N. ....BST
Williams, Herbert Edward ....SLA; EOT
White, Charles D. ....ELA
Wright, George O. ....BST
Woolen, Clyde L. ....RSD
Winslow, Julian E. ....DAF
Warner, James William, Jr. ....SLA; KST
Williams, Victor Elza ....SLA; KST
Williamson, Joseph R. ....CJW
Werneth, Louis S. ....LHV
Wentworth, Will ....PFO
White, Asmon D. ....PFO
Woods, Clyde ....TFT
Wertenbaecher, Henry E. ....RSD
Wilson, Maurice W. ....TFT
Warner, Brady W. ....DMA
Whiting, Frank R. ....LHV
Wyman, George W. ....KST
Waterman, Sherwood L. ....HHN
Waite, Herbert E. ....FRF
Wright, George Osgood ....CFT
Kranz, Irwin B. ....TFT
Wakefield, Robert B. ....KST

Y

Yount, Barton K. ....DMA
Young, Ernest E. ....PFO
Young, Leslie B. ....PMT
Young, Alsie McKinley ....SBI
Young, Daniel J. ....ELA

Z

Zuckerman, Stanley ....RSD
Zipp, Homer D. ....BST
Zacher, Edwin F. ....RWT
Zimmerman, John E. ....PWM
Zipf, Oscar R. ....AGC

Notes

Note 1—Report to places mentioned in the order named for temporary duty.

Note 2—Report to Dist. Mgr. of Aircraft Finance, Dayton, Ohio, and by wire to DAP, Washington.

Note 3—Report to Dist. Mgr. Aircraft Production, Dayton, Ohio, and wire DAP, Washington.

Note 4—Report to Aberdeen, Md., to commanding officer 271st Aero Squadron.

Note 5—Report to Detroit, Mich., to commanding officer Aircraft Production.

Note 6—Report to Canal Zone, Panama, France Field, Coco Walk.

Note 7—Report to Dayton, Ohio, to Chief of the Areoplane Eng. Dept. and wire DAP, Washington.

Note 8—Report to Middletown, Pa., and report to commanding officer officer.

Note 9—Report to Syracuse, N. Y., to the H. H. Franklin Company as plant property officer and wire DAP, Washington.

Note 10—Report to Goodman Field, Stithton, Ky., for duty.

Special Orders Nos. 280 to 288, Inclusive

A

Allen, Edmund T. ....NOTE; 6
Anderson, Edward M. ....CWT
Adams, Harold V. ....PMT
Aney, Melvil C. ....HHN
Alley,, Gerard Francis ....SLA; BFT
Allen, Truman W. ....HHN
Ainsworth, Frank W. ....ELA
Almy, John Hull ....ABC
Anderson, Milton S. ....EOT
Aikin, Thomas B. ....CAF
Allen, Thomas B. ....PMT
Abbott, Henry F. ....HHN
Alvey, Paul ....HHN
Austin, Joseph Hubert ....SLA; CRI
Alexander, James Franklin ....DAP
Abbott, Leo James ....EOT
Anderson, Charles ....SLA; MAC
Amundson, George ....SLA; MAC
Anglin, Charles H. ....DMA

B

Buedinger, William Anton ....SLA; CFT
Balkema, Bert B. ....DAP
Blake, Wilton McKay ....TFT
Beck, Edward S. ....PFO
Binion, Clay ....SLA
Burgess, George H. ....EOT
Brelin, Hilding Gustav ....SLA; MAT
Baldwin, Robert C. ....DMA
Burmeister, John Carl ....SLA; RWT
Blouke, Pierre ....EOT
Barry, Lawrence Elmer ....SLA; SBI
Bufkin, Wesley F. ....PMT
Bigelow, James L. ....HHN
Beckman, Fred Herman ....SLA; BFT
Butterworth, Russell I. ....HHN
Battles, Winthrop H. ....HHN
Barker, John De Forrest ....HHN
Blevins, B. B. ....TMA
Baer, William Sidney ....EOT
Bishop, Edward P. ....CAF
Barker, Stephen R. ....CAF
Blair, Winfrey Dyer ....EOT
Bradley, Walter Thomas ....SLA; EOT
Bentley, Frank H. ....HHN
Butler, William E. ....HHN
Barr, Eugene O. ....HHN
Bettainier, Leo Claudy ....SLA; MAT
Brown, Raymond J. ....HHN
Bruner, William D. ....TFT
Black, Charles N. ....LDT
Brown, Sidney F. ....CFT
Boucher, Clarence K. ....HHN
Burns, John R. ....HHN
Bufkin, Wesley F. ....PMT
Bacon, Guy Clarence ....SBI
Bishop Edward P. ....CAF
Barker, Stephen R. ....CAF
Renton, James Thomas ....SLA; MAT
Blackburn, Jack ....HHN
Bigelow, Joseph Smith ....FOB
Boyd, James Francis ....RWT
Budinger, William Anton ....RWT
Burnight, Ernest R. ....DMA
Brooks, Frederick H. ....DMA
Blanchard, Leslie D. ....EOT
Bragg, Caleb S. ....NOTE; 7
Baldwil, Ernest Robert ....Note; 5
Banks, Frank ....NOTE; 7
Brock, Henry I. ....DMA
Boynton, Willard Henry ....SLA; SBI
Barlow, Leonard Maas ....SLA; BFT
Barnes, Robert Haywood ....SLA; KST
Bird, Lee Wilson ....SLA; CFT

(*Continued from page 776*)

Report of Personnel Department, Bureau of Aircraft Production, Washington (excluding Spruce Production Division), as of June 30, 1918.

RANK OR STATUS	Executive	Engineering	Production	Procurement	Finance	Advisory	Spruce	Total
COMMISSIONED								
Colonels	2							2
Lieutenant colonels	2	1	1		1			5
Majors	1	1	11	2	2	1		18
Captains	9	5	36	11	10	1	1	73
First lieutenants	17	5	44	14	21			101
Second lieutenants	17	9	46	21	27			120
Total commissioned	48	21	138	48	61	2	1	319
CIVILIAN								
Executives	3	4	5	9	2	1		24
Volunteers	2		1	4		1		8
Production experts	35	45	66	53	48	2		249
A. M. engineers		50	23	3				76
Inspectors, A. and A. E.	2	10	74					86
Expert cost accountants			1	2	15			18
Stenographers	78	10	98	116	47	2		351
Typists	52	4	44	49	40			189
Clerks	75	18	101	98	142			434
Catalogue and index clerks	21	1	19	13	8			62
Laborers	29	2						31
Messengers	75	10	31	43	13	1		173
Watchmen	56							56
Charwomen	68	1						69
Telephone operators	20							20
Elevator operators	6							6
Miscellaneous	60	24	26	10	27			147
Total civilians	582	179	489	400	342	7		1,999
Grand total	630	200	627	448	403	9	1	2,318

NOTE.—No enlisted men assigned.

These figures show an increase in personnel from May 24 to June 30 of approximately 24 per cent.

VII.

SPECIAL MISSIONS.

In order to carry out a thorough study of European production of aeroplanes, engines, and accessories, a special mission was sent overseas in June, 1918. This mission consisted of experienced experts from the United States on engines, planes, electrical equipment, contracts, instruments, and accessory apparatus.

The great distance from the front makes it a vital necessity to have representatives on the ground who have had experience with actual production facilities of the United States and are able to convey to the Service in France the limitations of what can be accomplished in the way of improvements and changes and at the same time keep the stream of production continually flowing. The lack of such experts in this new art of aeroplane construction and operation has made it exceedingly difficult to use this means of communication in the past, as the few men with experience have had to be kept in the United States in order to train the men necessary to develop the production required.

The necessity for continued liaison service between France and this country increases daily, but with the rapid training of the men responsible for the direction of the various departments this situation should be materially improved.

The bureau has also started the practice of sending experts in production and inspection from the United States to study methods used by the allies and take advantage of their four years' experience.

An invitation on the part of the allies has been given to the manufacturing plants of the United States to send their officers and plant managers to Europe to study European methods and adopt from their practice what will be of advantage to supplement American methods.

W. C. POTTER,

Acting Director of Aircraft Production.

Bowmon, George Orville ..... SLA; CFT
Briggs, Charles Ernest ..... SLA; CFT
Billings, Benjamin Franklin ..... SLA; MAT
Bierhardt, John Seymour ..... SLA; EOT

C

Crawford, Frank H. ..... HHN
Corbett, Thomas C. ..... HHN
Cumming, Thomas William ..... SLA; SAG
Crawford, Harry Lee ..... SLA; EOT
Chapman, Amos Blackburn ..... SLA; MAT
Collins, Robert Benton ..... SLA; MAT
Christensen, Ezra A. ..... RWT
Cleary, Maurice G. ..... HHN
Caldwell, Robert M. ..... GLC
Cushman, Robert C. ..... RWT
Clarke, Alexander Vinton ..... SLA; AAD
Clifton, Edgar T. ..... CAF
Crombie, John Newell ..... SLA; EOT
Chamberlin, Clarence D. ..... PWM
Chandler, Harry A. ..... DAF
Cobb, John Devine ..... SLA; EOT
Clancy, Edwin M. ..... PFO
Cain, Howard B. ..... HHN
Callender, Leonard ..... KST
Cobb, James F., Jr. ..... HHN
Carey, Harry M. ..... SLA; BFT
Cochrans, William R. ..... KST
Cowie, Franklin G. ..... RWT
Conrad, Franklin E. ..... KST
Coates, William T. ..... HHN
Chandler, George D. ..... EOT
Coe, Alfred L. ..... TFT
Clark, Harold L. ..... HHN
Craig, Howard A. ..... TMA
Clark, Wright ..... EOT
Clark, Richard H. ..... RWT
Corkville, John D. ..... TMA
Cottrell, George W. ..... TFT
Charlton, John P. ..... LDT
Cushman, Robert G. ..... RWT
Cattermole, Edward L. ..... TFT
Connell, Samuel M. ..... HHN

D

Dunham, Carroll ..... CPA
Davis, Calvin E. ..... SLA
Dreby, Ernest E. ..... PWM
Daggett, George William ..... SLA; PMT
Dean, Edward E. ..... DMA
Davis, William Bardsley ..... SLA; MAT
De Armond, George W. ..... LTC
Dean, Floyd Myrl ..... SLA; MAT
Davidson, Frank G. ..... HHN
Decker, Kenneth ..... HHN
Davies, Ward J. ..... CFT
Doyle, James Archie ..... SLA; MAT
Davis, Paul J. ..... TFT
Dudensing, Frank Valentine ..... SLA; PMT
Dougherty, Virgil Frank ..... SLA; BFT
Donovan, Lawrence J. ..... EOT

E

Evans, Charles R. ..... EOT
Eller, Alfred ..... SLA; MAT
Everett, Edward Arthur ..... SBI
Edwards, Idwal H. ..... TMA

F

Foster, Robert S. ..... KST
Fitzpatrick, Arthur ..... TFT
French, Guy Hatfield ..... SLA; EOT
Faneuf, Leo J. ..... TFT
Frost, John W. ..... HHN
Foltz, Joseph R. ..... TFT



Lieutenant Colonel Thomas Duncan, one of the few junior military aviators in the U. S. Air Service

Freeman, Orville B. ..... LDT
Fordyce, Addison ..... SLA; SBI
Foster, Van Butler ..... SLA; MAT
Foster, Edwin B. ..... CAF
Faust, Clyde Ambrose ..... SLA; BFT
Foster, Ellery N. ..... TFT

G

Graham, James McDowell ..... SLA; MAT
Gray, Bryce ..... KST
Gilmore, William E. ..... DMA
Glidden, Charles J. ..... SAG
Griffith, Ralph E. ..... ELA
Grover, John H. ..... SAG
Gates, Fred Herbert ..... SLA; MAT
Gormley, Richard R. ..... TMA
Gelvin, Clyde Richardson ..... SLA; MAC
Gauntlett, John M. ..... DMA
Gile, Richard D. ..... HHN
Glenn, Ivo Burns ..... SLA; PMT
Gary, Martin Witherspoon ..... SLA; PMT
Gates, Miles Walker ..... SLA; MAT
Griffin, Bulkley Southworth ..... SLA; TMA
Grubb, Walter Frank ..... SLA; EOT
Galvin, Patrick Joseph ..... SLA; RSD
Gregg, Albert Edward ..... SLA; MAT
Grosvenor, Charles Niles, J. ..... PMT
Garrett, Ellis C. ..... HHN
Garrabrant, Arthur Anderson ..... SLA; EOT
Grevenberg, Carlos E. ..... CPA
Goggens, Joseph T. ..... TFT
Gibbons, Francis C. ..... TFT
Goodman, Timothy S. ..... KST
Gustafson, Charles Gustaf ..... SLA; BFT
Green, Alfred M. ..... HHN
Gilchrist, Hugh R. ..... PFO
Gurney, Chester Rainsford ..... PMT
Goodrich, Donald Reuben ..... ELA
Grevenberg, Marien E. ..... CFT
Gay, Strawn Aldrich ..... SLA; CFT
Gaskell, Ellsworth F. ..... HHN

H

Hagenah, Harry Bartell ..... SLA; SAG
Haslup, Charles Le Roy ..... SLA; RWT
Hines, Carter Elliott ..... SLA; SAG
Hassell, Bert Raymond John ..... SLA; CRI
Hurst, Donald Chaffee ..... MAC
Henry, William H. ..... RSD
Hoffman, Edward L. ..... HHN
Hellman, Isaac H. ..... DMA
Howell, George R. ..... DAP
Hooker, Charles J. ..... HHN
Hall, William T. I. ..... HHN
Hammett, Irving Russell ..... RWT
Hiatt, John B. ..... BFT
Hinman, Donald M. ..... HHN
Heberton, Craig ..... RWT
Holmes, Robert Anderson, Jr. ..... SLA; TMA
Hollstein, Arthur Watts ..... KST
Haston, John George ..... SLA; BFT
Hull, Perry A. ..... TFT
Holderman, Lester D. ..... TFT
Hamilton, Stewart A. ..... RWT
Hazeltine, Matthew E. ..... HHN
Hefron, Bernard M. ..... PFO
Hickey, Charles Keon ..... TMA
Hurt, Samuel F. ..... GLC
Hammond, Reginald G. ..... CFT
Hamilton, Edwin Coursault ..... EOT
Hyde, Clarence E. ..... HHN
Huffman, Carl F. ..... DAF

FOREIGN NEWS

Ambassador Page and Wife Fly in Dirigible

Rome.—Captain Guinaraess, of the Brazilian military aviation mission, has arrived and established headquarters here.

Ambassador and Mrs. Page were guests of Captain Guinaraess on board a dirigible December 14th.

Air Traffic Started Between German Cities

London.—Air traffic has been begun between some of the largest German towns, advices reaching here report. The aeroplanes are carrying parcel post matter and passengers. The fare per passenger is 2½ marks a kilometre or about a dollar a mile. The machines can fly at the rate of eighty miles an hour and the journey from Berlin to Munich, for instance, can be accomplished in 4½ hours.

One company is constructing a new, large type of aeroplane, able to carry forty passengers.

Aero Mail in India

The *Times* correspondent, writing from Simla on October 14th, says that the Government of India is considering a proposal to establish an aerial postal service in India.

The Transatlantic Flight

The first entry in Great Britain for the *Daily Mail* Trans-Atlantic prize was lodged with the Royal Aero Club on November 15th by the Whitehead Aircraft Co., Ltd. The machine is described as a Whitehead biplane fitted with four screws, each driven by a 400 h.p. Liberty engine. The machine, which is said to be nearing completion, is of 120 ft. span and an overall length of 65 ft., while the speed is expected to be in the neighborhood of 115 m.p.h. It is proposed to start early next year from Whitehead Park, Feltham, and replenish fuel tanks at Oranmore, Galway. Capt. Arthur Payze, R.A.F., is nominated as the pilot, and he will be accompanied by an assistant pilot, a navigator, and one mechanic.

The London-to-Paris Air Service

If promptitude counts for anything, the prospects for commercial aviation after the war are certainly bright, for scarcely had the armistice been established as an accomplished fact when it was made known that at least one firm is ready to inaugurate an aerial passenger service as soon as conditions permit. Mr. G. Holt Thomas, managing director of the Aircraft Manufacturing Company and various other enterprises, state that arrangements have already been made for a passenger service between Paris and London. As Mr. Holt Thomas points out, the fact the British celestial rights end in mid-Channel will practically preclude all-British companies from establishing international air routes, and for aerial mail routes at any rate the rights of both countries concerned in the enterprise will have to be considered.

With regard to the proposed London-to-Paris passenger service, the arrangements at English end will be in the hands of Aircraft Transport and Travel, Ltd., a company registered by Mr. Holt Thomas, and which is under the same direction as the Aircraft Manufacturing Co., Ltd., and other aviation enterprises in which Mr. Holt Thomas is interested. In France the interests of the company will be looked after by an allied company, the Compagnie Générale Transaérienne, of which M. Henri Deutsche de la Meurthe is President. It is proposed to make the Ritz Hotel, Piccadilly, the starting point at this end, while the French terminus will be the Ritz Hotel, Place Vendôme, Paris. The time-table that has been drawn up, and which, with the machines it is proposed to use, it should in most cases be quite possible to adhere to or even to improve upon, is as follows:

Departure by motor car, Ritz Hotel, London.....	10.00 a. m.
Departure from London aerodrome	10.30 a. m.
Arrival Paris aerodrome	1.00 p.m.
Arrival Ritz Hotel, Paris	1.30 p. m.

The fare has at present been fixed at 15 guineas, which will, it is expected, include an insurance for £1,000 for each passenger.

The first ticket at £15 15s. was purchased on Friday by the Hon. Sir Arthur Stanley, M.P., chairman of the Red Cross Society, while other purchasers of tickets on that day were Mr. E. Manville, chairman, Associated Chambers of Commerce; Mr. Percy Martin, managing director, the Daimler Co.; Mr. Julian Orde, secretary, Royal Automobile Club; Mr. H. J. Irish, Sir John and Lady Shelley Rolls, Lieut. Guy A. Reed, U.S.; Mrs. Robert Rankin (three tickets), the Hon. Kathleen Robson (two), Mrs. Alec Tweedie, Mr. A. E. Nathan, and Mrs. Locke King.

The machines to be used at first will be of a type that was designed for quite a different purpose, *i. e.*, for long-distance raids into Germany, but with very little alteration they will be very suitable for the more peaceful purpose to which they are now being put. Like all the other famous machines produced by the Aircraft Manufacturing Co., they were designed by that firm's distinguished designer, Capt. Geoffrey de Haviland, whose designs have played such an important part in the aerial supremacy of the Allies over Germany. These machines are twin-engined bombers, but not of such a large size as others which have been employed for long-distance bomb raids. They are, however, very fast—somewhere about 130 m.p.h.—so that it may be confidently expected that, except under extraordinarily bad weather conditions, an average speed over the ground of 100 m.p.h. will be maintained.

Night Stops On Islands Proposed for Trans-Oceanic Aeroplanes

Crossing the ocean and continents in aeroplanes not equipped with sleeping facilities is proposed by the "Rivista Del l'Aviazione," an aviation review published in Italy, according to the Italian Bureau of Public Information. The review figures that small, swift aeroplanes, even though they would have to stop for ten hours at night for the sleep of the passengers, could cover more ground in less time than a large aeroplane which would not have to stop because it carried its sleeping accommodations with it.

Practical examples of how long flights could be made are given. The lightest aeroplanes and those of small dimensions have at present a velocity of from 112 to 135 miles an hour. By flying fourteen continuous hours, the review figures that in a single flight, without alighting, it is possible to traverse from 1,550 to 1,900 miles, which is greater than any single stretch of ocean without intervening islands. Many small ocean islands could be converted into dormitories for aeroplanes and their passengers. The hours lost in alighting and stopping on the islands would be made up for by the greater speed made possible by the light weight of the aeroplane.

Aerial flights, the review further observes, even though made less swift because of the nocturnal stops, would still represent a great saving in time when compared with steam and rail trips. The most rapid transatlantic steamer today requires four days to complete the trip from England to the United States. An aeroplane would require, including a nocturnal stop on the Canary Islands, Bermuda or Newfoundland, not more than two days. The crossing between Europe and South America, with nocturnal stops at the Canary Islands, Madeira, Asuncion and Trinidad, would require not more than four days, calculating fourteen hours of flight to ten of rest.

Tests of these proposed flights without sleeping on board will soon be made, according to the review, in flights between Europe and India. These may even be inaugurated before the conclusion of the present war.

The development and perfection of these small planes need not mean the exclusion of the larger ones, of which the Caproni are typical. The review pleads for the development of all types of aeroplanes, large and small. Gianni Caproni, designer of the famous huge Caproni aeroplanes, recently published the designs for two new triplanes with cabins de luxe and accommodations for twenty-four passengers. The review does not question their success, but it would like to see developed simultaneously with them the small, swift aeroplane, which it believes will prove supreme in transportation after the war as it has in warfare.

Italian Veneer-Wood Industry

Veneer-wood, a manufactured wood used especially in aeroplane construction, the Italian Bureau of Public Information states, is now being manufactured on a large scale in Italy, whereas formerly almost the entire amount used in Italy was imported from Austria. With the establishment of many factories in the northern part of Italy and a few in the south the manufacture of veneer-wood may now be called a national industry.

The many uses of this wood for war purposes have resulted in its production on a large scale. Veneer-wood is a composition of three strata of thin wood placed upon one another with the fibres running in opposite directions. This gives to the wood greater resistance in proportion to its weight than any other wood known. The combination produces a strong wood, which is light in weight, is elastic and still keeps its shape. At present it is extensively used in aeroplane and hydroplane construction.

The only factory for veneer-wood in Italy before the war had an output of about 100 square yards a day. At present, with the introduction of modern machinery, the national output has been increased to more than 5,000 square miles daily.

A New Observation Balloon

Italy's success in aviation, according to the Italian Bureau of Public Information, is no longer a subject of discussion; not only the individual records of Italian aviators speak for themselves, but also the daily work of the Italian planes on the Italian or French fronts are hard facts that the world at large concedes. The Caproni, the Fiat, the Ansaldo, and the Pomilio companies are daily producing many aeroplanes, and the Italian aviation has actually a record of speed in production, efficiency and thoroughness. But not only in aviation, but also in aeronautics Italy has come to the front. There is, for instance, a new observation balloon that is now about to be used by all the Allied armies, which is the invention of an Italian army officer, Major Brassoni, of the Italian Army Engineers. The particular merits of this balloon are the extraordinary stability and its powers of suspension. Moreover, a most important factor, there are absolutely no metal parts exposed that might cause any damage by electricity. This allows the observers to stay up even in an electric storm without any more than the average danger of being, for instance, on a tree. The observer's basket communicates with the crew on the ground by means of a wireless telephone. Six months ago this balloon rose to a height of 16,000 feet over London, which in itself was a record for an observation balloon.

Aero-Navigation in Europe

Notwithstanding the cold, matter-of-fact wording of the report of the Italian Permanent Commission for Aeronautics, the fact remains, says the Italian Bureau of Public Information, that a wonderful, almost impossible dream of a near past has been declared not only a possibility, but will be a reality before long. The committee reported "that the plans for the regular aero-navigation between the various capitals of the Allied nations and that of the subsidiary lines across the Mediterranean have been approved."

Pushes Aircraft Surrender

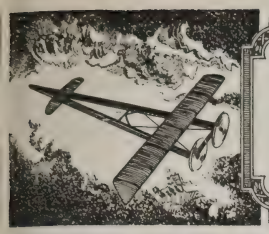
London (British Wireless Service.)—The surrender of the 2,000 German aeroplanes required under the terms of the armistice convention has been proceeding the last week, and it is expected that the full complement of enemy machines will soon be in the Allies' hands.

The taking over, examining, and parking of so vast a fleet of machines has necessarily taken time, as the German armies in their retirement are leaving the planes behind in their evacuated aerodromes. Difficulties and attempted evasions connected with the precise proportion of the types of aircraft to be turned over and the air worthiness of some of the machines surrendered are being adjusted in response to firm representations by Marshal Foch on behalf of the Allies.

Some light is thrown upon what this gigantic surrender of aircraft means to the Germans by the official British figures of air fighting upon the British western front from January 1, 1918, to the date of the armistice. These figures show the number of enemy machines destroyed in aerial combats by the British to have been 3,060, while enemy machines driven down out of control numbered 1,174.

Germany is known to have lost well over 6,000 aeroplanes, destroyed and surrendered, in the present year.

On the other hand, the resources of the Allies are being reinforced by 2,000 German machines of modern type and in good condition.



ELEMENTARY AERONAUTICS and MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

The fuselage is braced with No. 30 Piano Wire drawn up taut by the use of turnbuckles. The sections at the pilot's seat and to the rear are tightened with the bicycle type as illustrated previously while the sections around the engine and wings have regular small size turnbuckles. When fastening the piano wire to the turnbuckle a nipple is used to hold the hook in place, the wire being bent to a small loop and the end slipped through the nipple after which it is bent over, as shown in the sketch at the lower part of the picture. The regular turnbuckles should be no longer than 4". Before bending the wires it would be better to measure the correct distance from one terminal point to the end of the turnbuckles, having the turnbuckle wide open, then making the loop around a jig of some kind. The turnbuckles bracing the sides of the machine should be up near the top of the fuselage to enable one to get at them easily should they loosen and have to be taken up.

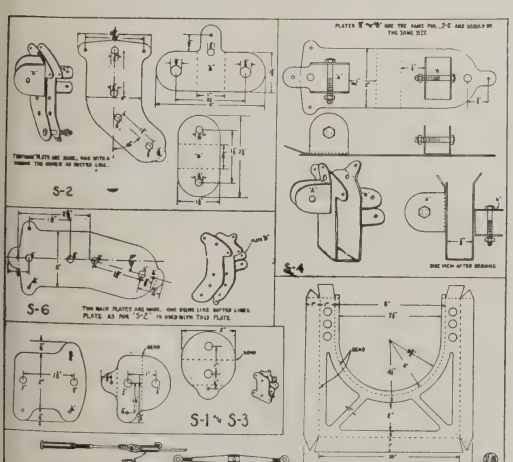
The special fittings S-1, S-2, etc., should be made. These are constructed of sheet steel .10 inch thick. The correct sizes and shapes can be had by consulting the drawings. S-1, and S-3 are for attaching the upper struts in place. The combination consisting of three plates made to the sizes given and then assembled as shown in the sketch. S-2 is the rear landing chassis strut and wing fitting combined. Two plates of the same size and shape and two separate plates, one for the inner bracing strut, the other for the wing fastening and flying wire attachment. When making this combination one should be made left-handed and the other right, that is when making it, have the wing attachment on the right hand side on one fitting and on the left hand side for the other. The bolts for these fittings are ¼" S. A. E. thread and case hardened if possible. S-4 is for the forward wing attachments and you will notice that the landing chassis plate is missing and the wing plate is higher as in the strut fitting inside. This fitting will need a filler block of wood between the two main plates just above the longeron.

S-6 is for the forward landing chassis strut and engine strut. No wing fitting is needed as you will see. When assembling, the plates they should be welded or carefully riveted together.

A nose plate for the front of the machine is shown also with dimensions.

The conrols and landing chassis are next to be considered.

(To be continued)



Details of metal fittings for the Ford motored tractor

The Smallest D H 4

The accompanying photograph shows what is supposed to be the smallest D H 4 battle plane known. This model, although having the general appearance of its big battle plane prototype, is only 9" span and was built by the Model Editor for Mr. Henry Woodhouse as a radiator ornament. The model was used as a sample for castings which are to be made in order to build a quantity of these machines.

The body is made of solid wood, the wheels of turned aluminum, the struts of $^{3}/_{32}$" tubing and the planes, tail, and rudder of tin. The struts, wires, and planes are fastened with solder. The propeller is free to revolve, which it does when the automobile is moving. The fastening for the model consists of a horseshoe-shaped strip of ⅛" x ½" brass, which is clamped around the filler of the radiator by means of a bolt, while at the other end is fastened a ⅛" drill rod threaded and which passed through the body at the gunner's ring after which the nuts are tightened and the model is held rigidly.

Mr. Attilio Di Sabato of the AERIAL AGE staff photographed the model.



A D.H.4. Radiator Ornament

Notice to Readers of This Page

It is our intention to have a contest for construction and flying of models to begin the first of the year. The editor would like to hear from every model builder who is a reader of this page, so that we might line up the names of those who wish to take part in the contest. In fact, it will be well for all model readers, whether flyers or not, to communicate with the editor, so that we might be able to arrange some other kind of a contest for their benefit. Let us hear from you even if it is only a postal card with your name and address on it.

During the war many model flyers who were called to the colors did not have as much time to devote to model flying as they might have had, but now that peace is in the air they will come back and study aviation more seriously than ever.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

"'E Ain't No Bloomin' 'Ero"

You can talk about the infantry, the cavalry, artillery, the tank men, and the rank men, and the rapid firing squads; but the boys who do the fixing, when your darned old "carb's" not mixing, are the greasy old mechanics, and they ask no man for odds.

No medals they'll be getting, no cheers, or public petting, but you'll find them in the front line—when you need them, they'll be there. With a monkey wrench and hammer, midst the battle's roar and clammer, they're the guys that keep the army's eyes, the flyers, in the air.

Oh, his overalls are greasy, but when your engine's wheezy, he's the doctor that can fix it, you can bet your life on that. Tho' he has no gun for shooting, and no one his horn is tooting, he is serving Uncle Sammy with the "bean" beneath his hat.

So Here's to you, "Motor Mech", may you always be on deck; and serving Uncle Sammy, in your own peculiar way. Tho' you get no public petting, it's ten to one in betting, that "Bill" will know you've been there when he has his debt to pay.—Exchange.

Platsburg Officer—Mr. Blank, explain the moving pivot.

The Rookie—A moving pivot pivs; and, having pived, moves on.

The longer we stick around the human hemisphere the more we realize Uncle Jake, who sowed a few oats in his day himself, hit the spike squarely on the bean when he said: "Tomorrow's flight depends a whole lot on your take-offs today.—Plane News.

The New Nursery

Pussy cat, Pussy cat, where have you been?
I've been up in a flying machine.
Pussy cat, Pussy cat, what have you seen?
I saw our aviators drop bombs on Berlin.
—By H. C. Wirth (with apologies to Mother Goose Nursery Rhymes).



(*Continued from page 773*)

Fig. 7 shows the H.P. and fuel consumption of the motor at ground level and at 9000 ft. altitude.

Fig. 8 shows the H.P. and fuel consumption as a function of the decreasing barometric pressures.

Fig. 9 is a timing diagram of the motor giving timing of the valves as a function the angular crank movement.

Fig. 10 Longitudinal Section through the direct type 120 x 130 mm. motor, 150 and 180 H.P.

In addition to the types and sizes here described, there has been developed a larger size of motor which is built in eight and sixteen cylinders capable of giving 300 and 600 H.P. respectively. The design is identically the same as the 120 x 130 mm. motor, excepting that the sizes have been increased to 140 mm. bore and stroke.

Table 3. Hispano-Suiza Motors

Reduction Gears

	No. Teeth	Face	Module	Helical Angle	Motor R.P.M.		Propeller R. P. M.
Pinion & Gear.	21 & 28	60 mm.	5.25	8 deg.	2000	1500	
200 H. P.....	22 & 62	70 mm.	4.5	6 "	2000	700	(Gas Bag Dirigible)
a n d	26 & 39	60 mm.	4	5° 43"	2000	1333	
220 H. P.....	24 & 41	60 mm.	4	5° 43"	2000	1170	
	36 & 48	40 mm.	4.5	6°	2000	1500	Cannon type
300 H. P.....	26 & 44	50	6	5°	2000	1180	

Table 4. Hispano-Suiza Motors

Rated H. P.	Piston Displacement in cu. in.	Wt. in Kilograms	Weight in lbs.	Weight Per 1 H. P.	Cu. in. of Displacement Per 1 H. P.
150	708	190	419	2.77	4.72
180	708	192	422	2.35	3.93
200	708	230	506	2.53	3.54
220	708	230	506	2.3	3.21
300	1165	250	550	1.83	3.88
350	1248	290	638	1.82	3.57
400	1416	475	1045	2.62	3.54

Rated H. P.	Comp. Ratio	Compresion in Kilograms Per Cm.²	Pressure in lbs. Per sq. in.	Fuel consumption Per H. P. Hour in Kilograms Gasoline	Oil
150	4.7	7.5	106	0.231	0.009
180	5.3	8.74	124	0.233	0.012
200	4.7	7.5	106	0.235	0.015
220	5.3	8.74	124		
300	5.3	8.74	124		
350	5.3	8.74	124		
350	4.7	7.5	106		
	5				
	5.65				
	6				

Leonard Wood, Major General U. S. A.

As combat's roar and din subside
And battle's smoke is blown away
We see a figure by our side
Whose life is open as the day.

A patriot and a soldier true
He sensed his country's peril great
Too proud a soul to bow or sue
He spoke his mind to land and State.

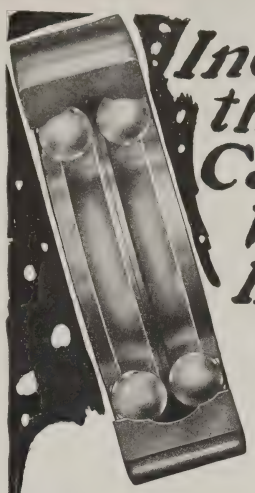
The pigmies that he tried to aid
Misunderstood his nature grand,
And fated him to never fade
From hearts of countrymen and land.

His martial soul was on the Mons
His spirit fought at Thierry's Grove
He stands among his country's sons
Full decorated by their love.

We owe a debt of gratitude
To Leonard Wood, it's hard to pay,
His chance destroyed by party feud
Will come again as bright as day.

For history's unerring eye
Has seen and chronicled the facts
And it will all his foes defy
By simply pointing to his acts.

GEORGE L. UPSHUR.



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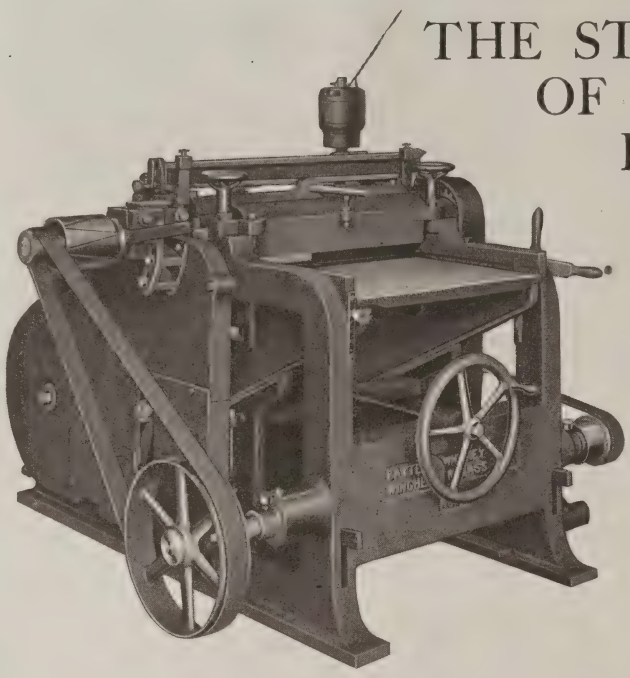
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AERIAL AGE WEEKLY

Vol. 8, No. 16 DECEMBER 30, 1918 10 CENTS A COPY



The "H-16", one of the largest of the United States Navy's flying boats

General Menoher, New Chief of Air Service

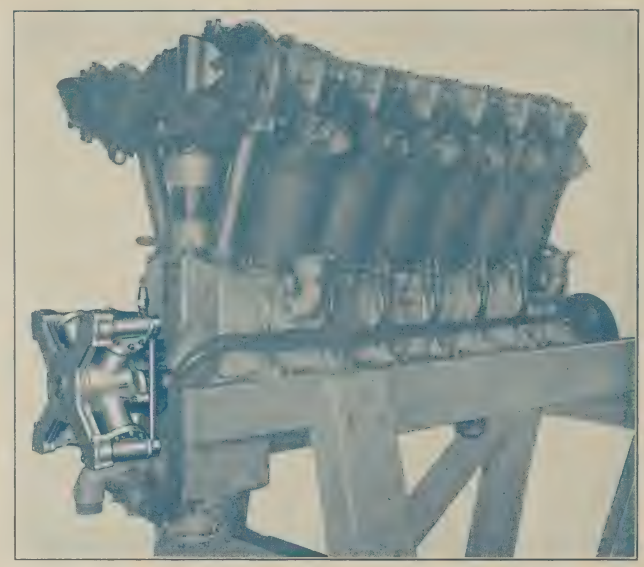
The Hispano-Suiza Engine

IED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
tion: Domestic, $4. Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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Cranks motors up to 500 horsepower.
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It is entirely self-contained without brackets or other gearing, bolting direct to crankcase of engine, and cranking direct to end of crankshaft.



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AERIAL AGE WEEKLY

VOL. VIII DECEMBER 30, 1918 No. 16

TABLE OF CONTENTS

	PAGE
General Menoher, New Chief of Air Service	805
Aero Club to Send Aerial Expedition to Explore Arctic	805
Naval Aviation Report	806
News of the Week	807
Aircraft Trade Review	809
U. S. Aerial Mail	810
Military Aerostatics	811
Hispano-Suiza Engine	812
The Motor Compressor	816
Gallaudet D-4 Seaplane	817
The Hughes Aircraft Report	820
Naval and Military Aeronautics	822
Foreign News	825
Elementary Aeronautics	826
Aeronitis	827

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY
PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
WASHINGTON OFFICE: 619 *Union Trust Bldg.*
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Dec. 30, 1918
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, DECEMBER 30, 1918 NO. 16

GENERAL MENOHER, A NEW CHIEF OF AIR SERVICE

THE appointment of Major-Gen. Charles T. Menoher, who commands the 42d (Rainbow) Division in France, as Director of the Air Service, succeeding John D. Ryan, was announced on December 21 by General March.

Colonel James A. Mars has been named Acting Director of Aircraft Production, succeeding William C. Potter.

General March explained that these two details brought the producing machinery of the aviation service back into the permanent military organization.

General Menoher is now on his way home to take up his new duties. General Menoher's record as division commander during the active fighting led to his assignment as commander of the Sixth Army Corps some time before the signing of the armistice.

Colonel James A. Mars is a Regular Army officer, at present chairman of the demobilization of the Department of Military Aeronautics. He has been in command of a number of Army aviation fields and is known to be a progressive officer.

Assignment of these Regular Army officers to posts in the Air Service previously held by civilians is because, in the forthcoming staff reorganization plans, the Air Service will be treated as an integral part of the existing establishment and not as a separate service.

THE AERO CLUB OF AMERICA TO SEND AERIAL EXPEDITION TO EXPLORE ARCTIC

ONCE more the Aero Club of America shows its progressive leadership, by an undertaking which is considered by leading scientists as the most stupendous ever conceived, as it means nothing less than starting to explore, survey and map 8,000,000 miles of the earth's surface by "Aircraft."

The Board of Governors of the Aero Club of America, of which Rear Admiral Robert E. Peary is a member, has decided to back Capt. Robert A. Bartlett, the famous explorer, in equipping and sending to the Polar regions the most complete expedition ever sent out in the history of the world.

This expedition will have as its aim the stupendous task of exploring and surveying the unknown Polar regions, as well as exploring the depths of the Polar Basin and the upper air of the Arctic regions.

The Board of Governors of the Club decided to back such an expedition after giving considerable study to the subject. A committee has been studying the conditions and the possibilities for the past two years and made a preliminary report to the Club a few days ago, on December 17, urging the Board on that date, the fifteenth anniversary of the first flight, to undertake this stupendous task, which is considered by explorers and scientists as the most complete and ideal expedition ever conceived.

The Committee which studied the conditions and reported to the Board of Governors of the Club consisted of Rear-Admiral Robert E. Peary, discoverer of the North Pole; Alan R. Hawley, Henry A. Wise Wood, Henry Woodhouse, Rear-Admiral Bradley A. Fiske, John Hays Hammond, Jr.; Rear-Admiral William N. Little, U. S. N.; Professor Charles L. Poor, Colonel E. Lester Jones, U. S. A.; Charles Jerome Edwards, Major Cushman A. Rice, U. S. A.; Augustus Post, Major J. C. McCoy.

It is expected that the Expedition will cost about $250,000, which sum will be raised by a committee of prominent members of the Aero Club of America in the near future.

The co-operation of the leading geographical societies and scientific bodies is assured, and the plans are to have this expedition leave the United States in June 1919, to take advantage of the period of warm weather which exists in the Arctic regions for six weeks in the summer.

Further details regarding the project were given out by Mr. Alan R. Hawley, President of the Aero Club of America, today, who said:

"It is most amazing to find that for a period of the year in the Arctic regions the weather is not as cold as it is in New York during the months of October and November, and that the plan to fly across the top of the earth would really be a comparatively easy thing to do.

"There are six weeks of fair weather in July and August, when, even in the Polar regions, it is seldom lower than sixty degrees above zero. The plans are to have a ship go to Etah, about 600 miles from the North Pole, in June, when the ice is sufficiently broken to permit the ship to cross Melville Bay. The ship would carry a large seaplane or land aeroplane for the final flight across the top of the earth and for exploration of the unexplored Polar regions, as well as smaller planes for the scouting flights.

"Immediately upon arrival at Etah, a base would be established, and while waiting for the ice to break up further north to permit the ship to go as far as Cape Columbia, the small seaplanes would fly to Cape Columbia and establish a base there for the large plane, which is to be used for the flight across the top of the world, from Cape Columbia on the American side, over the Pole, to Cape Chelyuskin on the Siberian side, and for exploration over longer distances.

"For the six weeks after the middle of July, when the weather conditions are best for flying in the Polar regions, the large plane as well as the small planes will be put into service and the important work of the expedition will be done.

"Results of inestimable value to the United States and to science will surely be obtained from this expedition. There is no doubt whatever that this expedition can explore, survey and photograph the unexplored parts of the Arctic regions and establish the existence or non-existence of land or lands in that region.

"I feel sure that with Admiral Peary as Chairman of a Committee to co-operate with Capt. Bartlett, this expedition will be the greatest and most useful expedition ever sent to the Arctic regions.

"This expedition besides actually exploring the Polar regions will also explore the upper air and the bottom of the Polar Basin.

"The North Pole has been discovered. A number of hardy explorers have made certain discoveries and established certain scientific facts, but the major part of the work still remains to be done. Both Admiral Peary and Capt. Bartlett

want, I believe, to do a great deal of scientific research in the Polar Basin, of which over 1,000,000 square miles remain unexplored, and they would want to have a laboratory or part of the ship where the flora and fauna from the ocean bottom will be kept until the return of the expedition. Little or no data has been obtained from the bottom of the Polar Basin; no meteorological surveys have been made in the Polar region."

Mr. Henry Woodnouse, a member of the Board of Governors of the Club, who has made an extensive study of the subject of exploration by aeroplane, and who co-operated in organizing the Steffanson Relief Expedition in 1914, and with Admiral Peary, Capt. Bartlett and Capt. Amundsen in preparing to organize the Arctic expeditions of 1916, which were prevented by America's entry in the War, said:

"The plan was first proposed by Admiral Peary over two years ago, as a plan to be carried out by Capt. Bartlett, and the Club has fostered the development of the idea.

"This is a stupendous conception and is to start the use of aeroplanes for the important work of exploration, which, on the face of what the war has taught us, is most necessary. Exploration today is necessary to take stock of the world's natural resources, so that we may know exactly what the natural resources of the human race are. From a national standpoint it is absolutely necessary to explore and map all the land, island possessions and waterways under the control of the United States.

"I recall vividly the tragedy created by our lack of a supply of mica for use in gas masks upon our entry in the war. When some British ships which were carrying mica to the United States were sunk, we faced the tragedy of not having the material with which to make gas masks to save the lives of tens of thousands of American boys. At that time, when we all felt so helpless, I happened to talk to Admiral Peary about the matter, and he told me mica was plentiful in the sub-Arctic regions. Also that other minerals which were in great demand were to be found in the sub-Arctic regions.

"But it was too late, as it would have required months to prepare an expedition, and then it would have taken more months to find out exactly where the mica was to be found.

"The aeroplane makes all exploration easy, and its employment will permit exploring and mapping the unexplored part of the world in a few years, whereas by following the old methods it would take over 200 years.

"One of the fundamental factors necessary for the advance of civilization is the knowledge of the earth, the world which is the Human Race's inhabiting place, and its natural resources.

"There is a physical as well as a spiritual side of civilization, and the physical aspect which greatly influences the spiritual aspect is advanced by scientific progress. Philosophies not based upon a scientific foundation have not stood, and will never stand, the test of time.

"Considering civilization from its physical aspect, we can truly say that the world will never be civilized until we know all there is to be known about this earth of ours, which is the inhabiting place of the Human Race, until we know what it is and what its resources are. This means that considerable exploration and a tremendous lot of mapping will have to be done, and whereas aircraft greatly simplifies exploration and mapping, we find here another important service which the aircraft can render to science and humanity.

Only One-Seventh of Earth's Surface Accurately Mapped

"According to Edward A. Reeves, Map Curator of the Royal Geographical Society, England, only one-seventh of the earth's surface has been accurately mapped, and two-thirds have been mapped only from rough sketches, and the remainder has not been surveyed at all.

"Our present knowledge of the earth, its form, size, the configuration of its surface features, their measurements and representations on maps as we see them today is, according to Mr. Reeves, the result of many centuries of strenuous endeavor and conquest over obstacles, yet, at the present time, only one-seventh of the earth's land surface has thus far been accurately mapped, and it would take at least two hundred years to complete the task—with the usual methods.

Aircraft Will Make It Possible to Do in Twenty Years What Would Require Two Hundred Years with Usual Methods

"The aircraft will make it possible to do in twenty years what would require two hundred years with the usual methods. Progress in exploration and mapping has been slow. Looking back in history, we find, at the end of centuries of work in this line the conditions set forth by Mr. Reeves.

"The extent of geographic knowledge at the time of Homer, about seven centuries B. C., was limited to a few miles and the prevelant idea was that the earth was a flat surface surrounded by an endless ocean, with all kinds of awful beasts barring the progress of travelers. The entire world, as far as they knew, consisted of Greece, Rome, the western coasts of Asia Minor, Egypt, and coastal lands along the Mediterranean Sea, the Red Sea; but they had no actual geographic knowledge.

"Two thousand years later, before Columbus sailed from Spain for that eventful trip which resulted in the discovery of America, geographic knowledge was still very limited. The world, as known then, consisted of the land between the Atlantic and Arabian Seas, and from the African coastal lands on the Mediterranean and Red Seas, to not further than Moscow on the other side, about 5,000 square miles in all. The maps of the time show that geographers believed the American continent to be China and India.

"Today our geographic knowledge is extensive, but not complete. The total area of the land surface of the earth, together with the unknown parts of the Arctic and Antarctic regions, which may be either land or water, is about 60,000,000 square miles. Of this only about 9,000,000 square miles have been scientifically mapped. This is roughly one-seventh. Of the remainder, about 6,000,000 miles have been mapped from less reliable surveys, chiefly non-topographical, about 38,000,000 miles have been mapped only from route traverses and sketches, and 8,000,000 are entirely unsurveyed and unmapped.

"At the pace aeronautics is developing we may expect that within twenty years aircraft will be plying across the oceans and deserts and landing cargoes of goods and passengers in what are now the most inaccessible places."

Capt. Bartlett was captain of the "Roosevelt" on both of the Peary Expeditions in which he reached the 88th parallel. While captain of the G. G. S. "Karluk" in January 1914, the ship having been crushed by the ice, he led the 17 members of the Expedition to Wrangle Island, then crossed over to Siberia with one eskimo and returned with a relief party.

Capt. Bartlett was also commander of the MacMillan Relief Expedition, and last Winter was commended by Secretary Daniels for his extraordinary achievement in taking the ship "Favorite" out of the ice from Quebec.

NAVAL AVIATION

SECRETARY DANIELS' annual report contains numerous reports and references to naval aviation. While, as Admiral Sims pointed out, the supply of naval aircraft was short of meeting the need, Secretary Daniels' report shows that American naval aviators have a most remarkable account of themselves.

In his report the Secretary asked for $225,000,000 for naval aviation for the year beginning June 30, 1919, but, it will be recalled, these estimates have since been cut down to a very small sum, which does not even seem large enough to keep the Naval Aircraft Factory in full operation and meet some of the financial obligations already incurred.

We print herewith references to Naval Aviation which occur in the 380 printed pages of Secretary Daniels' report:

The Navy That Flies

Of gratifying proportions and effectiveness have been the expansion of aviation in the Navy.

On July 1, 1917, naval aviation was still in its infancy. At that time there were only 45 naval aviators. There were officers of the Navy, Marine Corps, and Coast Guard who had been given special training in and were attached to aviation. There were approximately 200 student officers under training and about 1,250 enlisted men attached to the Aviation Service. These enlisted men were assigned to the three naval-air stations in this country which were then in commission. Pensacola, Fla., had about 1,000 men; Bay Shore, Long Island, N. Y., which was put into operation at that time, had about 100 men; and Squantum, Mass., which was abandoned in the fall of 1917, had about 150 men.

On July 1, 1918, there were 823 naval aviators, approximately 2,052 student officers, and 400 ground officers attached to naval aviation. In addition, there were over 7,300 trained mechanics and over 5,400 mechanics in training. The total enlisted and commissioned personnel at this time was about 30,000.

Of untold importance during the year was the establishment and placement under operation of naval-air stations at all the strategic and important points on the coast of the United States. Likewise, a station was established in the Canal Zone. As a result of those activities, the larger part of the American coast has been constantly patrolled by naval aircraft. Furthermore, the Navy Department has already planned and is fully prepared to establish enough additional stations to so complete the system that every foot of the coast of the United States can be thoroughly and constantly patrolled. Many of the stations now in operation are equipped not only with seaplanes, but also with dirigibles and kite balloons. The extent of activities that are being carried on can be readily illustrated. Thus, during June, 1918, a total of 25,642 flights, covering about 2,155,860 miles, were made by seaplanes at stations along the United States Coast. These figures include both patrol and training. During that same period of time lighter-than-air craft made a total of 613 flights, covering about 56,420 miles.

(*Continued on page* 824)



THE NEWS OF THE WEEK



Relics of Lufbery to Go to Home Town

Wallingford, Conn.—Edward H. Lufbery, father of Major Raoul Lufbery, the American ace killed in the war, presented to the Historical Society of Wallingford the war medal and diploma of the Aero Club of America that had been conferred upon his son.

The Aero Club was represented at the presentation in the Town Hall by its President, Alan R. Hawley, who said: "The Wallingford boy's heroic valor in the service of our country will always remain one of the brightest memories in American history."

The medal and diploma were accepted for the town by Selectman Hall, and will be permanently displayed in the Public Library. Governor Holcomb was a speaker. Former Lieutenant Governor Lake described Major Lufbery's death duel in the air, which Mr. Lake saw. Captain Bachelier, Military Attache of the French High Commission, was a guest.

Aeronautics Course at Brooklyn Polytechnic

A new course in the Theory of Aeronautical Engineering is to be given in the Evening Department of the Polytechnic Institute of Brooklyn, starting shortly after January 1. The class is open to college graduates and to others having adequate preparation which will correspond with that given by the first two years' work of a good technical college.

Two other new evening courses will be started about the same time: Marine Engineering, with about the same prerequisites as the course in Theory of Aeronautical Engineering, and Tool Drafting and Design, open to men having a good knowledge of mechanical drawing and modern machine shop practice.

Binoculars Being Returned

Return of binoculars, telescopes, spyglasses, sextants, chronometers and other navigation instruments loaned to the Navy soon after America's entrance into the war, in response to an appeal by Assistant Secretary Roosevelt to the public to supply "eyes to the Navy," has been ordered. Over 100,000 of these articles were sent out in response to the request.

Each article will be returned as soon as practicable, and owners are requested to refrain from unnecessary communications to the department, as this will tend to delay rather than expedite return and distribution. Considerable delay is to be expected in many cases, as these instruments have been in use in various parts of the world at ships and stations, and it is probable that it will be more than a year before the last of them reach this shore. Permanent changes of address of owners should be communicated to the Naval Observatory, Washington, D. C.

Transfers in Department of Military Aeronautics

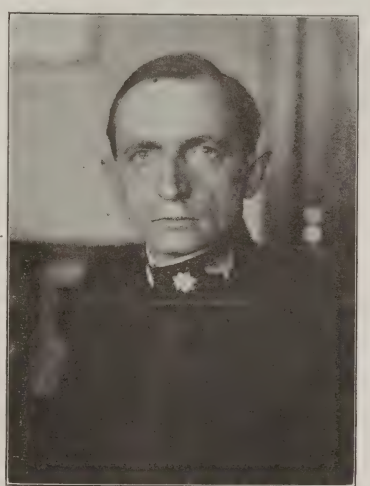
Colonel Arthur Woods has been appointed Assistant Director of Military Aeronautics. Colonel Woods, who was Chief of the Personnel Section, Division of Military Aeronautics, is the immediate successor of Colonel Gerald C. Brant. The appointment of Colonel Brant, however, was only temporary, and therefore, according to the records of the division, Colonel Woods is officially the successor of Colonel Henry H. Arnold.

Colonel Brant has been appointed chairman of a board to work out and recommend plans for the permanent organization of the air forces.

Colonel Woods has been succeeded as Chief of the Personnel Section by Lieutenant Colonel Rush B. Lincoln, formerly Executive Officer of that section.

Direct Airmen By Radio Phone

A ship formation of three planes directed by a fourth, by means of the new radio telephone was staged at Bolling Field for the benefit of government officials.



Commander Coburn, in charge of the Naval Aircraft Factory at Philadelphia

This is the second exhibition of the new air wireless telephone that has been given in Washington. The first was demonstrated before President Wilson on the White House lawn two weeks ago.

Army Airmen to Be Instructed Yearly

Washington.—Army aviators who go on the inactive list of the reserve corps after demobilization are to be given an opportunity to keep in practice by flying military planes, so that they may be in touch with the development of new fighting aircraft and ready for active service on short notice.

A War Department announcement December 4th outlines a plan contemplating that reserve aviators will be called to active service at army flying fields for two weeks each year for experience with up-to-date planes. It is realized, the statement says, that it cannot be possible for any proportion of the men to buy aeroplanes of their own, or that anything approaching delivery of service planes is to be foreseen in the near future.

Albany to Have Municipal Aerodrome

The city of Albany, one of the hundred or so cities cooperating with the Aero Club of America and the Aerial League of America, is to have a municipal aerodrome.

The bubble of skepticism which has for years clouded the establishment of an efficient and speedy mail and passenger transportation system by air was burst on December 18 by the energetic Major Cushman A. Rice and Captain Stanley Stanger, British ace who went to Albany, representing the Aero Club and Aerial League.

These men addressed the newly organized Members' Council of the Chamber of Commerce at the initial meeting in the Ten Eyck Hotel and drove home convincingly the benefits and feasibility of Albany as a pioneer centre of air activity. If Albany were to establish, as is planned, a municipally owned aerodrome and landing field, the city would be the first in the United States to take this leading step.

Major Rice, who had charge of 20 American aero squadrons sent overseas last winter, outlined the startling future of aircraft in America and in Albany. Some of his points touching on the development of the air, which were received most enthusiastically be the members, were these:

"If you men take this as a business proposition, as I am confident everyone will, I assure you there will not be an ounce of first-class mail carried by other means than aeroplane inside of three years."

"Albany has several favorable sites for an aerodrome, which may be fitted properly in a short time and at minimum cost to make the city an intermediate point in air routes with a surprising volume of air traffic benefitting the city."

"There are now in operation several efficient system of mail traffic between principal cities, and the expansion and development of the air as a mail and passenger transportation medium is coming surely and speedily."

"Thousands of aeroplanes in use overseas and now under construction, owned by the United States government, should be utilized for this service with the double asset of minimum cost and employment for thousands of returning aviators."

Col. Thaw In from France

Lieut. Col. William Thaw, known as "the American Eagle" in the days of the Lafayette Escadrille, arrived at the home of his mother, Mrs. Benjamin Thaw, 640 Park Avenue, last week. Colonel Thaw and a half-dozen other officers reached Newport News, Va., Dec. 21 on the steamship Martha Washington.



The Curtiss "N-C-1" flying boat, equipped with 3 Liberty engines, which recently made a flight with 50 passengers



American labor leaders who visited the Caproni factory: Messrs. John Spargo, Charles E. Russell and Samuel Gompers—are shown herewith with Mr. Caproni

Colonel Thaw, who comes back with the decoration of a Chevalier of the Legion of Honor and any number of citations for courageous exploits, was well known in America as an amateur aviator long before he joined the French Army two weeks after the war began. He was in Paris when hostilities began, flying in a hydroaeroplane, and he enlisted in the Foreign Legion for field service and later was transferred to the aviation section. Previous to going abroad, Colonel Thaw's most notable air exploit was a trip in a flying boat from Newport to New York in 1913, during which he made the first flight under the four bridges spanning the East River. While serving in the escadrille, Colonel Thaw's name was as frequent in dispatches telling of the downing of German aeroplanes as that of the famous Major Lufbery.

A year ago the War Department announced that Colonel, then Lieutenant Thaw, had been taken into the American Air Service, with the other members of the escadrille. He was commissioned a Major and assigned to duty with the 103d Aero Squadron. Up to the time he was promoted to a Lieutenant-Colonelcy last month he had been officially credited with bringing down seven opponents, this number of victories, of course, not including his record prior to entry into American service.

Dirigible Makes Record

Key West, Fla.—A new world's record endurance flight in a non-rigid dirigible balloon—thirty-two hours of continuous flight—was established November 23 by Ensign Thomas E. Maytham of Buffalo at the United States Naval Air Station at Key West, Fla.

The usual full load of radio outfit, supplies, etc., was carried. Six hundred miles were covered before a leak and a threatening storm compelled landing.

Air Battle Staged for Motion Pictures

With the American Aerial Forces in France.—An air battle between a big German biplane and a little French Spad with Lieutenant Edward V. Rickenbacker, an American ace, in the French machine, was staged over an American aerodrome the other day for the benefit of an army photographer. The German machine was a big Hannover, which had landed within the American lines because of motor troubles. The motion pictures were made by Captain Edwin H. Cooper in the observer's seat of an American Liberty machine. Lieutenant Thorne C. Taylor, of Chicago, was in the pilot's seat of the Hannover machine.

At first Rickenbacker's Spad and the German biplane were warily circling around while the Liberty machine encircled both with Captain Captain Cooper grinding the crank of his motion-picture camera. During the manoeuvre Rickenbacker's machine gun was rattling merrily while the guns of the German machine also were working vigorously.

The machines had worked up to a considerable height and attracted the attention of aviators in nearby aerodromes who were not in the secret, and who were amazed to see a lone German biplane circling over an American pursuing group in broad daylight. Four machines from these other camps came over to see what it was all about, ready to put the finishing touch to the German if their help was needed. By signaling they were warned that it was all a game, and they sailed away again. Suddenly the German machine swerved, and the figure of a man came hurling to the ground. A groan went up from the lips of one of the mechanics who had been delegated to fetch the dummy figure, for it had struck the ground nearly a mile from the field. This ended the "fight."

Aviator in Fox Hunt

Lieutenant Thomas Hitchcock of the French Escadrille, whose escape from a German prison camp furnished one of the most interesting tales of the war, recently forgot his terrifying experiences as a French aviator when he took part in the fox hunt of the Meadow Brook Hunt Club. Seventy members of the organization went out with the hounds in a hunt over the north country in the vicinity of East Norwich, Syosset, and Jericho.

The trail led over a distance of about twenty-five miles with a number of unusually large jumps marking the journey. Six coverts were drawn and several fresh trails were found, but because of the velocity of the wind the pack was unable to hold the scent for any great length of time.

Lieutenant Hitchcok is an ardent hunter. He is following the hounds regularly now as part of a course of training which he calculates will restore him to perfect condition for air service again.

Urges Naval Air Patrol System

If the United States had possessed coastal air defense stations when it entered the war such as the Navy now proposes to establish German submarines, which operated along the Atlantic coast, "would have done much less harm than they did."

This is the opinion expressed by Captain G. W. Steele, acting director of naval aviation, in a statement to the House Naval Affairs Committee on December 17, in which he strongly urged the creation of a naval air patrol system, embracing both heavier-than-air and lighter-than-air machines, on both the Atlantic and Pacific coasts.

Dirigibles of the lighter-than-air type, similar to the Zeppelin, are favored by Captain Steele.

Numerous instances of combats between air and underseas craft were described by him, which were filed with the committee, having been secured from the official archives of the British navy.

This has been advocated for several years by the Aero Club of America and repeatedly driven home by arguments and addresses delivered all over the country by Rear Admiral Robert E. Peary, U.S.N., retired, president of the Aerial League of America.



The Curtiss Model "K" Triplane, with a Curtiss engine

The AIRCRAFT TRADE REVIEW

S. A. E. Members Visit Standard Plant

On Monday, December 16, 1918, about 60 members of the Society of Automotive Engineers visited and inspected the plant of the Standard Aircraft Corporation, Elizabeth, New Jersey.

Previous to going through the big aeroplane factory the members of the society were the guests of the Standard Aircraft Corporation at a luncheon.

The program of the day follows:

10:57 A. M.—Arrive at Elizabeth Station, Pennsylvania Railroad.

11:10 A. M.—Take special busses and arrive at plant of Standard Aircraft Corporation, using entrance to visitors on side street.

11:15 to 11:30 A. M.—Issuing passes and registration.

11:30 A. M. to 1:15 P. M.—Plant inspection: HS2L Boat, Wing Assembling, Handley-Page Warehouse and Receiving Department, Metal Shop and Brazing Department.

1:30 P. M.—Luncheon in Office Dining Room.

2:30 to 3:30 P. M.—Plant inspection: No. 5 Building to No. 4 to No. 3 to No. 2 to No. 1 to Handley-Page Assembly.

3:30 P. M.—Motor Testing Building.

3:40 P. M.—Club House, Auditorium, Moving Pictures and addresses.

4:40 P. M.—Leave for trains to New York. Time, 4:49, 5:05, 5:09, 5:17, 5:55.

The following members of the Society of Automotive Engineers were present:

S. P. Thacher, S. C. McKeoun, Joseph Schaiffers, George M. Cohen, H. W. Topley, Charles E. Davis, James R. McCallum, Elmer S. Crocker, E. Tarvay, H. C. McBriair, Carl F. Scott, F. G. Diffin, Charles Aroesch, J. Breitenbach, C. A. Chapman, Robert Miller, J. W. B. Pearce, Chas. J. Faber, J. R. Straus, W. K. Hadley, C. H. Crittenden, R. C. McAlpin, G. Edgar Allen, Edward J. Fornlinson, Gilbert L. Dannehurd, W. C. Davis, H. W. Merritt, Theodore Douglas, E. W. Holmes, O. Froelich, O. Blomgren, M. C. Dorine, B. Nikifokoff, Louis W. Williams, C. R. Bissell, Leo Weiner, C. B. Hayward, E. Lindberg, William F. Ryerson, Frederick J. Schmidt, Lieutenant A. F. Wagner, P. M. Erikson, Henry S. Sherman, J. J. Murray, Robert H. Schickel, Arthur Mayer, W. More, L. Ruprecht, F. A. Thompson, A. M. Wolf, G. B. Ingersoll, J. R. Kelso, R. H. Sleicher, J. T. Pratt, First Lieutenant A.S.A.P.; J. B. Sessions, Joseph L. Moss, Jr., A. Gibbons, Henry C. Steinman and Sidney Oxberry.

Wadman Opens Office

Rex W. Wadman, who has been doing special work for the Ordnance Department, U. S. A., has re-established his New York office at 16 Beaver Street.

After American Agencies

Washington.—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has requests from Columbia for the agency for aeroplanes, automobiles and trucks. Further information can be secured by addressing the Department of Commerce, referring to Foreign Trade Opportunity No. 27743. The Department also has an inquiry from Peru, desiring an agency on a commission basis for the sale of farm tractors, automobiles, accessories and oils. Further information can be secured from the Bureau of Foreign and Domestic Commerce by referring to Foreign Trade Opportunity No. 27748.

Liberty Motor Production

Washington.—The actual output of Liberty motors in October was 3,878, according to an announcement authorized by the War Department. This is an increase of 1,500 over September. The Air Service expected 2,500 motors in September and deliveries were short 122. The quota for October called for 3,000.

The factories producing the motors are expected to turn out a minimum of 4,350 during November. With the big plants now in full operation, it is expected that the November figures will be far ahead of the number called for.

Wins Liberty Motor Flag

Indianapolis.—The Nordyke & Marmon Company of this city won the first honor pennant offered by the United States Government to the concern building and shipping 12-cylinder Liberty motors the most rapidly in October, it was announced. The contest began October 1, and ended last midnight. The company made a production record of 225 per cent of its allotted quota in October. The contests are to be continued each month. Five other firms contested during October.

Statement by Henry Ford

In answer to the criticism of Charles E. Hughes that the Ford Motor Company employed some enemy aliens, Henry Ford made the following statement:

"The Ford Motor Company has manufactured 1,242 Liberty motors during the last month. That was about 300 more than were manufactured by the next highest factory. I do not know what better answer could be made to all the criticisms.

"We started later than others and have passed all, the production standing up to the most rigid inspection in every particular.

"Our policy is to make men, not to break them. In times of panic great injury and injustice are often done to innocent persons, and we try to keep our heads.

"We would not allow injustice to be done to an old, trusted and valued employe even though he was born in Germany. The results speak for themselves. Mr. Embe, referred to as the special example in the Hughes report, has been with us a little over twelve years, and he is a most able and excellent engineer and has always given perfect satisfaction. Not one word of fault could be found by Mr. Hughes or any one else with regard to Mr. Embe's actual work.

"We in the plant know that he gave valuable assistance and many suggestions with regard to the development of the Liberty motor cylinders, which are being furnished to all the manufacturers, with a saving of $345,000 a month to the Government over former prices.

"From the very beginning of the war we have taken the greatest precaution against sabotage or other hostile work of aliens, and at the same time have endeavored to follow the instructions of the United States Government as stated to us by the United States Marshal. We have had no interference with our work that could in any way be traced to enemy aliens. We organized an investigating department, with the utmost care, to examine into the record of every alien enemy and his work, and we have been commended most highly by the Government officials for that work. The United States Marshal can speak for himself as to our organization and work with regard to that."

"The Ford Motor Company did not employ a single German alien without the permit of the Marshal's office. There were 801 applications in all out of 40,000. When the names were brought to us we found that they had already been thoroughly investigated by the Ford investigators," said United States Marshal Henry Behrendt. "We found in our work that the Ford investigating system is the most thorough of any, and I have often referred to it as a model for others to follow.

"We have had less trouble with enemy aliens in the Ford plant than in any other large plant. If there is any blame with regard to the Ford plant, it should be on the Marshal's office, and not on the Ford people. We only found two men against whom a suspicion arose afterward, and they were taken care of. In our investigation we found that many of the 800 had sons and brothers in Europe fighting for America."



Society of Automotive Engineers visiting Standard Aircraft factory, Elizabeth, N. J.

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
L. T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations



PILOTS

Ira O. Biffle
Irving Graeb
Trent C. Fry
Leon D. Smith
L. V. Smith
Dunn K. Steele
Lyman W. Doty
Carroll C. Eversole
Dan Davison
Dana C. DeHart
Edwin W. Hubbard
D. I. Lamb

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Geo. R. Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AVIATOR-MECHANICS

Christopher C. Cole
Julian Sykes
Wm. L. Lindley
August E. Carlson

Aero Mail Terminus Removed to Belmont

Coincident with the announcement that the eastern terminus of the aero mail service had been transferred back from the Standard Aircraft Corporation's field at Elizabeth, N. J., to its original site, the Belmont Park, L. I., field, officials of both military and mail air services cited occurrences of the past week to show that, through flying by compass, American aviators have succeeded in overcoming the impediment of fog and cloud banks, which had been one of the reasons for moving previously to the New Jersey field.

Two flights by compass were told which aroused the pride of American aeronauts in the ability of their colleagues to traverse the airways without the aid of visible landmarks. Captain W. P. Jacobs, with Colonel L. W. MacIntosh for a passenger, flew from Buffalo to Mineola, a distance of 407 miles, in an army De Haviland "9," equipped with a Liberty motor.

Flying above the clouds, Captain Jacobs depended entirely upon "navigating instruments," and managed to keep well on his course, coming by way of Binghamton in order to avoid the mountain passage by following the Delaware Valley. He made the trip in three and one-half hours, averaging 120 miles an hour. He left Buffalo at 10:20 and landed at Mineola at 1:50 P. M.

Officials at Hazelhurst Field also told of a flight made successfully from the Mineola army station on Sunday, when the fog hung like a pall over all this part of the country and was so dense that great ships, such as the Leviathan, were unable to enter New York Harbor. A military aviator carrying departmental papers for Washington left the Hazelhurst field and flew to the capital in two hours and fifty minutes.

The time in clear weather has ranged from ten minutes to two hours longer, it was said, and the present aviator was handicapped by being compelled to make two landings because of the heavy rain he encountered along the way.

Record Aero Mail Flight

Ira Biffle piloted the New York-Washington mail aeroplane to the National Capital Dec. 16 in one hour and thirty minutes' flying time. Ten minutes were consumed in transferring the mail at Philadelphia, making the time from field to field—New York to Washington—one hour and forty minutes.

Chicago-New York Aero Mail

On December 18th, fifteen years and a day after the Wright Brothers made their flight at Kitty Hawk, N. C., the first regular aero mail route between New York and Chicago was inaugurated at 6 A. M. from Belmont Park, Pilot L. D. Smith started at 6:30 A. M. in a DeHaviland-4, driven by a Liberty Motor, for the first leg of the journey to Lehighton, Pa. Owing to engine trouble he had to land at State College, Pa. His ten sacks of mail were to be transferred to another plane which was to leave Bellefonte for Cleveland at 10:45. This, however, could not be done, and the mail was sent out by train. Smith was several hours behind schedule when he landed at State College. At Cleveland they were to be changed again for the last lap to Chicago. His aeroplane carried 266 pounds of first-class mail, which was due to reach Chicago at four o'clock in the afternoon. The hope was to cut the eighteen hours required by train to negotiate the 832 miles to Chicago down to nine hours by aero mail.

Pilot A. E. Johnson waited, and as Smith did not arrive on schedule time, Johnson left at nine o'clock A. M., without any mail, for Cleveland. He landed ten miles east of Woodland Park, mail plane field at Cleveland, because he was unable to locate the station, and his machine remained there over night. Searchlights were kept on the Woodland Hills, Park Field, till a late hour, as postal authorities thought that an attempt might be made by Johnson to fly into Cleveland.

Lyman W. Doty, flying a reserve plane, landed and turned turtle near Painesville, Ohio, during the day. The only damage sustained was a broken propeller.

The delay at the Chicago end was caused by the inability of the planes to reach that city from Defiance, Ohio. It was expected that a start would be made from Grant Park, Chicago, at 10 A. M. Local officials who gathered at the park were informed that one of the machines which left Cleveland to fly to Chicago had met with an accident at Defiance.

As the two machines attempted to land, one was partially wrecked by impact with a fence. A propeller was broken and the plane otherwise damaged. The accident was caused when a woman spectator, with a baby in her arms, emerged from the crowd, and the aviator steered his plane into the fence to avoid striking them.

The other plane, piloted by "Mike" Ebersole, landed successfully and later continued on to Chicago, reaching there in the afternoon. He took aboard a cargo of mail for New York at 4:07 P. M., and flew to Ashburn flying field, in the outskirts of the city, where he spent the night preparatory to the eastward flight this morning.

Chicago officials said that probably several days will elapse before the service will be running regularly on schedule time.

On December 17th, Lieutenant D. I. Lamb, an aerial mail carrier, crashed his aeroplane into a tree near Selinsgrove late today, uprooting the tree and damaging the machine. He escaped uninjured.

Lieutenant Lamb was en route to Bellefonte from New York, where he was to take up a lap to-morrow of the New York-Chicago mail route.

Second Day, Chicago-New York Aero Mail

On December 19th Aviator Taylor left Belmont Park at 7:10 in the morning, flying a DeHaviland-4 on the first leg of the journey to Chicago. Thirty minutes later Aviator Fry followed Taylor to pick up the mail if Taylor should meet with an accident. The first section of the route ends at Bellefonte, Pa., where two other fliers were to await the arrival of Taylor and carry the mail to Cleveland, where the last section starts. Both Taylor and Fry got away without mishap. The weather was excellent, and it was expected good time would be made if no accidents interfered. As AERIAL AGE goes to press, we have not heard whether he landed safely.

Taylor carried two sacks of mail. One, weighing eight and a half pounds, was for Chicago. The Cleveland pouch contained five pounds. Fry flew a Curtiss plane with a Liberty motor.

Word was received at Belmont Park that no mail plane started from Chicago. All available machines there had developed trouble and could not be repaired in time to get away for Cleveland.

Post Office men are not discouraged by the failure to complete a trip yesterday. They are confident that they will quickly have the service in good working order and are confident that they can overcome all difficulties.

Carrying the aerial mail from Philadelphia and Washington, Pilot L. V. Smith started from Belmont Park at 12:12 P. M. He carried six sacks containing 157 pounds of mail.



Left to right: Miss Wanda Orynski, Miss Helen F. Armstrong, Miss Marie Thomas and Miss Marjorie Spuslock, attached to the Aerial Mail Service



MILITARY AEROSTATICS

By LIEUT. H. K. BLACK, R. F. C., C. F. A.



WHEN a free balloon leaves the ground it is very necessary that sufficient lift is obtained to ensure the steady ascent of the balloon. There have been many good ballonists fooled by a false lift. While weighing off the balloon may be caught by a stray gust of air which will give the impression that a lift has been obtained. When a balloon has been let go, however, if it was a false lift it will probably sink rapidly to the ground, and if there happens to be a wind at the time the landing will be more exciting than comfortable. I remember one occasion when something like this occurred. A pilot was taking three cadets up for their first flight. There was about thirty-five miles of wind on the ground. The pilot, old hand at the game as he was, was mistaken in his lift. The balloon rose from its shelter till the wind struck it. Then it descended forcibly upon the roof of a nigger "Shack," much to the discomfiture of the inmates. The pilot was spilled out by the impact onto the room. As the balloon struck he shouted to throw out a bag of sand. The cadets were determined not to lose the pilot, as he was their only hope in the balloon. None of them knew anything about one. They hauled him back into the basket. The loss of his weight, however, had lightened the bag, giving it a good lift. Then as it started up they each threw out a bag of sand. There was no doubt about the lift they had then. The basket was swinging and their ascent was made in a series of zigzags, if one may use that expression regarding a balloon. So the false lift is a thing to be avoided. As the appendix is open when the ascent is made—and, by the way, be sure to see that it is open—there is no danger of a free balloon bursting. The escaping gas reaches the open air through the appendix.

When the balloon has reached a sufficient height the drag rope may be released. There are several methods of coiling a drag rope. The best method is probably that adopted by the French. In this way it is coiled in a sort of figure eight arrangement. It is tied about the middle with some strong twine in such a way that it cannot interfere with the uncoiling. The whole thing is then tied to the edge of the basket. The twine which holds the drag rope must be cut when the required altitude is reached. If the rope has been coiled correctly it will uncoil rapidly, smoothly, and with not the slightest jar to the basket. There is a knack in coiling the rope which I know has not been learned in some of the training schools in this country.

A free balloon is about the quietest thing I know of. As one is drifting with the wind at the same speed there is no wind blowing past one's ears, and, as there is nothing to move there is no other noise. When the balloon is either rising or falling very slowly there is no sensation either of going up or down. A statoscope is an instrument designed to give one that information. It is extremely sensitive. If, however, no statoscope is available, a home-made device will answer the same purpose. If small pieces of tissue paper are thrown out of the basket they will remain almost stationary in the air and from the direction they apparently take one can tell whether the balloon is ascending or descending.

When the balloon has reached the desired altitude the pilot must endeavor to keep it there without the expenditure of more ballast or gas than is absolutely necessary. If it is desired to fly at five thousand feet and the balloon goes higher than that it is best to check its ascent by valving a little at a time. The chances are that when it stops going up it will come down somewhat. The contrary is also true. If a balloon is coming down, the expenditure of enough ballast to check the descent will probably send it up again somewhat. Ballast and gas are two precious things, and they should be husbanded as much as possible, for on the supply of both depends the length of the trip. So many things affect the altitude of a balloon, such as upward currents of air, valleys, hills, woods, etc., that while the balloon may not remain at a constant height all the time, still the average height will remain fairly constant, and what one loses in height from one cause one will gain from another.

The landing of a balloon is probably the hardest part of ballooning. From the air the ground should be searched for a suitable landing place. The balloon should be brought down to a fairly low altitude for this, but one must be careful not to valve too much on the descent. A landing spot should be picked which can surely be reached, and when one has decided to make a landing there it should be made. A vacillating mind does not belong to a good balloonist. A fairly high amount of gas should be released as the balloon nears the landing place. More gas should be released than seems necessary, for as the drag rope touches the ground it releases weight from the balloon and thus eases up the descent. It also tends to slow up the balloon in a high wind if it drags through trees. The anchor, if one is carried, may be dropped overboard also when nearing the ground, and when that touches the ground it releases a lot of weight and sometimes necessitates even more valving.

When the anchor catches and brings the balloon to rest, it may be valved down to the ground, and the use of the rip cord is obviated. However, in lots of cases the anchor is not carried, and sometimes it does not hold up the balloon, so as a general rule it is better to use the rip cord. This should be done at not less than twenty feet. It is impossible to be arbitrary about this, but as a rule somewhere about twenty feet is about right. The rip cord should be pulled with a good sharp jerk and continued until the panel is fairly well out. The balloon should then settle to the ground without jar, and not move once it has touched. However, one thing which should be remembered on all occasions is that no one should get out of the basket until the balloon has fallen down. In cases where the flight is to be resumed, of course, the rip cord is not used. The balloon is valved to earth and ballast put in to take the place of those who get out of the basket. In this case it is more necessary than ever for no one to get out of the basket till their weight in ballast has been placed therein.

Accidents will happen surely if this is not remembered. When the balloon has fallen down, the remaining gas is released, the basket disconnected and the net removed and rolled. The valve should be removed, fastened and placed carefully inside the basket to one side and the concentrating ring to the other. The net is then packed in between them. The instruments should be carried personally. The envelope is folded and rolled and placed in its case. The drag rope is coiled and put in the basket. The anchor should never be put in the basket. It should be a separate piece of baggage.

After the balloon is packed someone should always remain with it; it should never be left alone.



Free balloon ready for an ascension at Washington, D. C.

THE HISPANO-SUIZA ENGINE

THE Hispano-Suiza engine has been used in far larger quantities by the allied arms than any other motor and has been produced in much greater numbers than any other design of aeronautical engine.

It has been built in France, Spain, England and America, and is about to be made in Japan. Originated in Switzerland and Spain through the old Hispano-Suiza Motor Car Co. by Marc Birkight, the engineer and general manager of the company, it was quickly taken up by the French Government, being an engine which at that time was exceptionally light for its power and was also very easy to manufacture by comparison wtih the rotary motors and with the majority of the water-cooled fixed cylinder engines of French or British origin. For France it did so well in the air that a large number of French factories were ordered to drop their own experiments and devote all their energies to Hispano-Suiza manufacture. At the signing of the armistice there were seventeen plants in France wholly given over to Hispano work.

Meanwhile one of England's largest automobile plants had been taken over by the British Government to make a slightly modified copy of the French motor and the Wright-Martin Aircraft Co. of New Brunswick, N. J., had started to make an exact copy of the French engine, for France, before the U. S. entered the war.

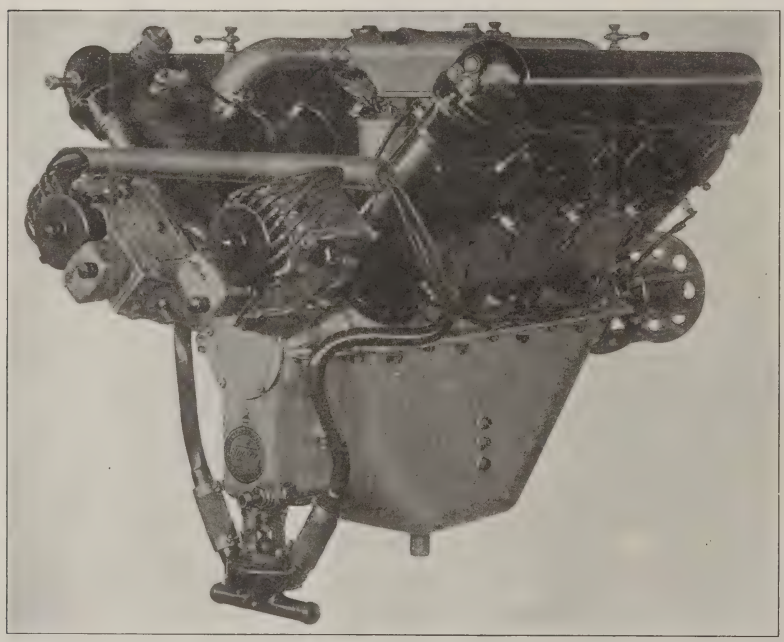
While the French plants all manufactured to identical drawings, the British made some changes. The American company, while it was building to the French order, copied the French design so well that parts shipped as spares would fit the motors built in France just as well as those completely manufactured in America, but when work was begun on orders for the U. S. forces a number of changes were gradually introduced.

The most interesting American development by far has been that of the 300 h.p. engine. The original motor was of 150 h.p., and this was followed by the almost identical 180 h.p. which differed only in that it had a higher compression and ran at a higher speed. The Wright-Martin Co., the only American licensees, by the way, have built large quantities of the 150 h.p. model, most of which have been put in advanced training planes and used in the U. S. It also built a good number of 180 h.p. engines for S.E.5 planes which were being shipped to the front at the conclusion of hostilities. The 200 h.p. geared motor, used largely in France, was never manufactured in America.

In the Summer of 1917 Monsieur Birkight laid out a 300 h.p. motor similar to the original 150 h.p., but larger, and there was much discussion then as to whether the geared 200 h.p. should be abandoned in favor of the new design. At that time plane makers were not ready with fighting machines to utilize 300 h.p., so the design was side-tracked, only being taken up intensively in France towards the end of 1917. Between June and September, 1918, practically all the French plants were changed over to produce nothing but the 300 h.p. and had the war continued till next Spring, tens of thousands of this type would have been in use.



Model A Hispano-Suiza engine, identical with the original French 150 h.p. motor



Wright-Martin piston and connecting rod, Models E and I

During the period from June, 1917, till the end of that year, Birkight went on with experimental work on the 300 h.p. and H. M. Crane, Vice-president of the Wright-Martin Aircraft Co., also proceeded with a design which, while it embodied most of the French features, yet differed in some very important points. When placed on test last Spring at the Bureau of Standards at Washington, and later at McCook Field, Ind., this Crane motor showed substantially more power than the French engine with the same bore and stroke and had a much lower oil consumption. It was also easier to manufacture in several details, and was stronger than the French engine, making for greater durability. The weight was slightly greater, but the power to weight ratio was slightly better in the American design.

In course of developing the 300 h.p. sundry small discoveries were made which led to alterations in the smaller motors then in production at New Brunswick, so that at present the 150 h.p. and the 180 h.p. American Hispano engines are quite distinct from the French motors of the same rated power and cylinder dimensions. The differences are, however, matters of detail and are not such as to prevent interchange of American and French engines in the same plane.

In all there are four types of

Wright-Martin Hispano motors. Model A is the original and is a copy of the French 150 h.p. precisely. Model I is the improved 150 h.p. which for some time past has been supplied for American training planes.

Next comes the 180 h.p. which is known as Model E and is identical with Model I except that the pistons are different, giving the higher compression. Finally there is the 300 h.p. or Model H.

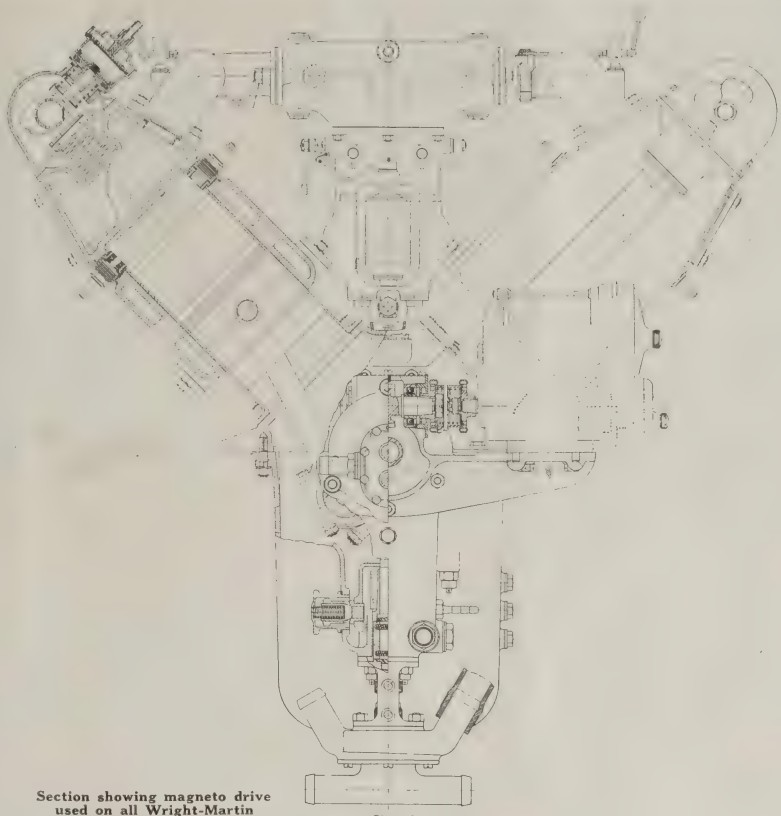
All four engines are eight-cylinder V type with 90 degrees between the blocks and each of the three smaller ones have the same piston displacement, their bore being 120 mm. or 4.72" and stroke 130 mm. or 5.11". Model A and I develop 150 h.p. at 1450 r.p.m. Model E develops 185 h.p. at 1750 r.p.m.

The three smaller motors will be described first; in the following description all parts are common to all three models except where otherwise specified.

Unique Points in Design

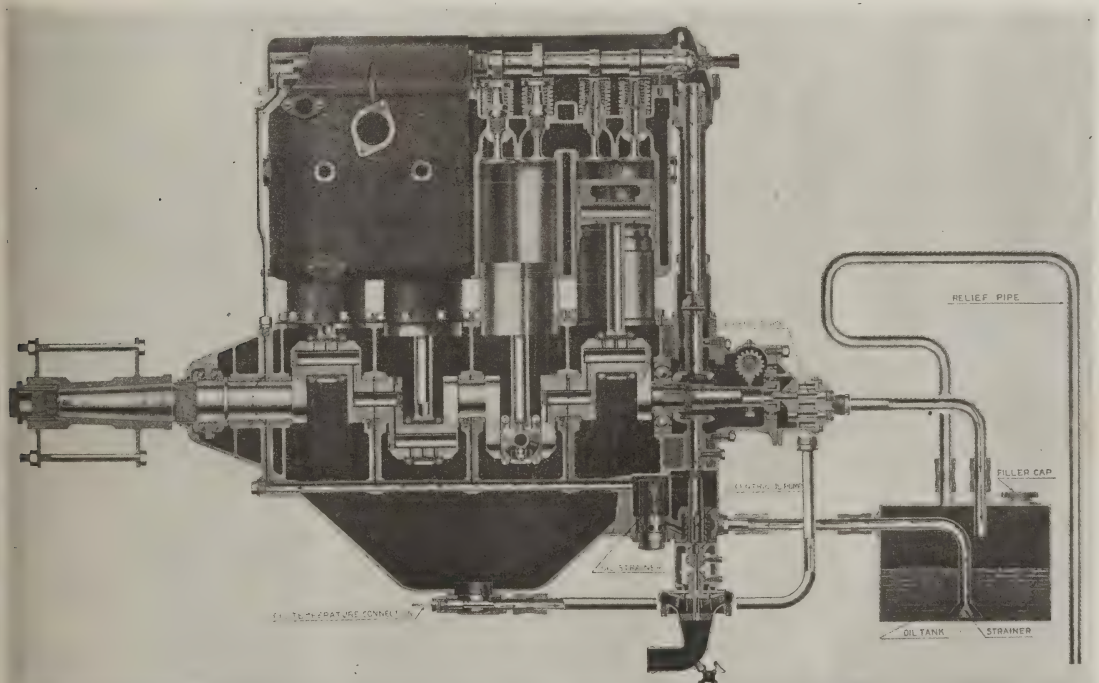
There are two basic features peculiar to all Hispano-Suiza motors, the cylinder construction and the valve operation. The cylinders are separate steel sleeves flanged at the bottom for attachment to the crankcase and with flat steel heads in which the valve seatings are cut. These sleeves are threaded for almost their entire length and are screwed into an aluminum water jacket which carries the valves and the camshaft. The resulting effect of this construction is to provide an aluminum cylinder block completely lined with steel.

All stresses within the cylinders

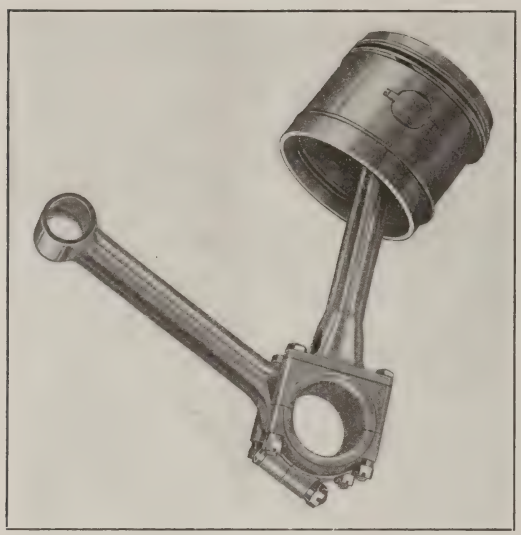


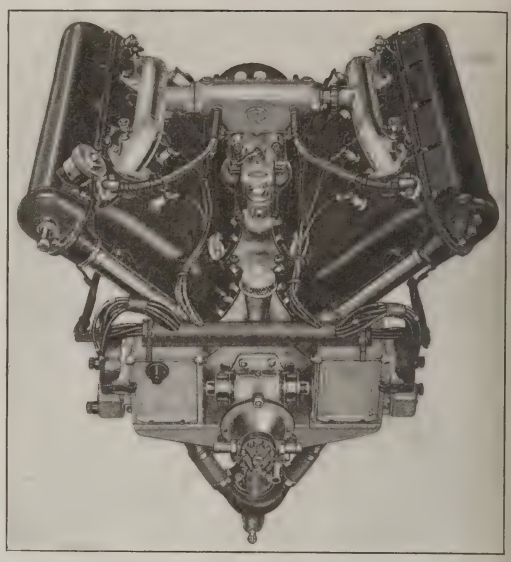
Section showing magneto drive used on all Wright-Martin Hispano motors

Plate 82



Section showing the complete lubrication system of the 300 h.p. motor. Note the large strainer on the discharge side of the pressure pump



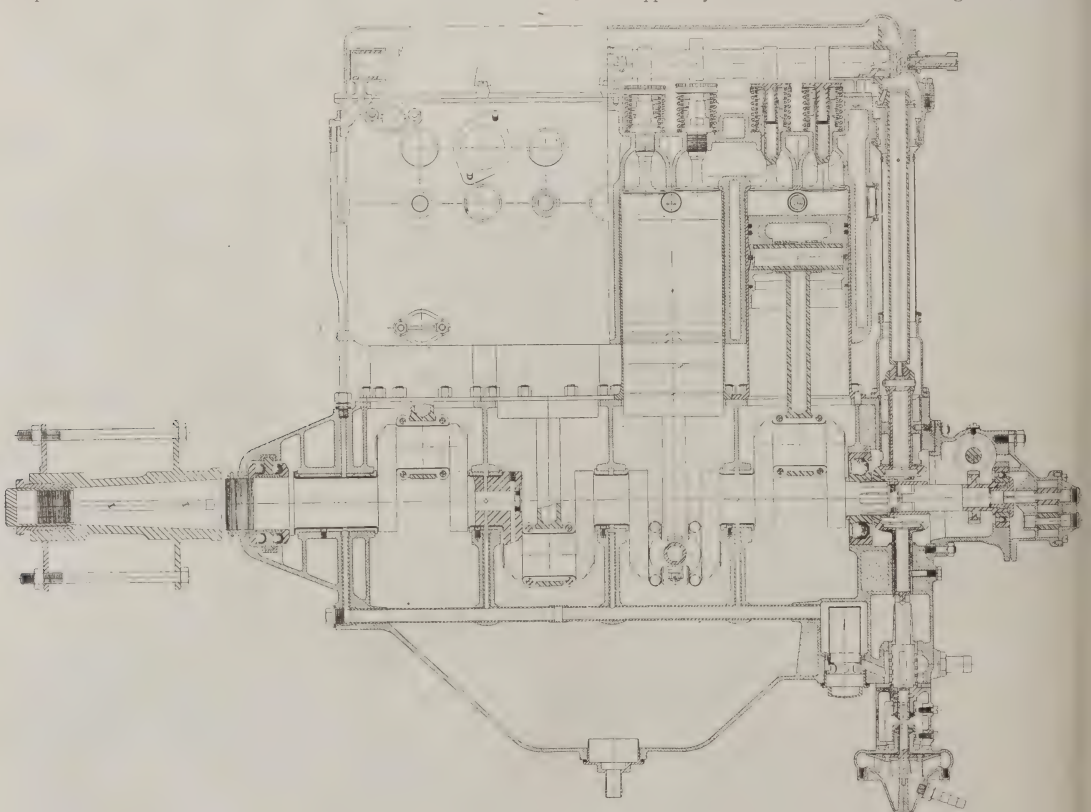


Left—Piston and connecting rod for 300 h.p. Wright-Martin motor. Right—Model E 180 h.p. engine

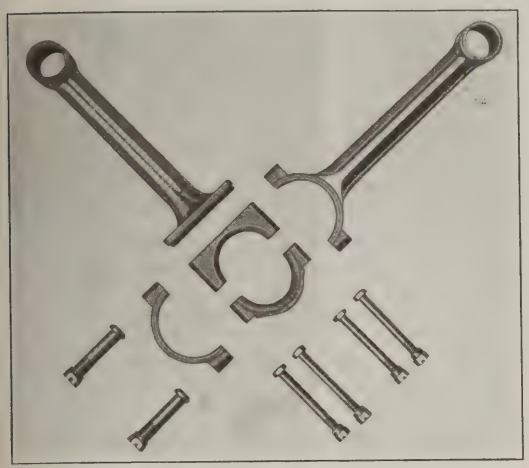
are transferred directly to the crankshaft and crankcase through the steel sleeves, the aluminum having only to carry the camshaft, and this means that the cylinder block is very strong while being very light in weight. The cylinder block is enameled inside and out, protecting the aluminum from corrosion due to impurities in cooling water or in the atmosphere.

The valve seatings are cut in the steel heads of the cylinder sleeves and the valve stems project vertically upwards through cast iron guides screwed into bosses in the aluminum. A flat tappet of mushroom form is attached directly to the upper end of each valve stem.

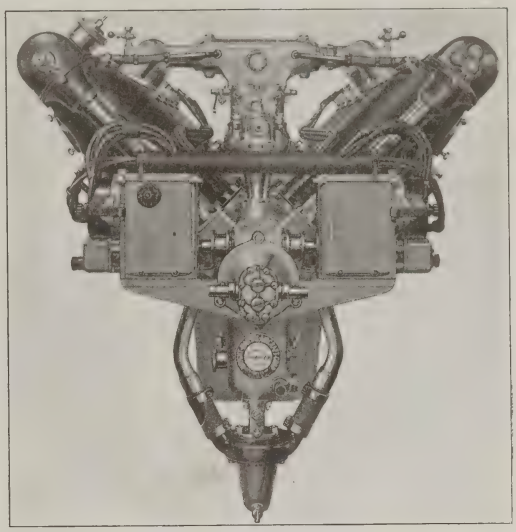
The valve location has already been described, but the detail of the tappet adjustment is one of the most ingenious features



Section of Model I 150 h.p. Wright-Martin design Hispano-Suiza. Note the additional oil pump on end of magneto shaft



Left—Crane design connecting rod showing all component parts.



Right—Magneto arrangement on Model I and E Hispano-Suiza

of the motor. The valve stems are of large diameter and are hollow, being threaded internally. The tappet has a flat head with a notched edge and its underside is serrated, the top surface on which the cam bears being case-hardened. The stem of the tappet screws deeply into the hollow valve stem.

Beneath each tappet there is a washer with fine serrations which mesh with those on the underside of the tappet. The hole in the center of the washer is not circular, but there are two projecting pieces which fit in slots cut in the top end of the valve stem and around the periphery of this washer are a number of small holes. The valve springs, of which there are two to each valve, one inside the other, come immediately beneath the washer and hold it up against the tappet.

Now, owing to the washer fitting into the slots in the valve stem, it cannot turn on the valve, and if the washer is held the tappet can be turned, the serrations between the two "clicking" over each other and yet having grip enough to securely lock the tappet. A special wrench is used for this adjustment which can be performed with great ease and quickness.

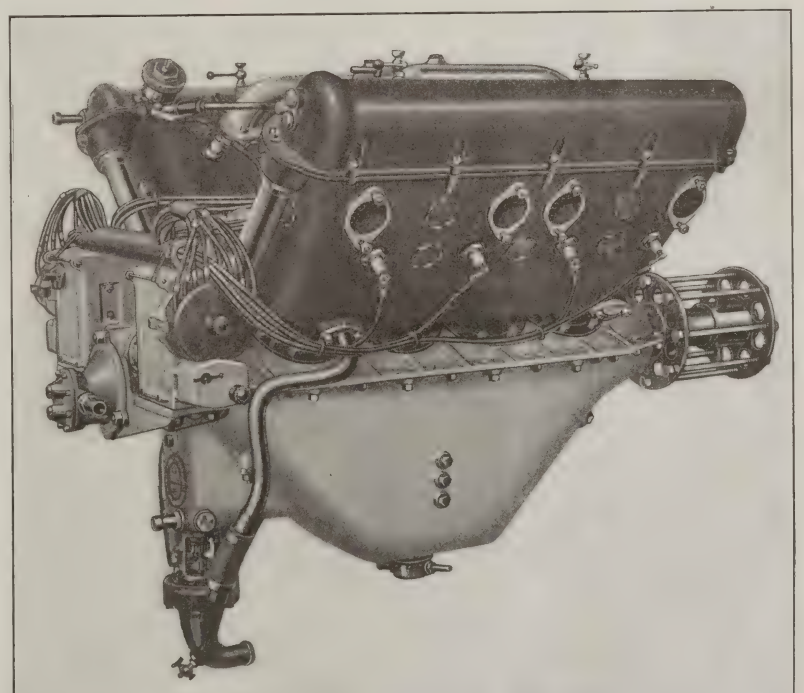
The camshaft is mounted in three bronze bearings bolted to the top of the cylinder block, so that the cams act directly upon the tappets without any intermediate mechanism. Camshaft and valves are inclosed by an aluminum cover and operate in a perfectly lubricated condition.

At the end of the cylinder block there is a vertical shaft which drives the camshaft through bevel gearing. This is called the upper vertical shaft and has a disconnecting joint above the level of the crankase so that it forms a unit with the cylinder assembly. Thus cylinders, valves, camshaft and camshaft drive form a complete unit which is both light and compact.

Owing to the nature of the cylinder assemblies the crankcase is comparatively simple. There are upper and lower halves, split on the center line of the crankshaft, and the respective halves of the bearings are carried directly in the crankcase halves. The upper and lower crankcase halves are bolted together very strongly, and since each half takes its share in supporting the crankshaft, the case as a whole is very rigid and light in weight.

Both halves are aluminum castings and the upper half has a projecting foot running the entire length of the case on each side, forming the bedplate from which the motor is supported.

In the upper half, at the rear end, there are two short shafts in bronze carriers called the lower vertical shafts. Each of these shafts has a bevel gear at the lower inside and meshing with a bevel gear on the crankshaft. The upper ends of these two shafts project above the crankcase and are slotted to receive the tongues on the ends of the upper vertical shafts which are attached to the cylinder blocks as described. It is

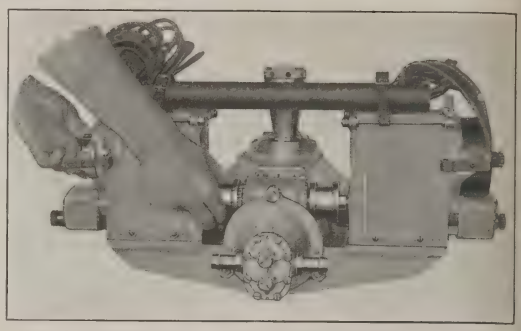


Model E or I motor ready for shipping. This is the condition in which the motor's weight is taken. The carbureter is in position

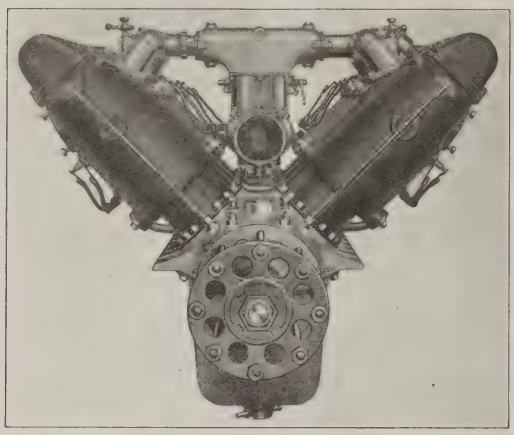
thus possible to remove and replace cylinders without disturbing any of the camshaft drive gearing.

The lower half of the crankcase supports another shaft with a bevel pinion at its upper end, this pinion meshing with the same gear on the crankshaft which drives the camshafts. This shaft is vertical and mounted in a bronze carrier socketing into a hole in the aluminum of the case. The lower end of the shaft connects by a tongue and groove with the shaft of the oil pump, the latter having its cast iron body socketed into the crankcase from beneath.

The oil pump shaft passes right through the pump and drives the water pump, which is attached to the outside of the crankcase immediately beneath the oil pump. Thus one bevel gear on the crankshaft drives the two camshafts, the oil pump and the water pump. This completes all the gearing



How the magneto may be timed through adjusting the coupling



Front end view of smaller motors

on the motor except the magneto drive, which is described later. All shafts run at one and a fifth times crankshaft speed except the camshafts and magneto shaft.

The crankshaft is hollow throughout for lightness and for the passage of oil. It is supported on four babbitt faced bronze bearings and one ball bearing, the latter being at the rear end immediately behind the bevel gear. The front end of the crankshaft has a taper on which the propeller hub is mounted and directly back of this is a ball thrust bearing housed in the crankcase.

At the rear end there is a difference between the Model A and the other two models. Model A crankshaft has a plug screwed into the end which can be changed for special attachments when it is desired to take a drive from the end of the shaft for a special oil pump or a starting crank. Models **I and E crankshafts have a screwdriver slot in the end** which is always used to drive the magnetos, the magneto mounting being different from that of Model A. There is also a difference in the form of key used on the taper end for the attachment of the propeller hub.

(To be continued)

THE LIBERTY STARTER

THE Liberty Starter is a four cylinder radial two cycle air motor and compressor with a bore of 2¼" and stroke of 2¼". As a starter it has 9 to 1 gear reduction on final drive to motor. It pumps direct drive at engine speed.

The valve construction is a semi-rotary of the Corliss type, having universal joint action to rocker shaft. The driving member between the rocker shaft and the valve not only performs the function of a universal joint, but is so constructed that the air pressure in valve chamber presses it against the end of rocker shaft bearing sealing the chamber airtight. It also permits the valve to be floated and held against the seat by the air pressure. This entirely eliminates the use of troublesome soft packing where valve actions are used.

The crank shaft is carried on roller bearings. All parts are idle except when brought into action as a pump or a starter.

The Liberty Starter has been approved and is being used by the United States Navy. The Japanese government recently placed an order for a large number.

The usual attachment on such as the Liberty, Hall-Scott, Renault and Bugatti motors is by bolting direct the flange of starter to the flange on motor. A suitable flexible coupling is provided for the drive to the crank shaft. Where flanges are not provided, such as the Curtiss V.X., etc., arms are provided for supporting the starter on engine runners.

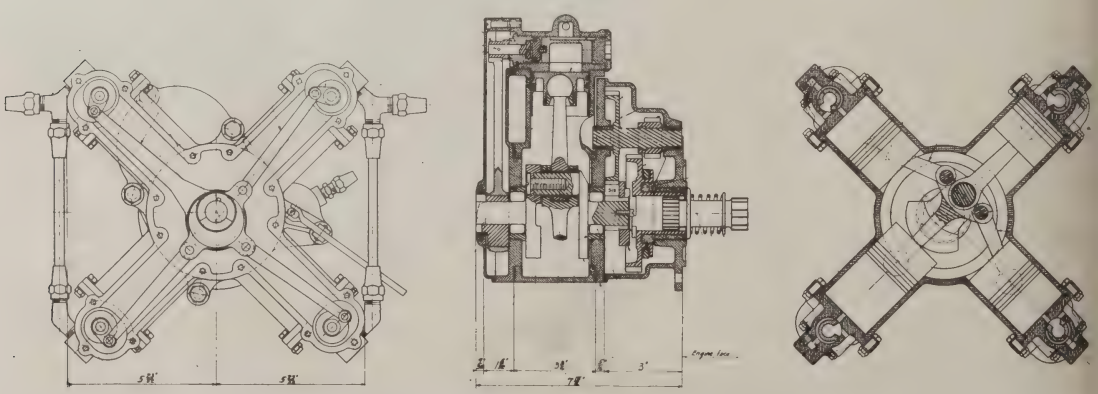
Although it weighs but 30 pounds completely the Liberty Starter is capable of starting the largest engines in service, such as the Liberty, Hall-Scott, Renault, Bugatti, etc. Its compactness lends itself to the requirements of installation on aeroplanes where but little space is available for "accessories" of any kind; though the "Liberty" can hardly be termed an accessory for it has really become a necessity.

Its length is only 8". It cranks the engine at 150 R.P.M. or more, and it replenishes its own energy in half a minute. The tank weighs 12¼ lbs., bringing the total weight of the outfit to 49 lbs.

After the engine is started, the Liberty starter automatically disengages and remains disengaged until it is needed again either as a starter or compressor.

When the air pressure in the tank becomes low, the compressor is put in operation by pressing a button on the control valve while the engine is running at low speed. When engaged, the engine must be run at from 1200 to 1400 R.P.M., and when the pressure has been brought up to 230 lbs., the mechanism automatically becomes disengaged.

Hundreds of these starters are in service throughout the country, and the New Mail Service is installing them in the larger machines.



Elevation and Sections of the 4-cylinder "Liberty" Starter

The Gallaudet D-4 Light Bomber Seaplane



FOR light bombing operations, the Navy Department has adopted the seaplane designed by Mr. Edson Gallaudet, whose wide practical experience in aeronautical design, and particularly machines adapted to Navy requirements, has placed him in a position to bring out a machine which has attracted considerable admiration.

The latest machine is the "Gallaudet D-4 Light Bomber Seaplane." In general it follows somewhat the lines of the Navy seaplane described in AERIAL AGE, May 14, 1917, but the latter machine was provided with two 150 H.P. Duesenberg engines, whereas the Light Bomber uses a single 400 H.P. Liberty "Twelve" engine.

Several refinements in detail have been incorporated in the newer design, and it is probable that the Gallaudet is now the fastest seaplane ever built. Its manoeuverability is exceptionally flexible, in spite of difficulties usually encountered in seaplane design.

On December 12th a series of tests of the D-4 Seaplane were carried out during a two-hour run over Narragansett Bay by Lieutenant E. F. Stone, U. S. N. The tests show the machine to be capable of cruising at 78 miles an hour, while the engine turned at 1,260 r.p.m. At this speed the fuel consumption was 16 gallons per hour, and the cruising radius 7.19 hours, in which time a distance of 561 miles could be covered.

General Specifications

Span, upper plane	46'-6"
Chord, both planes	7'-0"
Gap between planes	7'-0"
Total wing area	612 sq. ft.
Weight, machine empty	3,800 lbs.
Weight of useful load	1,600 lbs.
Weight, fully loaded	5,400 lbs.
Maximum speed	126 m.p.h.
Slowest landing	42.6 m.p.h.
Slowest getaway	46.0 m.p.h.
Climb in two minutes	2,100 ft.
Flying radius at full power	3 hours

The useful load is made up of the following:

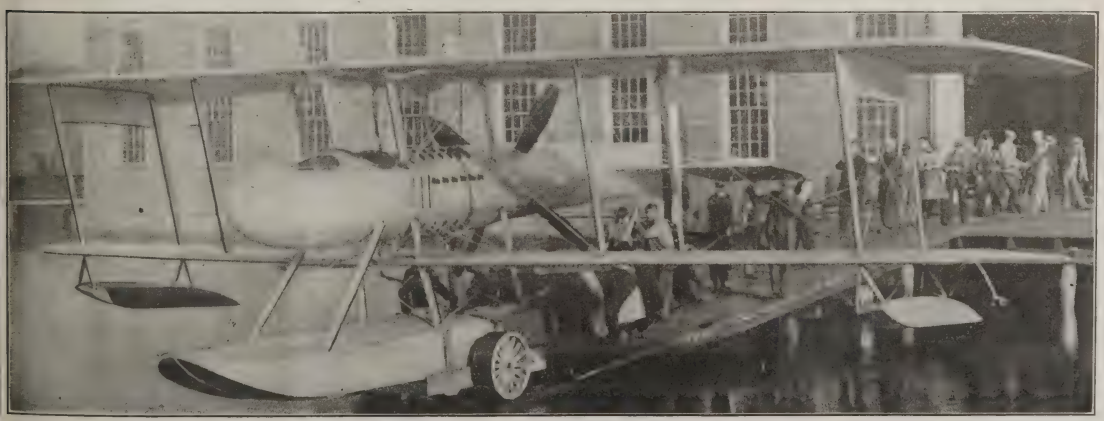
Water	115 lbs.
Pilot and observer	350 lbs.
Fuel and oil	650 lbs.
Ordnance	95 lbs.
Bombs	390 lbs.
Total	1,600 lbs.



The Gallaudet D-4 in flight over Narragansett Bay

The fuselage is of streamline form, with a circular section bullet nose. Steel tubing is employed in the framework. At the forward end the gunners cockpit is located. A flex-

(*Continued on page* 831)



The 400 H. P. Liberty motored Gallaudet D-4 light bomber seaplane

"THE OP

Curtiss Achievements"

1—The design and construction of the fastest fighting airplane ever flow Government records credit this triplane, which was built for the U known as model 18-T, with 160 miles per hour, carrying full military and passenger. This is 15 miles per hour faster than any speed ever an airplane, a truly epoch-making achievement, made possible by the d of our new model K motor.

2—The design and construction for the Navy of the largest flying boats in colossal crafts capable of carrying five tons useful load. It was one of that recently carried fifty passengers.

3—The design and construction for the U. S. Navy of the fastest and m Seaplane in service anywhere. This craft which is known as the Curtiss with Liberty motor, made an official speed of 126 miles per hour with f load, armament, ammunition, pilot and passenger.



The Curtiss Engineering Corporation is today the center of aer Glenn H. Curtiss and his engineers have been busy in drafting room of suitable commercial types. Aircraft especially designed for sportsm workmanship and performance as Curtiss military planes have proved

CURTISS ENGINEERI

iss

BOOK"

The Great War

evelopment and construction of a 12 cylinder, 400 H.P. motor of an entirely
id much lighter type, known as the Curtiss model K-12. These motors have
one exhaustive tests and are already in production.

evelopment and construction of the Curtiss model K-6, a new and much
6 cylinder motor. These engines develop 160 H.P. and possess greatest en-
e and reliability.

evelopment and construction on a large scale of the Curtiss OXX motors,
e J-N-4. training planes, which were used almost exclusively by the United
and Canada and largely in England for the training of American and
aviators. The training of over seven-tenths of the original land and
flying pilots, most of whom entered the service and formed the nucleus
United States Training Forces.



ies instead of being decreased will be increased by the coming of peace.
nels and shops in perfecting designs and carrying forward the production
r peace-time purposes are already available and are as superior in design,

'ION, Garden City, L. I.

THE HUGHES AIRCRAFT REPORT

(*Continued from page* 672)

NINTH—SUPERVISION OF PRODUCTION—WASTE

Little need be said with respect to the supervision of the production of engines. Although the numerous changes in the Liberty engine, and the remedying of the defects which were disclosed, necessarily involved considerable outlays, the losses due to these causs can hardly be said to be greater than would naturally be expected in the development of a new high-powered motor for aeroplanes. It has already been pointed out that the actual cost of the first lot of 600 motors at the plant of the Packard Motor Car Company, which was earliest in production, was as high as $3873 per engine, and that this cost was subsequently reduced so that the average cost of the first 1200 motors was $3442, and that it is expected that the cost per engine at this plant will fall below $3200. Again, the actual cost of the first lot of 600 motors at the plant of the Lincoln Motor Company was $3583, and it is believed that motors can now be produced at this plant at a little, if any, over $3000 per engine. The enhanced cost of the first lots of engines may be said to reflect in large measure the expenditures which could have been avoided had there been no changes in design, but these outlays fell within the range of reasonable experimentation and can not justly be regarded as showing a lack of careful supervision.

The chief losses, which may be properly characterized as waste, have been in connection with the production of aeroplanes. A statement has already been made (*ante*, p. 15) of the cost of the Standard-J1 training planes which were condemned as dangerous in June, 1918, because of the unsuitability of the type of engine. The expenditures on the Standard J-1 planes, including the engines, to September 30, 1918, amounted to about $17,500,000, and the amount which may ultimately be saved if these planes are utilized with another engine can not now be stated.

The changes in the DeHaviland 4s which have been detailed (*ante*, pp. 126-131) caused great additional expense which could have been avoided had there been a more efficient organization and prompt decision as to equipment. The most serious waste, however, in connection with service planes was in the work and materials thrown away on the Bristol Fighter, which was in course of production at the plant of the Curtiss Aeroplane and Motor Corporation, and was finally condemned in July, 1918 (*post*, *p.* 157).

Under the cost-plus contracts it was of the utmost importance that there should be the most careful supervision of production and an adequate system of cost accounting so that useless expenditures should be avoided and actual costs carefully determined. This undertaking was difficult in itself, but it was rendered even more difficult by the demand for haste and the necessity of quickly providing a large force of inspectors and accountants in a novel undertaking. Manufacturers were in constant opposition to what they regarded as unnecessarily technical requirements by accountants, and the government representatives themselves were admonished by their superior officers not to let strictness stand in the way of production. And it could hardly be expected that this large matter of industrial supervision and cost accounting could be adequately handled under the restrictions of military organization. Moreover, not only was efficiency hampered, but the door was open to abuses, and despite the fidelity of many who sought to protect the Government, wasteful conditions were permitted to exist which were wholly inexcusable. It should also be said that a large outlay has been caused by the fact that the Army and Navy each maintains a complete staff of accountants so that, for example, in the North Elmwood plant of the Curtiss Company, where both Army and Navy work is being done, there are two sets of Government employees at work in all branches of cost-plus accounting under the respective contracts.

Labor

Labor conditions generally were unsatisfactory. In the labor market the Government was largely competing with itself. At the plant of the Packard Company the labor turn-over is from 400 to 600 per cent. a year, which would mean 40,000 to 60,000 men coming and going in order to maintain an organization of 10,000 to 11,000 men. The larger portion of this "floating," as it is called, occurs among probably 4,000 to 5,000 men, and the testimony is that in some departments there has been a complete change about fifteen times a year. Women have largely been employed in many plants with satisfactory results. The plant of the Wright Martin Aircraft Corporation at New Brunswick, New Jersey, is a conspicuous exception, few, if any, women being employed in the shops. The testimony is that the local labor organization has taken a stand against the employment of women, and accordingly this has not been pushed by the management.

In the case of the Wright Martin Company also it was apparent that a very large proportion of the employees were within the draft age as fixed by the Selective Service Law of May 18, 1917. The records show that on August 15, 1918, 41.36 per cent., or 2,300 of the total number of employees (5560) at the New Brunswick plant were within the draft age, and of this number 15.83 per cent. were in Class 1. The report of the representatives of the Government at this point states that the method used by the Company for securing deferred classification and indefinite furloughs is as follows: When a man is employed who is in Class 1 of the draft, he is given a week to "make good." If he then is found to be efficient his foreman induces an application for deferred classification, and if this is refused by the District Board and the employee is called to camp, a request is made by the company to the personnel department of the Bureau of Air craft Production for his return on indefinite furlough. Prior to August, 1918, the operations of the draft department of the Company were open to serious criticism and exhibited many irregularities. In one case a man, whose duties were such that anyone who could handle a screw-driver could do his work, was drafted and immediate steps were taken to have him returned as a "motor builder." Previous to his employment by the Company he had been employed as a stock clerk by a manufacturer of gowns and he had no previous mechanical experience. In another case a man who was considered a deserter by his Local Board was finally located at the plant of the Wright Martin Company, where he was arrested and inducted into the Army. Affidavits were immediately presented for his return from camp upon industrial grounds, and he was returned accordingly. One who had been a clerk of a carpet company, without mechanical experience, and who had a minor assembly job, was drafted and was returned on indefinite furlough as a necessary employee. A former proofreader, a former skating-instructor, and a former coupon-clerk, who had obtained employment at the Wright Martin plant were drafted and similarly returned. In other cases, men whose work was entirely clerical secured deferred classification on industrial grounds. Cases of this sort have now been brought to the attention of the Provost Marshal General. It is stated by the Government representative that at present the draft department of the Wright Martin Company is in competent hands, and it appears that its work is being done with a better regard for the interests of the Government.

Labor Cost

To establish the labor cost under cost-plus contracts it was necessary that there should be proper time records and suitable provision for the identification and check of employees as they entered and left the factory. The opportunities for irregular pay-rolls, through laxity or connivance, are obvious. The conditions in this respect at the North Elmwood (Buffalo) plant of the Curtiss Aeroplane and Motor Corporation were especially bad. It was at this plant (completed last Fall) that the cost-plus work was done on the Bristol Fighter for the Army and the HS-1 seaplane for the Navy.* There is abundant testimony, with picturesque detail which can not be given here, to the effect that at the North Elmwood plant large numbers of employees were kept on the pay-rolls when they were not needed; through an utter lack of a decent system men and women were paid when they did not work; employees were able to leave the factory without being detected and remain absent for hours while recorded as on duty; employees would ring one another's time cards; men who were without work enough to keep them busy during the day were employed over-time at increased rates; men were brought to the plant on Sundays when there was virtually nothing to do; and for many months there was such demoralization at this plant that it became the subject of contemptuous gossip among the employees and in the community. One of the inspectors for the Navy testifies that as late as July he, with others, went through the plant at night on a tour of inspection, and not only were they able to go from one end of the plant to another without being asked for their passes, but they found absurd conditions of idleness. In one room, "the foreman and three men (were) sprawled out on the floor," and, as he put it, there were "slackers from one end of the plant to another."

It is urged in palliation that the cancellation of the Spad order and the difficulties encountered in the development of the Bristol created a state of confusion, and that the management was constantly expecting to be able to get into production and felt it necessary to maintain an adequate force for this purpose. That the force was increased heavily at the North Elmwood plant during the early period, despite the fact that there were serious difficulties with the Bristol design and the Company was not ready for large production, is beyond question. In October, 1917, the average number of men working at the North Elmwood plant was 578. In December this was increased to 4142; in January, to 5970; in February, to 7029; there was a decrease of a few hundred in March and April, and an increase in May to 7557, and in June the average number at work was 9788. To approximately sixty per cent. of its capacity, this plant was either idle or working only in connection with the Bristol. The employment of men on a large scale when there was not work enough for them had much to do with the virtual destruction of the morale at the plant. But whatever loss the Government has sustained in this way is not nearly as large as it might otherwise have been, by reason of the fact that a careful re-audit is in progress, which should be strictly prosecuted, and final settlement of payments awaits a satisfactory determination of actual outlays.

Employment of Alien Enemies

Among the regulations established by proclamation of the President on April 6, 1917, was the following:

"An alien enemy shall not approach or be found within one-half of a mile of any Federal or State fort, camp, arsenal, aircraft station, Government or naval vessel, navy yard, factory or workshop for the manufacture of munitions of war or of any products for the use of the army or navy."

Under the authority granted by the President to the Attorney General for the administration of the alien enemy regulations, the Department of Justice developed a permit system whereby alien enemies could obtain permits to be employed within a munitions factory, including one engaged in the manufacture of aircraft, within the half-mile zone. The granting of such permits is entrusted to the United States Marshal of the district, who is authorized to issue them if he is satisfied that such action will be in no respect dangerous to the community or the United States. He is required before issuing a permit to confer with the special agent of the Department of Justice in the locality, to make a thorough investigation, to get the approval of the United States attorney or assistant United States attorney of the district, and also to obtain from the employer a certificate in writing to the effect that he desires to employ the applicant and that he is satisfied that such employment will not be to the injury of the community or the United States. Sponsors or bonds may be required and all such permits are revocable.

It will be observed that while the precaution has been taken to require suitable investigation by agents of the Government, the cooperation of the employer, who has special opportunities for obtaining accurate information, is expected. It is manifest that unless the Government is in possession of facts showing the inadvisability of the employment, the certificate of the employer in compliance with the regulations is likely to be most persuasive.

There is considerable difference in the practice of the various companies engaged in the manufacture of aircraft as to the employment of enemy aliens under these regulations. The following illustration will suffice:

The Fisher Body Corporation states: "We do not employ any German aliens in our aeroplane factory or in our aeroplane divisions." On May 22, 1918, Mr. Kepperley, the Vice-President and General Manager of the Curtiss Company, gave instructions that under no circumstances should alien enemies be employed. Despite this instruction some alien enemies, who had previously been employed on permits, were retained in positions of importance. One of these, who began work for the Curtiss Company last Fall, was put in charge of the milling-machine department in the machine shop, and became assistant general foreman of the machine shop at the North Elmwood plant. Another German subject (having a brother in the German navy) who began to work in the Curtiss plant in February, 1917, became foreman in the welding department at the North Elmwood plant and has been at work on all the tubing work and tail units for the Bristol Fighter as well as on the engine braces for the HS flying boats. Another, who had himself served one year in the German army and was discharged on account of wounds, was employed as tool maker at the Curtiss plant until sometime in June.

*The Curtiss Aeroplane and Motor Corporation has seven distinct plants: at Buffalo, the Churchill Street group (including the Churchill Street plant where training planes are made, and the plants at Niagara Street, Bradley Street and South Elmwood, making parts for Churchill Street); the Austin Street plant, doing Navy work, including contracts for the British Government; and the North Elmwood Avenue plant. At Hammondsport, New York, motors are manufactured exclusively. The work, except at the North Elmwood plant, is on a flat-price basis.

The Lincoln Motor Company states: "It is our endeavor to employ none but American citizens or friendly aliens. We are careful and using every precaution to not employ enemy aliens." The Nordyke & Marmon Company is equally careful. Their statement is: "At this date there are no alien enemies employed in the aeroplane-engine division. A very few have been employed in this division from time to time but for only short periods at a time, as it has been our settled policy from the beginning of the war to keep alien enemy employees out of our Government departments, notwithstanding the individual man might be perfectly harmless. As fast as these men have been discovered they have been discharged."

About 200 enemy aliens (including Austrians and Hungarians) are employed by the Packard Motor Car Company. About 200 enemy aliens not Germans, but Austrians and Hungarians) are employed at the plants of the Wright Martin Aircraft Corporation in New Brunswick and Newark. No enemy aliens are employed by that company at its Long Island City plant.

The Ford Motor Company has about 250 German aliens who are employed in departments dealing with Government work. 143 of these are in departments in which from 20 to 60 per cent. of the work done is Government work; 35 are at the blast furnace, and 61 are at the shipbuilding plant which is doing Government work exclusively. These enemy aliens are working under special permit granted on the company's recommendation.

German Sympathizers

The serious risk that is taken in permitting men of known pro-German sympathies, whatever their citizenship, to work in aircraft plants in any important capacity is generally recognized. The opportunities are abundant for delays and interferences in production through the action or inaction of those controlling the progress of production. It is the assumed sympathy with his nation which makes the employment of the German subject dangerous, and the danger may be quite as great in the case of one who, although not an enemy alien, is more friendly to Germany than to the United States.

There have been persistent rumors of pro-German sympathies on the part of employees of the Curtiss Company, but it has been impossible to ascertain to what extent, if any, the demoralization that until recently has existed at the North Elmwood plant of that company was due to any influence of this hostile description. The conditions that existed naturally bred distrust which was reflected in common talk, but facts warranting a definite conclusion as to disloyalty on the part of employees in important positions are lacking.

In the case of the Ford Motor Company, one of the company's employees (who formerly had been in the Educational Department and had represented the American Protective League) testified as to his inquiry into cases of disloyalty. The reports obtained by him exhibit utterances of employees in antagonism to the Government, insulting references to the President, and praise of the Kaiser. In an extreme case, in which the employee reviled and even threatened the President, there was a prosecution and a plea of guilty. The man was fined $300, was released, and the testimony is that he resumed work in the Ford plant. The reports were numerous, and the employee who obtained them testified that there were about 200 employees whose loyalty was seriously open to question, but how many of these were employed in Government work he could not say. So far as the Liberty engine was concerned, his investigation related to half a dozen cases in the Drafting Department in the Ford Company. In this department there was a serious situation which engaged the attention of the management. Its importance was manifest from the fact that the drafting department embraces the tool design and drafting room in which the drafting work upon the Liberty engine is done, and it is possible for one in that department to bring about delays, the causes of which, in view of the multiplicity of drawings involved, it would be difficult satisfactorily to trace. This department was in charge of Carl Emde. There were repeated reports of pronounced pro-German utterances by Emde. A former employee, who had left the plant voluntarily and had later been found with plans and photographs of the plant, was a close friend of Emde's and had been employed in his department. This man, it is understood, has been interned. While nothing conclusive could be established against Emde in relation to his work, the advisability of removing him from a position of such strategic importance was clear to some of the most important men in the management. A conference was held on the subject at which Mr. Ford and the factory managers were present. According to the minutes of this conference reports were read from various members of the drafting department who were in touch with the situation, and who felt that the department was practically a pro-German institution." Several conferees expressed the opinion that Emde should be removed, and one said that in his opinion "in the very nature of things Mr. Emde could not give us everything required to assist the Government of the United States." Mr. Ford, however, was opposed to that course and overruled his associates. Mr. Ford's position and his reasons are thus set forth in the minutes:

"Mr. Ford deliberated and stated that he had heard numerous rumors but in speaking of all he had heard there had not been one thing shown him which would make him change the present head of the drafting department. He felt that it was a time of sacrifice—that in the next few years every man would be called upon to make some sort of sacrifice, and that possibly Mr. Emde, German born, was making his sacrifice now when making drawings for the Liberty motor to be used ultimately against Germany."

This statement of attitude is sufficiently expressive and requires no comment. The proposed removal did not take place. There has been a laxity at the Ford plant with respect to those of German sympathies which is not at all compatible with the interests of the Government. In reference to Mr. Ford's view, those in direct charge of production, who were alive to the situation, have had to pursue a policy of constant watchfulness and supervision instead of being free to take the precautions which the exigency demanded.

Materials

The leading causes of waste in material were engineering changes and faulty workmanship. As material was rendered useless it was scrapped, and there is no little evidence of a lack of care in securing salvage. For the losses due exclusively to changes in design after authorized production had begun, the manufacturers can not be regarded as responsible; and these losses, while they cannot be accurately computed, are undoubtedly heavy. Their extent, of course, is proportioned to the stage of production reached when changes were directed; and with respect to the service planes the history of production at the Dayton Wright Airplane Company, the Fisher Body Corporation and the Standard Aircraft Corporation discloses the same conditions varying only in degree as to the delay and waste caused by repeated changes.

With respect to the intelligence and efficiency of the inspection, and the extent to which rejections have been on sound grounds, there are naturally differences of opinion and complaints and counter-complaints the basis for which can not be satisfactorily determined. It is to be noted that the rejection of spruce which has gone into production has reached a high percentage. Even at one of the best plants the Government representative puts the percentage as high as sixty per cent. after allowing for salvage, and at other points the percentage of rejections was probably higher.

A poor industrial organization such as existed at the plants of the Standard Aircraft Corporation and the Curtiss Company (North Elmwood plant) did not favor economical production, and in the case of the former company conditions were aggravated, as already pointed out, by the assignment to that Company of a large number of small orders for varied work. At the North Elmwood plant of the Curtiss Company the waste which was incident to delay and changes was vastly increased by irregular practices. Thus, in order to keep men busy who apparently had no proper work to do, there was excessive production of parts. A production order might be for 500 parts, but the actual production might run to 5000 or even more of these parts until this unwarranted conduct was discovered and stopped. There is instance after instance of excessive production which served to increase the size of the scrap heap when a change made the parts useless.

Again, at this plant when a change would lead to an order stopping the production of parts, production often would continue despite the order. As an illustration, one witness testified that he had personally given a stop order on certain metal parts and found two weeks after, in going through the metal shop, that they were still making the parts, sending them through the various operations and working over-time on their production. During periods of idleness employees devoted their time to making clocks and toys out of the materials at their command in the factory. Excess material was scattered about the factory without a proper record being kept of it. And it appears that material would be sent to the scrap heap instead of being properly salvaged, in order to cover mistakes.

There was also a lack, at the Curtiss plant, of proper records of material. In the case of steel stores there was confusion between what had been supplied for the Army work, for the Navy work, and for the Curtiss fixed-price work, so that accurate accounting based on the ledger entries was wholly impossible. And in addition to other manifest delinquencies, there was an absence of proper plant protection. The situation of the Company in view of its experience with both the Spad and Bristol orders was undoubtedly a difficult one, but the lack of competent industrial administration is too clear to admit of dispute and has freely been confessed.

There has been little evidence at the North Elmwood plant of the exercise of the broad powers of the Government to prevent these abuses, and the fact that conditions were permitted to continue reveals the failure of the representatives of the Signal Corps to take proper steps for the protection of the Government's interest. There was, however, such an absence of system on the part of the Company in the keeping track of parts, and so many changes in the persons employed, that, while there is abundance of general testimony, it is practically impossible at this time to trace particular instances of dereliction to individuals in order with suitable particularity to support definite charges. The divided responsibility which resulted in giving the design of the Bristol so largely into the control of the representatives of the Curtiss Company was also a source of embarrassment, and the extreme haste to make up for lost time added to the confusion. Conditions through the Winter and early Spring were chaotic and the improvement that has been made since that time has been unnecessarily slow. It is fair to say, however, that recently there have been changes which promise a needed betterment in the industrial organization.

So far as the loss of the Government in connection with the Bristol is concerned, the payments already made to the Curtiss Company, according to the Government accounts, amount to upwards of $2,000,000 exclusive of advances, and as already stated, the Government has estimated that the loss, including claims growing out of the cancellation may reach $6,500,000 (*ante*, p. 16). The Government, however, has a margin of security by reason of deferred payments, and a re-audit is in progress which must be completed before a final settlement is made for materials furnished. The loose methods employed by the Company should be taken into consideration and a final settlement should be reached only upon satisfactory proof of proper outlays.

Overhead Charges

In the course of production payments have been made on account of overhead charges upon the basis of a general estimate; that is, by taking a percentage of other outlays, which seems to be justified in the experience of the plant, as representing the overhead expense. The overhead expense embraces general administrative outlays, including executive salaries; and the theory of the cost-plus contract is that the Government pays the expense of superintendence as a part of the cost.

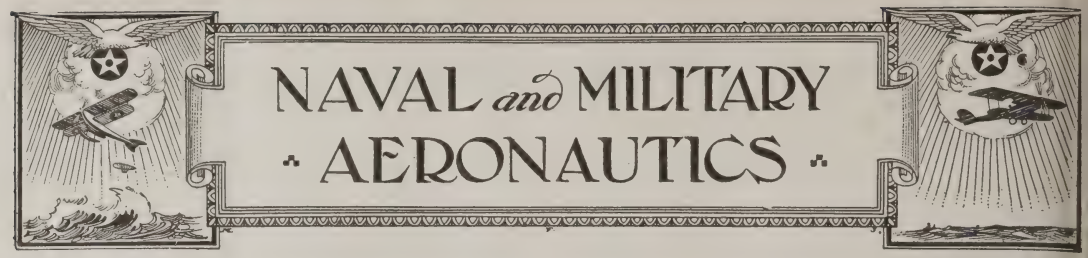
It is, of course, important that fair salaries should be allowed, and all exorbitant demands rejected. Reference has already been made to the salaries paid to the executive officers of the Dayton Wright Airplane Company, who were at the same time the stockholders in a close corporation and divided their time with other companies from which they received high salaries. There appears to be no justification for even the temporary allowances to the Talbotts and Kettering of annual salaries aggregating $100,000, and the explanation furnished that the "relations with the contractor were somewhat delicate at first, and, moreover, the Company was in crying need of cash, and any withholding of amounts due was sure to create much friction," is not convincing; inasmuch as the individuals, and not the Company, got the money, and it is difficult to see how "friction" in this matter could have injured the Government. It is also stated that when the salaries were allowed in the Fall of 1917, dating from August 1, 1917, it was felt that it was a matter of considerable importance "that would have to be passed by Colonel Deeds, who was in charge of the Equipment Division," but Colonel Deeds testifies that he knew nothing of the salaries that were paid to these officers.

It should be said, however, that these allowances, under the terms of the contract, should be regarded as tentative, and that it is within the authority of the Finance Department in its final settlement to adjust the matter on a fair basis. And that is the position of that department.

Even more extraordinary was the salary paid by the Standard Company to its President, Mr. Mingle, at the rate of $63,000 a year, which is sought to be charged as a part of the cost of operations. This, however, has not been allowed. The question what would be a proper allowance has been under consideration. Several vouchers have been passed which represent merely payments on account, or payments "subject to adjustment," and it is stated that the amount of Mr. Mingle's salary thus far actually allowed is at the rate of $15,000 a year.

The adjustments of overhead expense, as are the other payments on vouchers under the cost-plus contracts, are subject to a revision of accounts and it is within the power of the Finance Division in the ultimate adjustment of cost in accordance with the terms of the contract to protect the Government against any claims on the part of the contractors which may be found to be unjustified.

(*To be continued*)



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in order named for temporary duty.
Note 2—Report to Air Service Headquarters, Fayetteville, N. C.
Note 3—Report to Air Service, Detroit, Mich., to the officer in charge.
Note 4—Report to Honolulu, T. H., to the Hawaiian Dept. for duty with the 6th Aero Squadron.
Note 5—Report to Aberdeen, Md., to Commanding Officer of the 271st Aero Squadron
Note 6—Report to Chief of Tech. Section Dayton, Ohio.
Note 7—Report to Dist. Mgr. Aircraft Prod., Dayton, Ohio.
Note 8—Report to Bureau of Aircraft Prod., Air Building, Dayton, Ohio.
Note 9—Report to Students' Army Training Corps., Boston, Mass.
Note 10—Report to Commerce Building, Houston, Texas.
Note 11—Report to Chamber of Commerce Building, Indianapolis, Ind.
Note 12—Report to Air Training Radio Warehouse, Houston, Texas.
Note 13—Report to Aircraft Acceptance Park, Elizabeth, N. J., and wire DAP.
Note 14—Report to Emerson Field, Camp Jackson, Columbia, S. C.
Note 15—Report to Dist. Mgr. Aircraft Finance, 360 Madison Ave., N. Y. C.

Special Orders Nos. 270 to 279 Inc.

Quinn, Langdon C. ..... HHN
Quigley, John V. ..... CGC
Quaw, Clayton D. ..... CGC
Quirk, Joseph C. ..... KST

R

Russell, Maurice S. ..... TFT
Rice, David E. ..... KST
Robertson, Lawson ..... CGC
Roberts, George Downing ..... SLA; MAC
Rankin, Carle Austin ..... SLA; BST
Ronne, Edwin M. ..... NOTE: 4
Ramsey, John E. ..... EOT
Rich, James Leslie ..... MAT
Richardson, Frederick S. ..... HHN
Richards, Eldon Zent ..... SLA; TMA
Rogers, George Washington ..... DMA
Ritter, Paul N. ..... CFT
Rooney, Francis Lawrence ..... SLA; MAT
Rasmusson, Glen Robert ..... SLA; CRI
Redfield, Alfred W. ..... HHN
Reynolds, George Edwin ..... TMA
Rinker, Harry M. ..... GLC
Reese, John C. ..... CWT
Rogers, Oscar Leslie ..... CFT
Reynolds, Burton Ralph ..... SLA; MAT
Robertson, William B. ..... HHN
Ross, Glenn Shearer ..... SLA; KST
Ripperger, Clement Martin ..... SLA; MAC
Robertson, George Oliver ..... SLA; MAT
Ritter, Paul N. ..... CFT
Richman, G. Raymond ..... HHN
Ruegg, James E. ..... CAF

S

Sidenberg, George M., Jr. ..... AGC
Soule, Frank L. ..... RSD
Stewart, Clyde Emery ..... MAC
Sharpnack, John W. ..... RSD
Schlotterbeck, Lewis ..... SLA; TFT
Smith, Clement James ..... SLA; MAT
Smith, Henry Robert ..... SLA; SBI
Serguson, Raymond Patrick ..... SLA; MAC
Stephenson, James Mitchell ..... SLA; MAT
Shcroeppel, Harold H. ..... DAF
Shields, Henry Maxwell ..... SLA; CFT
Striker, Wallac M. ..... UTA
Smith, Vernon V. ..... LHV
Slover, Clark Harris ..... SLA; MAT
Schenck, Frederick W. ..... CGC
Spink, Ernest William ..... SLA; PMT
Schloss, Leo ..... RWT
Schwartzenbek, Francis Xavier ..... SLA; MAT
Strachan, Otto W. ..... AHT
Stobbs, Thomas William, Jr. ..... PMT
Stoffregen, Henry M. ..... HHN
Smith, Allyn G. ..... PFO
Selden, James K. ..... RSD
Soto, Earl ..... KST
Schell, Harold W. ..... LDT
Shilliday, Dave Blair ..... SLA; TMA
Squier, Merrill A. ..... HHN
Stanley, John M. ..... HHN
Suhr, Donald Louis ..... SLA; MAT
Shaw, Burton A. ..... BST
Storrie, Walter ..... MAC
Slimmon, James B. ..... HHN
Sumner, Edwin V. ..... LTC
Stanton, Lyman William ..... SLA; CRI
Snodgrass, Cleland ..... TMA
Sanders, Clarence L. ..... KST

one, Hubert Lafayette.....SLA; EOT
coby, Hal A.....CWT
herer, Bud F.....GLC
tovall, Willis.....TFT
haw, George E.....HHN
harpnack, John W.....HHN
anders, William C.....CWT
chell, Harold W.....LDT
haffer, William L.....HHN
helton, Carrell E.....LHV
howalter, Roy R.....HHN
hort, Shirley J.....SLA; BFT
mith, Crompton.....SLA; TMA
chwartz, Edgar L.....GLC
palding, Lester H.....CPA
mart, Ralph Gordon.....SLA; TMA
anders, William C.....CWT
hannon, George Cunningham.....SLA; PMT
ote, Earle.....KST
wope, Harry.....KST
herwood, Horace M.....TMA
mith, Harry M.....HHN

T

rimble, Philip Augustus.....SLA; EOT
hompson, Alexander Raymond.....SLA; CFT
aylor, Elmer L.....Note 10
rusler, Harold M.....DAF
rainer, Lloyd M.....EOT
albott, Harold Elstner.....Note 3
rowbridge, Jones R.....Note 5
Thompson, George S.....DMA
Trout, William Hall.....SLA; MAT
Tobelman, Gustave Henry.....KST
Todd, Harold Arthur.....ELA
Taylor, Newell E.....SAG
Tucker, Maurice L.....DMA
Tracy, Linwood W.....TFT
Treacy, Richard B.....DMA
Tuohey, Ellsworth B.....PWM

U

Underhill, Charles R.....LHV

V

Von Rosenberg, Herbert J.....EOT
Varney, Walter Thomas.....MAC
Valentine, Everett Milton.....CFT
Vaughan, Raymond E.....LHV

W

Walsh, John Leo.....SLA; ELA
Watson, Franklin.....SLA
Wheaton, Sidney Levi.....SLA; EOT
Witt, Joseph B.....CAF
Wirgman, Stewart L.....PFO
Warner, James William.....KST
Williams, Victor Elza.....KST
Winslow, Kenelm.....DMA
Watson, Harold E.....HHN
Williams, Philip.....KST
Wilson, Floyd Charles.....KST
Welch, Alfred Jerome.....SLA; TMA
Whitney, Reginald W.....HHN
Warner, Wyllys Edwin.....MAC
Winston, Thomas Blakley.....MAC
Weill, Lawrence Isaac.....MAC
Weston, Roy Faunce.....EOT
Whitehead, Eugene C.....AHT
Wright, George Osgood.....CFT
Whitehead, Ennis C.....RSD
Williams, Roger Q.....SAG
Wiegand, Vernon I. E.....CAF
Williams, Hugh Vanduyn.....SLA; SAG
Worsham, George Atkinson.....SLA; EOT
Wilbur, Clifford H.....PMT
Walter, George Metcalf.....SLA; MAC
Warner, Orville Holton.....SLA; MAC
Weede, Robert Ora.....SLA; MAC
Welty, Donald Regnier.....SLA; MAC
Weston, Harold Wilson.....CFT
Weil, Joseph.....SLA; EOT
Warren, George S.....PMT
Wentworth, Will.....SLA; MAT
Welch, Calire V.....KST
West, Stewart Nicholson.....SLA; MAT
Willis, Allan S.....DMA
Weldon, Roland Eugene.....EOT
Wright, Wilbur A.....BFT
Wilson, John L.....CFT

BUILDING A HUMAN MACHINE

Naval Aircraft Factory, Navy Yard, Philadelphia, Pa.

ON October 1, 1917, the first mechanic was hired at the Naval Aircraft Factory, the only government-owned industry of its kind in the United States. On November 1, 1918, there were 3642 men and women employed in building flying boats for the Navy.

When the Navy undertook the work of building its aircraft plant and when, one after another the structures of steel and concrete and glass began to rise at League Island it became necessary to fit into the huge scheme the human material.

It was something new. Executives, engineers, technical men, clerks and mechanics had to be gathered together and nearly all of them taught new duties. And the best answer that might be given is the simple announcement that to-day the Naval Aircraft Factory is ahead of its schedule of production.

The Navy could not call upon employees from other aircraft factories because these were already short of skilled aid. It had to develop its own organization. Civil Service rules, at first looked upon as a handicap, had to be dealt with and Naval regulations were to be taken into consideration at every step.

To-day the organization is complete; it is effective; it is as thoroughly stabilized as one of the winged boats that it sends to the fighting men in Europe. And do not forget this point: that out of the nearly 4000 employees at work to-day not more than twenty-five had previous experience in other aircraft factories.

Testimony of the generally satisfactory calibre of the employees secured under Civil Service is found in the fact that it was necessary to hire a total of only 6035 persons to provide for the growth of force and for replacements. In private industry it is often necessary to hire 8 to 10 persons before a satisfactory employee is secured. Further testimony of the generally satisfactory calibre of the working force recruited under Civil Service is found in the fact that only 139 persons have been discharged for cause since the start of the factory.

In spite of the bareness of the labor market and the fact that the calibre of workmen available in that market is reputed to be low, and although unsatisfactory employees have often been hired, the quality and spirit of the workmen of the Naval Aircraft Factory are regarded by the Manager as very much superior to those of most of the emergency plants created by the war. Witness the fact that $840,450 was raised in the Third and Fourth Liberty Loan by the employees of the Naval Aircraft Factory—$350,000 in the Third Loan and $515,450 in the Fourth Liberty Loan.

The hulls of the seaplanes are the hardest to build and boatbuilders were essential. The heads were informed that real old-fashioned boatbuilders no longer existed. A representative of the Naval Aircraft Factory was sent to the New Jersey coast, and in two trips visited the main boatbuilding centers between the Toms River and Red Bank. Old Boatbuilders, who for years had run their own small boatshops near their homes, were visited. The need of seaplanes to fight submarines was pointed out. Patriotism runs high among these Jersey shoremen, and many an old boatbuilder closed up his shop, bade good-bye to his family and went off as one expressed it "to help beat them Dutch." In all, these trips induced nearly eighty boatbuilders to come to the Naval Aircraft Factory, and they have proved to be excellent mechanics. Trained to do *all* of a job, they readily accommodated themselves to do any kind of work. A course in blue print reading was given them so that those unacquainted with blue prints might better understand the complex blue prints of a seaplane.

These men have been the nucleus around which has been built up the organization in the Boat Shop which turns out a boat hull a day, thus overcoming one of the most serious difficulties at the start of the Factory.

Every man in a supervisory position in the Boat Shop has been secured originally by the Employment Department as a mechanic and has since won his position from the ranks. The Foreman of the Boat Shop, William T. Rote, was one of these. "Billy" Rote is from Island Heights, New Jersey. He is Mayor of the town. For twenty-five years he has run a small Boat Shop making yachts and racing boats for summer visitors. When asked to come to the Naval Aircraft Factory, he demurred. He couldn't leave his business. He was Mayor of the town, and had just been re-elected. But he would do anything to "beat the Dutch," and visited the plant to "look it over." The opportunity of working in a big Boat Shop on boat hulls for the Government won him over. On January 3rd, 1918, he reported for work carrying an immense chest of tools. For two months he worked with his tools. On February 24th, 1918, he was placed as assistant straw boss in the Pontoon Department. The straw boss was soon moved to another department and Rote became straw boss of the Pontoon Shop where he again made good. A new foreman was needed to put the big Boat Shop in shape and Rote was given the job. He took it and, like Henry Ford, instituted progressive assembly in manufacture. The output in boat hulls increased so rapidly that one boat a day was turned out where the original estimates had provided for only five boats a week.

On June 3rd, 1918, "Billy" Rote, Mayor of Island Heights, N. J., received his appointment as Foreman Boatbuilder.

The plant has been built up on such examples of growth and development. After it attained a certain size the Manager sought for desired abilities from within his own organization, rather than by hiring in strangers to do important work. To promote this aim there has been made a vocational index card for each employee to show his abilities in detail so that valuable abilities in the plant might not be lost sight of when promotions were considered.

Certain unions, especially the Patternmakers' have been of assistance in sending men. But most of the new employees have been secured in a flow of employees who have made application in person. From the great mass of trades, of abilities, of experiences, there had to be selected those with the necessary skill to do the work.

Among those who applied in person was a disabled Belgian Soldier who had escaped from a German prison camp, and a former French Aviator who had been injured and declared unfit for military service.

The Frenchman, Joseph Merger, was born in Paris 23 years ago. When he was 15 years of age, he started a course in the

Lycee St. Louis in order to specialize in motors and electricity as applied to motors. This he continued for 3 years.

War was declared before he finished his studies and the French Army was mobilized, August 20, 1914, when the call came for volunteers he immediately joined the French Infantry.

On September 9th he partook in the attack upon Arras. In his first charge he was wounded by a shrapnel explosion. He was sent to a hospital in Amiens.

Upon his discharge, he answered a call for volunteers to join the Oriental Expedition which was to go to Salonica. He arrived at the Island of Toratos, June 7, 1916. He participated in a retreat of the Servian forces and received a wound in the head.

He was later sent to a Replacement Depot for a stay of several months, during which time he entered the Aviation service.

During one of his trial flights, he met with an accident and was badly hurt. Some months later he was declared unfit for military duty.

Merger asked the consent of his parents to make a voyage to America in order that he might learn our methods of working with motors,—and further to perfect his knowledge along this line.

The 15th of July, 1918, found him aboard the Niagara which sailed from Bordeaux to New York. After having interviewed the French Consulate at New York he arrived at the conclusion that Philadelphia was the industrial center of the United States and sought his goal in that city.

He had no acquaintances in Philadelphia whatever, and his search for information regarding the proper place for employment was not fruitful and he decided to return to New York. After having purchased his ticket at Broad Street Station, he inquired regarding which train he should take for New York and happened to come upon a member of the War Community League. This women asked him what he had been searching for in the city and upon hearing his story, sent him to the War Community League where he was advised to seek employment at the Naval Aircraft Factory.

The outstanding thing about Merger's interview for employment was the fact that he first declined employment unless he could work a 12 hour day. That is what they did in France in war time, he said, and he wanted to do the same here. Out of Merger and men like him have come the units now composing the Naval Aircraft Factory organization.

But the responsibility of the Employment Department was not limited to the securing of help. In an industrial plant a man's future and happiness are dependent upon his immediate superior's judgment. Ordinarily that judgment is sufficient and is just, but it frequently is not, and the manager believed that it was good business to have a department to which every employee might have the right of appeal,—a place where some one who was not responsible for production and under the pressure that implies might fairly consider both sides and render an ex parte decision in a dispute. Such practice was considered not only good humanity but also good business. This responsibility was placed in the Employment Department where grievances and charges of unfair treatment are regularly considered as matters of highest importance to the construction of seaplanes.

The Employment Department passes finally on rates, transfers, all discharges, exemptions and all employee activities. There are service workers under its supervision. A training school for the training of women is maintained and enlisted men are trained for duty at the American Aviation Bases abroad where the seaplanes are re-assembled and repaired.

NAVAL AVIATION

(*Continued from page* 806)

Stations Established on European Coasts

On July 1, 1917, there were no naval air stations abroad which were being operated by American naval forces. During the year, however, the Navy Department took over the operation of coastal patrol stations from our allies, and at the present time stations in Ireland, England and France are being operated by United States naval-air forces. It has been necessary to ship from the United States almost all the material for these foreign stations, which includes hangars, machinery, and practically every form of equipment that is being used at those points. Coastal patrols of the east Atlantic coast have steadily increased with respect to the number of flights, the total distances covered, and with respect to general efficiency and actual results. In addition to carrying out active anti-submarine patrols, the stations abroad have been extensively engaged in assisting the fleet with convoying of troops and merchant ships.

As illustrative of the live and energetic type of efforts that are being made, it may be mentioned that the French Minister of Marine, in recognition of the work that was done by an American dirigible on April 27, 1918, officially complimented the American forces. On that date a continuous flight of 25 hours and 43 minutes was made, during the course of which three convoys were escorted for 13 hours and 50 minutes in a zone which was mined and patrolled by the enemy. The official citation said in part that "such an ascension, which constitutes by its duration a remarkable performance, gives us proof of the most excellent qualities of endurance, of energy, of *sangfroid,* and of technical ability of the American forces."

On July 1, 1917, there were only about 50 seaplanes in commission. One year later there were approximately 100 seaplanes in commission that were being used for patrol purposes and 324 seaplanes that were considered as training seaplanes. The early seaplanes were of the *N-9* and *R-6* types, and there are now being used almost entirely for training purposes. With the development of the high-powered Liberty engine came the development of the flying boat, and it is these large flying boats which are being used for coastal patrol work. There has been no undue delay in supplying seaplanes, and the delivery of service seaplanes has been up to schedule. The delivery of dirigibles and kite balloons has also been sufficient to meet the requirements of the program which was undertaken.

The Naval Aircraft Factory

Shortly after the United States entered the war an investigation was directed to determine the feasibility of constructing and puting ino operation an aircraft factory to be owned by the Navy Department, with the three objects of assuring that the control of the manufacture of a part, at least, of the Navy's aircraft should be under the Navy Department, of having a plant wherein Government work of development of aircraft could be carried on under the close direction and control of the department and its bureaus, and of accumulating cost data for the department's guidance in dealing with questions of cost arising out of contracts with privately owned aircraft factories.

On July 27, 1917, the project was authorized by the Secretary at an estimated total cost of $1,000,000 for construction at the navy yard, Philadelphia, Pa., at which yard there was ample land available already owned by the Government and where advantageous conditions as to labor, material and transportation by water and land could be expected, and where the river area gave promise of sufficient space for test flying of aircraft. On October 16 the first power-driven machine was started, just 67 days after ground was broken.

Permanent Buildings

Aircraft have come to stay, and it was clearly good policy to erect a structure of permanent type rather than temporary, particularly as it was found that the cost and time required to build a permanent structure were little, if any, more than for a temporary structure, which would at best give poor shelter to the project during the period of the war.

It was contemplated that the factory should build school planes; that is, simple machines used for the instruction of flyers; but as the demand for the largest type of service planes used in anti-submarine warfare for patrol and convoy was more pressing, the factory was put into production with the larger machine known as the *H-16* flying boat. It measures 96 feet from tip to tip of wing, the wings being on a boat about 45 feet long, of very light structure, instead of on a fuselage and wheels, as in the land type of machine. The plane is equipped with two Liberty engines and four machine guns, carrying a crew consisting of a pilot, one or two observers, a mechanician, and a wireless operator.

On March 27, 1918, 228 days after ground was broken for the factory and 151 days after receipt of the plans, the first service machine was given its first flight, which was successful, and a few days later this boat with another one was shipped to England. These two boats were the first of the original manufacturing order, which was completed July 2, 1918, ahead of the time scheduled for its completion. Too much praise cannot be given to Commander F. G. Coburn, the capable naval constructor and executive under whose direction this plant was constructed and is operated.

Enlargement of the Factory

In the meantime, in December, 1917, an enormous expansion of the naval aircraft building program was inaugurated to meet the demands overseas and to take care of the major portion of this expansion, an extension of the naval aircraft factory facilities was ordered, estimated to cost $3,250,000. All these buildings were constructed by private contract after competitive bidding. The estimate was subsequently further increased by approximately $500,000 to cover a hangar and the necessary water-front improvements. This hangar will have one of the largest door openings in any hangar in the world. Besides this hangar, the extension included an assembly building 1,100 feet long, 350 feet wide, a 6-story concrete storehouse and a 3-story office building.

Utilization of Non-Essential Industries

At the same time contracts for the plant extension were awarded, other contracts were placed in privately owned factories not engaged on aircraft or other war work for the manufacture of parts to be shipped into this new plant for assembly. Over 7,000 persons were thus employed, in addition to the 3,700 persons in the naval aircraft factory proper; and the factory management directed these plants as if they were departments of the factory proper. This policy of manufacture gave promise of quickest deliveries, inasmuch as it took advantage of existing manufacturing facilities and organizations for the construction of parts and recognized the necessity of erecting only those buildings necessary for assembling, testing and packing the complete planes. Early in the spring this plant was put into production, even before its completion; and when in June, 1918, the first plant was at its designed full capacity, the new one was well under way in production.

Employment of Women

More difficult that the task of providing the plant and its equipment was that of assembling the working force and its directing personnel. The aircraft manufacturing industry was in its infancy and men skilled in aircraft construction were not to be had. At no time since the factory was started, and its total force has risen to 3,700 persons, have there been as many as 25 persons in its employ who have worked in aircraft factories; and the entire directing personnel was recruited from automobile factories, machine shops, and other factories doing work similar to some of the branches of the work of manufacture.

The employment of women on this work was begun at an early date, the maximum number reached being about 900. Women are admirably adapted to this class of work, and those in the factory did their part most effectively. They were employed on the principle of equal pay with men for equal work.

(*To be continued*)

FOREIGN NEWS

Weir Announces British Air Aims

Manchester, Dec. 20, (British Wireless Service).—Lord Weir, the Air Minister, in a speech here at a luncheon in his honor given by the Manchester Corporation, said that in August, 1914, the British flying service consisted of 1,285 officers and 1,853 men of other ranks. In November, 1918, the strength of the service was 30,000 officers, 260,000 men, and about 30,000 women and boys.

"We now have aeroplanes which can carry a crew of seven and thirty passengers to 10,000 feet, travel at 100 miles an hour, make a non-stop journey of 1,200 miles, and alight on the sea and rise again with a full load," he continued.

"The success of the operation side of air transportation will depend upon the following measures: Development of navigational instruction, creation of an energetic meteorological service especially designed to help air transport, the adoption of improved systems of wireless telegraphy and telephony, and the adoption of a first-class system of day and night marking of landing places.

"I am convinced that co-operation between the activities of the State and the activities of private firms will produce the finest results. The State must be a pioneer. It must exercise control, but it must not monopolize.

"I conceive a Government department, which will not be an autocrat, but an elder brother to all sides of aviation. Its first essential step should be to organize international flying. This will involve an international aircraft convention.

"We have already drafted the articles of this convention, which is being submitted to our allies. If it is approved, an international air conference will be held, and I have reason to anticipate that within the next four or five months the principal nations of the world will have reached an agreement on this momentous matter."

London, Dec. 20.—Shaw Desmond, correspondent of the Daily Express at Copenhagen, telegraphs as follows, under Thursday's date:

"I have received private information from an authoritative source that Germany is making enormous secret preparations to secure mastery of the air. German insurance companies are seeking cover in neutral countries, especially Denmark, for insurance relating to a great chain of aeroplane factories and aerial experiments.

"Factories throughout Germany are now being converted from war activities to the building of aeroplanes and engines. Staffs including engineers, designers and pilots are being trained.

"Gigantic hangars and flying stations are to be laid down in all the principal towns. The first step will be to link up the chief German centers with Berlin and then Berlin will be linked with the outside world, including Paris, London, and even New York.

"Although lighter-than-air machines are not regarded as of serious practical value, a Zeppelin will be used to make a transatlantic flight in the Spring."

Would Limit Uses of Aircraft in War

Lemans, France, Dec. 22.—Speaking here to-day at the Wright-Lafayette ceremonies, when the foundation stone of the Wilbur Wright monument was laid, American Ambassador Sharp deplored the "wicked uses to which aviation has been perverted by the enemy.

"The very horrors of its abuses," said the Ambassador, "will compel the civilized nations hereafter to abandon forever the employment of aircraft for the casting of bombs. As it is a barbarous method of murdering innocents and is lacking in military value it should be outlawed by the coming League of Nations. The submarine—that other evil genius of modern warfare and even more monstrous—should similarly be banished."

Henry Simon, French Minister of the Colonies, representing the Government, traced the effort made by the United States in the war, continuing:

"Without such aid supplied to our allies and at the same time to ourselves I do not know whether the war in the spring of 1917 could have been continued. Without the formidable push of last March and the monthly contribution of American troops I do not know whether Marshal Foch's decisive manoeuvre in the summer of 1918 could have been possible."

The monument is being erected by the Aero Club of France, and will mark the place where Wilbur Wright made his first flight in France on Aug. 8, 1908.

Big Steamship Lines Discuss Air Service

London, Dec. 20.—Indications that aeroplanes are to play an important part in transatlantic competition with the resumption of normal conditions again has been further strengthened by the informal consideration among some shipping men here as to the possible use of aeroplanes to carry mails and passengers from the principal ports to London.

While some conservative shipping men have not given their entire support to the idea, a correspondent learns that those who forsee the possible development of aerial traffic in the future adhere to the belief that many hours may be lopped off steamship schedules with the co-operation of air forces.

The chief point of competition in transatlantic traffic will be to cut down the time between London and New York. It is argued by air enthusiasts that business magnates will be able to cut off many hours by taking an aeroplane from Plymouth to London—in fact, cutting in half the former express train schedule between Plymouth and London. It is argued also that by the payment of additional postage fee certain classes of letters will reach their destination many hours sooner.

Such an aeroplane service is believed possible eight months in the year. Shipping men believe that the Germans intend using aeroplanes in connection with transatlantic competition in the future.

War Hero to Make Wright Aero Group

Lemans, France, December 24.—A sketch of the plans of the Wilbur Wright statue show it to be a fine conception and in keeping with the highest traditions of French art, according to a dispatch to the New York Sun.

The sculpture will be by Paul Landowski, winner of the Prix de Rome, who made the great reformation memorial in Geneva. He is a sergeant of engineers and winner of the Croix de Guerre.

The statue will stand on a broad base from the center of which will rear a gigantic pinnacled rock symbolizing the summits of the earth. On the top will be the figure of a man striving to climb higher. Facing this will be a representation of the inventor of the modern aeroplane. Inscribed on the monument will be a quotation from Victor Hugo, of which a free translation is:

"I have wings and I dare aspire. My flight is sure. I have wings to brave the tempest and penetrate the sky." The statue will stand in the shadow of the great cathedral, linking early history with Wright's epoch.

U. S. Naval Activities in Europe

The following are extracts from the Report of Admiral Mayo, Commander-in-Chief, Atlantic Fleet:

United States naval aviation in England is carried on by co-operation in two British commands.

The United States seaplane station, Killingholme, Commander K. Whiting, is under the vice admiral commanding on the east coast of England. It has been in operation for some time and does escort of coastal convoys, escort of mine layers in the southern part of the North Sea, and some reconnaissance work in the direction of the Dutch coast.

The northern bombing group, Captain D. C. Hanrahan, is under the vice admiral commanding at Dover, whose jurisdiction extends to naval aviation units in northern France in the vicinity of Calais and Dunkerque. The day bombing squadrons are manned by marines; the night bombing squadrons by the Navy. There has been some delay in the acquisition of suitable night bombing planes, but their delivery will find all in readiness to go immediately to work. The British prescribe the objectives and designate the available free flying time; the operations themselves are carried out by our own personnel. The seaplane station at Dunkerque has operated successfully under the handicap of limited and difficult water area in which to take off and to land.

The assembly, repair, and supply station at Eastleigh was brought into being primarily for the Northern Bombing Group because of the difficulties of transportation to and from the general aviation base at Pauillac. It also does necessary work for Killingholme and for the air stations in Ireland. This base, when visited, was in process of completion and gave every evidence of purpose and capacity to meet all requirements likely to be made of it.

United States naval aviation in France includes all that the title implies, except the northern bombing group mentioned above, and aviation matters are immediately in the hands of Captain T. T. Craven, aid for aviation on Vice Admiral Wilson's staff.

There are eight seaplane stations, three dirigible stations, and three kite-balloon stations, all of which are operated by district commanders in cooperation with the French naval air services in the several corresponding prefectures maritimes. There is also an assembly, repair, and supply base at Pauillac for the general service of all air stations in France and a seaplane gunnery and bombing training school at Moutchie, both of these activities being directly under the headquarters in Brest.

Of the eight seaplane stations, five have been in operation for periods varying from 12 to 3 months, and the remaining 3 are now about ready to begin.

Of the three dirigible stations, only that at Paimboeuf has been in operation for any length of time, and is to be used also for training and experimental work. The station at Guipavas will shortly be in operation. The station at Gujan has been delayed to let material go to other stations which it was deemed advisable to complete first.

Of the three kite-balloon stations, only that at Brest is ready for operation. Test and experimental work have been carried on here since August, 1918, in connection with destroyers and yachts. The station at La Trinite is nearing completion and that at La Pallice is progressing rapidly. The utility of the station at La Trinite seems to be somewhat in doubt, as the original purposes for its establishment have undergone some change due to alterations in the methods of handling convoys, coastal as well as on and off shore.

The assembly repair and supply station at Pauillac is under the command of Captain F. T. Evans, under whose forceful and able direction the station has progressed rapidly to completion and is deemed ready to undertake any and all demands that may be made on it.

The training school at Moutchic, under the command of Commander R. W. Cabaniss, appears to have a thorough system of instruction, founded on sound bases, and includes study and lectures, as well as ample, practical work. Endeavor is made to keep in touch with and to adopt, where deemed advisable, the best British and French methods. Some of the devices in use for training are ingeniously adapted to the simulation of the conditions obtaining while flying.

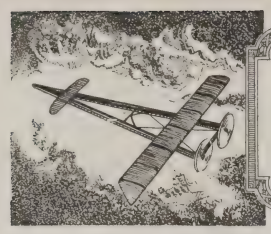
United States Naval Aviation in Europe

The establishment of United States naval aviation in Europe has been one of the most difficult and involved tasks which have had to be undertaken and brought into effect. Captain H. I. Cone arrived in Europe for this work about October 1, 1917, and has continued in charge of it ever since. He maintained headquarters in Paris until about August 1, 1918, when he removed to London and was designated as aid for aviation on staff of the commander of United States naval forces in Europe.

There were arrangements to be made with the French and the British as to locations for stations that would be best adapted for cooperation. There were further arrangements to be made as to the procurement of sites or the taking over of the stations already in operation or in process of construction. The Navy Department had also to be communicated with, largely by cable, as to design, quantities, and shipments of material, which upon receipt had to be allocated with a view to completing certain stations as soon as possible while not delaying the progress of the general scheme any more than could be helped.

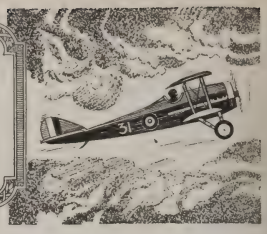
Delays and mistakes in the shipment of aviation material probably caused more trouble than any other one thing, for when material once arrives in a European port it has been, and still is, a very difficult matter to arrange for coastwise transportation.

Taking into consideration the necessary scope of the project, the difficulties inherent in providing for establishments on foreign soil, and the delays which the magnitude of the undertakings caused in the production and shipment of material (and personnel) from the United States, the state of progress is considered highly creditable to Captain Cone and his assistants.



ELEMENTARY AERONAUTICS and MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

THE seat for the aviator is next selected, but drawings of it will not be given, as the builder is at liberty to use any seat of light construction he may choose. The common bucket seat as found on racing automobiles can be selected, providing the sides and back are made from sheet aluminum.

The supports of the seat should be such as to eliminate the possibility of having them bear directly on the longitudinals between the body struts. It would be good practice to hang them from the top longitudinals at a point over the struts, or better still, set on a beam of say, 1½ x ¾" ash, fastened to the large body struts. The seat and fastenings should weigh no more than five pounds.

The radiator can be selected by the builder as well. In fact, any make of light radiator can be used. The radiator should then be cut to the shape and size given in the drawings. This can be done by almost any radiator repair man. The metal casing around it can be brass or aluminum. When the radiator is built four lugs are attached to enable fastening it to the nose of the machine. The capacity should be about 2½ gallons of water, thereby bringing the weight of radiator, water and connection up to about fifty pounds. The outlet pipe at the bottom of the radiator should be set about an inch above the bottom to have it clear the bottom nose strut.

The gas tank is made of sheet tin or light gauge sheet steel to the shape and size given. The metal should be cut to the shape of the patterns. Two being made of sides and one each of the top and bottom parts, a hole for the filler cap being cut in the top or large piece and a large opening for the outlet in the bottom one.

The metal is bent along the dotted lines and each piece soldered with hard solder which, when finished, will give a tank of the shape shown to the right. The filler pipe can be tubing with a plug in it or a piece of pipe and a plug screwed into it. The outlet can be made by simply soldering a copper funnel into the hole in the bottom. Later the gasolene supply pipe will connect to this. The tank, when finished, will have a shape that conforms to the general curve of the top of the body and should be set on top of the longerons and fastened securely a short distance in front of the pilot's cockpit.

The tail skid is made of spruce 3 feet long and 1" x 1½"; it is slightly rounded at the bottom and at a distance of 22" from the bottom is pivoted to the strut, which should be of ¾" steel tubing. Rubber strands are then fastened from the top of the skid to the top longerons at a point over the struts as shown. To keep the skid from standing upright by the pull of the rubbers, auxiliary strands are fastened to the bottom longerons.

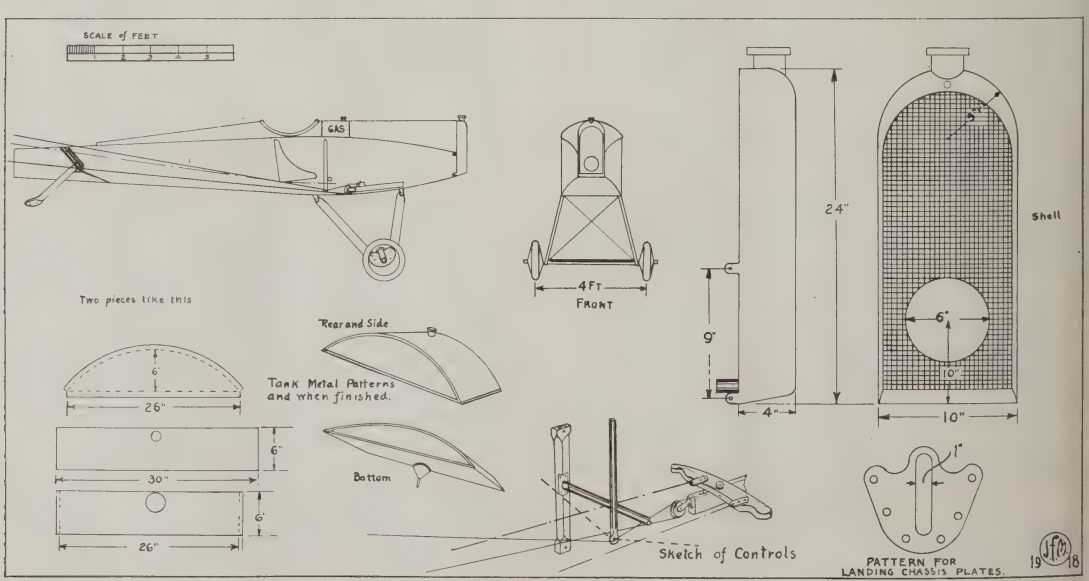
The controls are next in line and should be made carefully, as the whole working of the machine depends on their correct design and construction. By studying the sketch the reader will see that the rudder is controlled by a foot bar, the tail flaps and the lateral control of the machine by the upright stick, which is free to move in any direction. This is accomplished by using two 1" steel tubes filled with wood to protect them from buckling and pivoted at the central point of the cross-tube, which fits into special sockets attached to each strut and 6" from the bottom of the upright tube. The pivot is a ¼" case-hardened steel machine bolt 2½" long. The wires to the elevator flaps fasten to the Hale in the flattened portion at the bottom end of the control stick, the wire to the lower horn of the aileron flap runs to, and around the pulley set at the rudder bar and under the seat to the flaps. The wire to the upper elevator horn is fastened to the end and runs directly back. The wires to the ailerons pass to the right and left to each aileron. How the controls work will be taken up later.

The pulley is turned out of aluminum and is 3" diameter. A trap is made which holds the pulley and should be so fastened to the beam that holds the rudder bar to enable the free movement of the pulley so as to allow it to follow the movement of the wires.

The rudder bar is made of ash and 22" from tip to tip. The pivot, a ⅜" case-hardened machine bolt, is set in the middle and a plate at top and bottom is attached to keep the bolt from enlarging the hole in the bar. At a point 6" out from this pivot, on each side of the bar, fasten a strap of .050 steel ⅝" wide to which the rudder wires are to be fastened. The pilot's feet set in a grooved portion at the ends, and I would advise attaching a piece of fabric or leather, in the form of a loop, to keep the pilot's feet from slipping off.

The landing chassis is built up of 3½ x 1" pieces of ash, the lengths being determined by the size of the wheels.

Twenty-inch wheels are shown in the drawing, as these are the most practical size for this type of machine, but of course a larger size can be used if smaller ones are not at hand. For instance, a light 26 x 3 or so.





Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Of Two Evils

Dr. Llewellyn Rainey, director of the Overseas War Library, was entertained at dinner by a group of Johns Hopkins students on the eve of his departure for the front.

A rich young sportsman, afflicted with swelled head, said to Dr. Rainey:

"I'm going to volunteer, Doc, but I can't decide whether to take up the cavalry or the aviation wing. Which do you advise?"

"The aviation, most decidedly," Dr. Rainey replied.

"Ah, you've seen me fly, have you?" he said.

"No," said Dr. Rainey; "I've seen you ride."—*Free Press.*

Ponder on This

A flea and fly got the "flu."
They said, "What shall we do?"
Said the fly, "Let us flee."
Said the flea, "Let us fly."
So they flew through a flaw in the flue

Stunts

I cannot do the old things now
  That I've been used to do;
I'm all smashed up from doing stunts,
  And so must keep from view.

In doing tailspins on the ground
  I lost my nerve for sport;
I am not good for anything—
  One leg's a trifle short.

In flying upside down one day
  I turned the wrong direction,
So to the hospital was sent
  For rest and for correction.

For flying at high altitudes
  My life is quite undone;
My pressure gage is smashed and bent,
  And I have lost a lung.

Up in a tree there hangs a wing
  And on the ground a wheel,
While on the struts there rests an arm
  That has no power to feel.



THE PREHISTORIC FLYING CORPS
Training Division.—A pupil makes a bad landing.

Courtesy The Aeroplane

I lost a wishbone in the grass
  And broke a collar bone;
But these are trifles, so to speak,
  With what I got at home.

The major saw the ship and swore;
  In purple rage he said:
"We cannot have these ships mashed up,"
  While on the ground I bled.

In kindness keep my girl away,
  Nor even send a rose;
I haven't any sense of smell—
  I've lost my only nose.

Please tell the folks at home I'm dead
  And send to them my pension.
And you, cadets, take heed to this
  And through me learn prevention.

F. Milton Weeks, *Cadet.*

Lazy Lines

(By Lynn)

Lemme at
That guy who
Wrote "I
Don't Want
To Get Well."
Here I lay
All sewed-up
Like a Red
Cross sock
That's been
Thru a French
Laundry & a
Cadet and some
Lute, sewed-up,
Too, are
Discussing
How they were
Reopened to

Have a magneto
And a cylin-
Der head
Removed which
They reckon
The Doc forgot
& as I lay
Here wet
With sweat
That golden-
Barred Lieutenant
Sticks his
Head in
& asks me
Kindly:
"Have yo' all
Saw my
Trench helmit?"

The Young Idea

The quizzes at ground schools frequently bring forth remarkable gems of logic, and through the courtesy of one of the professors at a ground school somewhere in America we are enabled to present a few this week:

"When a propeller is not in dynamic balance it warbles."

"The lamentations of a propeller make it stronger and keep it from warping."

"The B. T. U. is a heat unit used by the British."

"Lilienthal had camber."

"A B. T. U. is the power required to make an airplane fly."

"Shock absorbers are made of cast iron."

"Rantoul was the first man to use an open fuselage."

"Chanute discovered the angle of incidence."

"Sock absorbers should have the same tension."

Consoling to Some of the Married

One thing about war: The wifie back home knows hubby is somewhere in France. That's more than she usta know half the time.

"Boisting" Literary Genius

"Don't strike me, you Hun brute," shrieked the captured canteen worker. "You know I am no match for you!"—*The Perils of Cana Sardine, Canine's Coutie Series.*

Thomas



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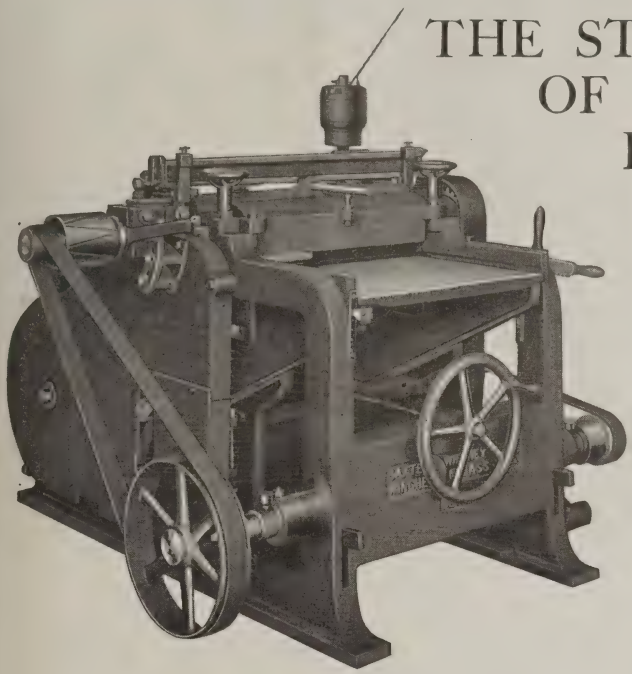
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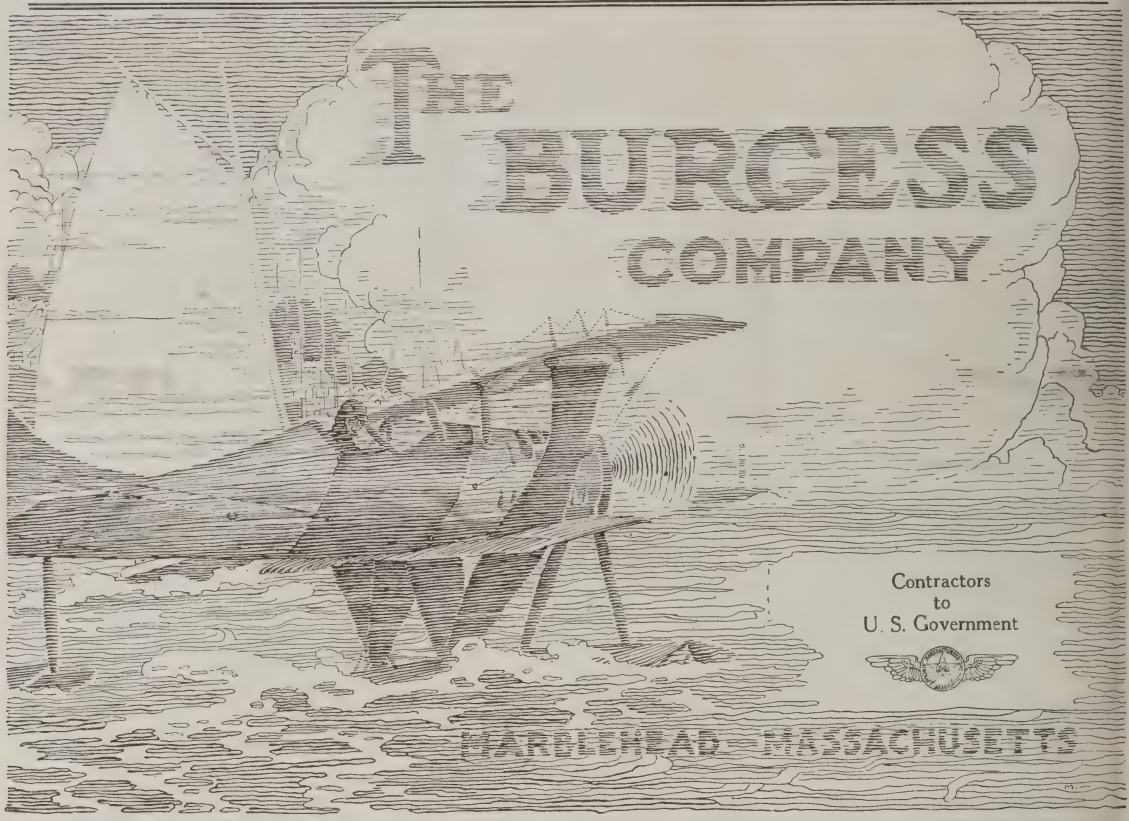
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(*Continued from page* 817)

ible scarff ring for mounting twin Lewis machine guns is placed around the cockpit. A very wide arc of fire is provided for the gunner, and an unobstructed view is obtained by both pilot and gunner.

The engine is located aft of the pilot, between the upper and lower planes. It drives a ring surrounding the fuselage, to which the four-bladed propeller is attached.

This construction is unique in that it permits the advantages of an enclosed fuselage usually employed in tractor machines, while the screw is placed in pusher position, permitting an advantageous placing of occupants and engine.

Planes are flat in span and similar in plan, but ailerons are placed on the upper plane only. Planes have a moderate stagger and a pronounced sweepback.

The center section of the upper plane contains a 38 gallon fuel tank with a supply pipe running straight down to the engine below it.

A 75-gallon fuel tank is placed in the main float at the center of gravity. The fuel system employs twin wind-mill pumps with overflow return.

Two radiators are located in the center section at either side of the gravity fuel tank. They are set into and conform in outline to the wing section.

Central pontoon or main float is built up of mahogany. It has 16 water-tight bulkheads or comparments. The two wing tip floats each have five compartments.

For the bracing between planes, and for the floats, special streamlined stays are used. Throughout the entire construction fittings are of aluminum bronze, which makes them proof against corrosion. Struts and spars are of steel tubing.



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Christmas "Bullet" Tested

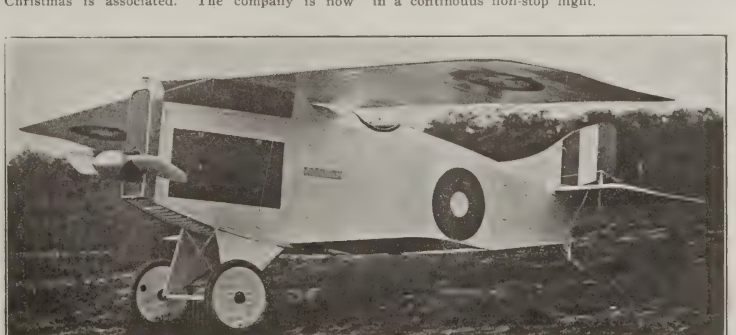
Remarkable speed was shown at the test of the Christmas "Bullet" which is reported to have made a speed of 170 miles an hour with the engine at three-quarter throttle. The machine has a Liberty "6" which is rated at 185 h.p. at 1,400 r.p.m.

The "Bullet" was tested at Government Experimental Field No. 1 (near Central Park, L. I.), on Tuesday, December 3 and December 7, before Col. Harmon and his staff. Although a forty-mile wind was blowing, making flying very difficult, the machine was flown by Cuthbert Mills very close to the ground so that the spectators could observe its action.

This machine is the first successful design to positively employ no brace wires or struts between the planes. The upper wing has a span of 28 feet and a chord of 5 feet. The lower plane is 12 feet in span with a chord of 2½ feet. The wings are flexible and during flight they bow, giving them the appearance of birds' wings. The trailing edge is flexible also and as the speed of the machine increases, the wing flattens. In encountering shocks in the air and in combatting severe winds, the flexibility of the wings makes the machine less subject to the racking effect which results in rigid machines.

Doctor William Whitney Christmas, inventor and designer of the Christmas "Bullet," is anxious to compete with any manufacturer in a race from New York to Washington at any time. Although Dr. Christmas' machine has a 180 h.p. engine; he will race it against any other machine in the country or if no competitors can be found, the machine will be raced against time, and it is expected to establish a record for speed between this city and the national capitol. Not only has this machine speed, but it is capable also of performing stunts of every description and in this respect also the designer invites comparison in actual competition

Mr. Alfred E. F. McCorry, General Manager and Treasurer of the Cantilever Aero Company, 1269 Broadway, New York City, N. Y., is the representative for the company with which Dr. Christmas is associated. The company is now making plans for the construction of a Trans-Atlantic Aeroplane with a 180-foot spread, giving 5,000 square feet of surface. This machine is to be equipped with four engines of 750 h.p. each. A land model is to be used, and although representatives of the company concede that the flight across the Atlantic may be made before their machine is completed, they nevertheless expect to be the first to make the trip across in a continouus non-stop flight.



The Christmas "Bullet," the first successful "strutless" biplane, for which a speed of 170 miles an hour is claimed

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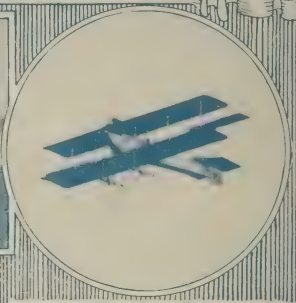
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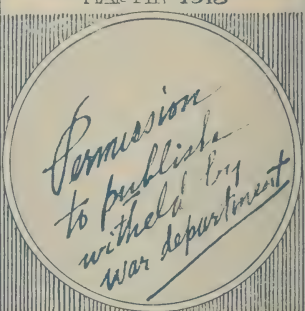
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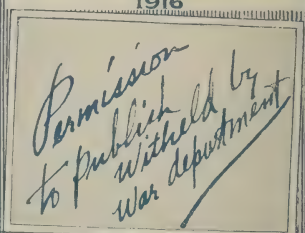
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TABLE OF CONTENTS

PAGE

$1000 Curtiss Marine Flying Trophy Prize Won by Marine Corps 849

Prize Offered for Parachute Competition 849

Captain Bartlett's Arctic Expedition 850

The News of the Week 851

The Aircraft Trade Review..... 853

U. S. Aerial Mail..... 854

The Hispano-Suiza Engine..... 855

The DeHaviland 4 860

The Hughes Aircraft Report 864

Naval and Military Aeronautics... 866

Foreign News..... 868

Elementary Aeronautics and Model Notes 869

Aeronitis 870

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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INSTRUCTIONS FOR THE PREPARATION OF PERMANENT AERODROMES AND EMERGENCY AVIATION FIELDS FOR DEVELOPMENT OF AERIAL MAIL SERVICE: Aerial Mail for U. S. and Overseas The National Defense and Commercial Value of Aerial Mail Service; Two Hundred Possible Aerial Mail Routes in the U. S.; Looking Ahead to the Days of Aerial Transportation; History of the Aerial Mail, Etc

HISTORY, RULES AND REGULATIONS OF INTERNATIONAL AND NATIONAL AERONAUTIC TROPHIES AND PRIZES OPEN FOR COMPETITION: The Gordon Bennett Aviation Trophy; the Gordon Bennett Balloon Trophy; The Michelin Trophy; The International Marine Aviation Trophy; The American Annual Aerial Derby; The Pan American Aviation Trophy; The $50,000 Transatlantic Flight Prize; The Curtiss Marine Flying Trophy; The Annual National Elimination Aviation Contest; The Annual National Elimination Balloon Contest; The Mackay (Military) Aviation Trophy; The Valentine Trophies of the Aero Club of America The Collier Trophy; The Pulitzer Trophy.

List of Holders of Aviation, Hydroaeroplane, Dirigible and Expert Pilot Certificates; The World's Aviation Records; The American Aviation Records. The Directory of Aeronautic Organization Containing Statements of the Purpose and Names of Organization, Officers of the Aero Club of America, Aerial League of America, and Other Aero Clubs and Organizations, the Pan American Aeronautic Federation, the Federation Aeronautique Internationale; The Clubs Affiliated with the Aero Club of America; The Aircraft Manufacturers Association National Committee on Aeronautics and Other Government and Civilian Organizations and Committees; Location of Weather Bureau Stations Where Aviators Can Obtain Forecasts; Location of U. S. Government and Private Aerodromes; Statutes of the International Aeronautic Federation.

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
WASHINGTON OFFICE: 619 *Union Trust Bldg.*
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., Jan. 6, 1919
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, JANUARY 6, 1919 NO. 17

$1,000 CURTISS MARINE FLYING TROPHY PRIZE WON BY MARINE CORPS

THE competition for the Curtiss Marine Flying Trophy and the $1,000.00 cash prize ended on December 31st, 1918, with Lieutenant T. C. Rodman, U. S. Marine Corps, as the winner of the prize and the Aero Club of America as the winner of the Trophy.

Lieutenant Rodman won the trophy with a flight of 900 miles, made with a large H-16 type Curtiss Flying Boat at Pensacola, Florida.

Another flight was made by the veteran naval aviator, Lieutenant-Commander P. N. L. Bellinger, U. S. N., who covered a distance of 651 miles without stopping, with five passengers besides himself. He made the flight in 9 hours and one minute.

Both flights were in competition for the Curtiss Marine Flying Trophy and the $1,000 cash prize, which ended on December 31st, 1918, with Lieutenant T. C. Rodman, U. S. M. C., as the winner of the prize, and the Aero Club of America as the winner of the Trophy.

Lieutenant Rodman won the Trophy with a flight of over 900 miles, including the 5 per cent increase for each of the eleven passengers which he carried. It was made with a large H-16 type Curtiss Flying Boat, at Pensacola, Florida. Commander Bellinger covered close to 850 miles. Had he carried additional passengers instead of carrying dead weight he would have had a larger mileage even than Lieutenant Rodman.

The following aviators competed for the Trophy:

1. Stewart W. Cogswell, flying an Aeromarine plane, equipped with 130 H.P. Aeromarine motor, at Keyport, New York, representing the Aero Club of America.

2. Lieutenant Thomas Clifford Rodman, U. S. Naval Air Station, Pensacola, Florida, flying a H-16 U. S. N. Curtiss type Flying Boat, equipped with two Liberty motors, representing the Aero Club of America.

3. Lieutenant Fitz William Dalrymple, Jr., U. S. Naval Air Station, Miami, Florida, flying a H. S. 2 Curtiss Flying Boat, equipped with two Liberty motors, representing the Aero Club of America.

4. Lieutenant G. B. Newman, U. S. M. C. R., Miami Flying Field, Miami, Florida, flying a Hydro-aeroplane JN4H, converted to a hydro-aeroplane by removal of landing gear and substituting an N9 Pontoon, equipped with a Hispano-Suiza 150 H.P. motor, representing the Aero Club of America.

5. Lieutenant Douglas Manning, U. S. M. C., Miami Flying Field, Miami, Florida, flying a H. S. 2 Curtiss Flying Boat, equipped with two Liberty motors, representing the Aero Club of America.

6. Lieutenant-Commander P. N. L. Bellinger, U. S. N., flying a Curtiss Flying Boat, equipped with Liberty Motors, representing the Aero Club of America.

The report of other entries and judges will be given in the next number of AERIAL AGE.

The complete reports of all the flights made for the trophy will not be available for a few days owing to the number of flights made at the different Naval and Marine Stations and elsewhere on the last day of the race and the closeness of the records, but it seems final from the reports that Lieutenant Rodman is the winner.

The telegraphic report of Lieutenant (J.G.) E. L. Mitchell, U. S. N., who acted as judge with Ensigns R. A. Talbot and M. S. Martin, at Pensacola, states that Lieutenant Rodman started at 6.50 A.M. on December 30th with eleven passengers. Landed at two minutes past four o'clock P.M., having covered a distance of 581 nautical miles, having made one landing to get gasolene.

Under the rules there is a penalty of five per cent for each landing and an increase of five per cent for each passenger carried. While the exact total will not be known until the detailed report of the judges are received, the estimates show that Lieutenant Rodman is entitled to a distance of over 900 miles.

The first flight for the Curtiss Marine Flying Trophy for 1918 was made on October 25th. Stewart W. Cogswell competed for the trophy, using an Aeromarine seaplane, with 130 H.P. Aeromarine motor. Mr. Cogswell flew over a course of 15 miles between Keyport, N. J., and Coney Island, L. I., and made a total distance of 540 miles in the actual flying time of 7 hours and 59 minutes, making 36 laps. From the total mileage a penalty of 5 per cent is deducted on account of flying over a broken course, and an added penalty of 10 per cent is deducted on account of two stops, leaving the net distance 459 miles, made at an average speed of 68.40 miles per hour. The fastest lap was made in 24¼ minutes, or at the rate of 76.50 miles per hour, and the two stops were made for fuel. A cross wind was blowing which increased materially just before noon. The official observers were Ensign Edward E. Jeffries, U. S. N., and Mr. T. W. Post.

Under the rules, the $1,000.00 cash prize that goes with the Curtiss Trophy for 1918 goes to the winning pilot, who must be a member of the Aero Club of America or an Aero Club affiliated with it, and he becomes the record holder of the trophy, which is to be held in custody by the Aero Club of America. A Club becomes the owner of the Trophy after the fifth year if it has been won for three consecutive years by its members. As a member of the Aero Club of America has won this Trophy three times in succession, it will become the permanent holder. The winners were: In 1915, Oscar A. Brindley, 443.72 miles; in 1916, Victor Carlstrom, 661.44 miles; in 1917, Caleb Bragg, 296.92 miles.

PRIZE OFFERED FOR PARACHUTE COMPETITION

TO BRING about the development of a parachute which will be to the aviators and air travellers what the life preserver is to sea travellers, Mrs. Louis Bennett has offered to the Aero Club of America $500.00 to be awarded as a prize or prizes to be awarded in a parachute competition.

Mrs. Bennett's son, Lieutenant Louis Bennett, R. A. F., who was a member of the Aero Club of America, lost his life in an air fight at the front; and Mrs. Bennett, believing that her boy's life, like the lives of many other aviators, including Major Lufbery, could have been saved had they had a parachute, wishes to do everything in her power to develop such a parachute.

The Executive Committee of the Aero Club of America has accepted the offer, and Mr. Alan R. Hawley, the Presi-

dent of the Club, has appointed the following committee of experts, members of the Club, to draw the rules and regulations for the contest.

Major Thomas S. Baldwin, U. S. A., the veteran aeronaut, who made his first parachute jump in 1885 and has made hundreds of parachute jumps from balloons;

A. Leo Stevens, another veteran aeronaut, also one of the U. S. Army experts, who was one of the first to arrange for parachute descents from aeroplanes, at the time when the speed of aeroplanes was only from 35 to 50 miles per hour;

Colonel A. L. Fuller, in charge of the Balloon Section, U. S. Army;

Colonel Henry B. Hersey, U. S. Army, another veteran expert, who made parachute descents from kite balloons at Omaha in the Summer of 1917;

Colonel James Prentice, U. S. A., veteran balloonist.

Lieutenant Colonel Wm. Thaw, the dean of the Lafayette Escadrille aviators, who has had extensive experience at the front;

Major Cushman A. Rice, U. S. A., who also has had extensive experience with aeroplanes at the front;

Congressman F. La Guardia, who until recently was Major in the U. S. Army in Italy and flew in the large Caproni aeroplanes;

Major R. W. Schroeder, the holder of the world's altitude record of 28,900 feet;

Rear Admiral Mark L. Bristol, U. S. N., former Director of Naval Aeronautics;

Commander Henry C. Mustin, U. S. N., veteran naval aviator;

Commander John H. Towers, U. S. N.

Lieutenant Commander P. N. L. Bellinger, U. S. N.,

Lieutenant Godfrey L. Cabot, U. S. N.,

Lieutenant R. A. D. Preston, U. S. N.,

Ensign Raffe Emerson, U. S. A.

All the officers who have had a number of years of experience in aeronautics; and Henry Woodhouse, Frank S. Lahm, and Augustus Post, who have given years to the study of the different branches of the service and are familiar with the different problems.

This committee was selected with due consideration of the fact that the problems are many sided and that besides securing an efficient parachute it is necessary to find the safe methods of attaching the parachute to the aeroplanes, and that the methods may have to be different for large aeroplanes or small aeroplanes and land machines and seaplanes.

If the competition shows that efficient parachutes are to be had, and fool proof methods of using it are decided upon, it is expected that carrying parachutes on aeroplanes will be made compulsory, just as it is compulsory to carry life preservers on board of vessels at sea.

It is the belief of the Aero Club authorities that this competition will be extensive, because a large number of parachutes have been evolved during the war. It is known that the Goodyear Company and Lawrence B. Sperry have two excellent parachutes. Lawrence B. Sperry tried his from a fast aeroplane and the first test was successful. A number of other types of aeroplanes were given preliminary tests by the Army and Navy. The competiton will be international in character and will afford a thorough test for every kind of parachute.

The most important problems to be solved are defined by Mr. Henry Woodhouse as follows:

"The main problems which remain to be solved," said Mr. Woodhouse, "are the problems connected with the use of the parachute in flying aeroplanes. Some of these problems are as follows:

"(1) To find the best way to attach a parachute to an aeroplane or to the aviator, so that it can be operated whether the aeroplane is at an even keel, or climbing, or diving, or side-slipping, or upside down.

"(2) It must be membered that when a plane is travelling at a speed of from 90 to 150 miles an hour—and there are machines going even faster—the pilot only has seconds in which to think and act, therefore, the parachute attachment must be simple and must work instantly.

"(3) The parachute may be fastened to the back of the pilot himself, or to the aeroplane, on the fuselage, back of the pilot; or under or to the side of the fuselage, or at the trailing edge of the lower panel of the wing, or to the seat of the aeroplane. But it must be remembered that the pilot is fastened to his seat by a safety belt which he must unfasten before the parachute is opened, else he will have the unpleasant experience of having the parachute pull the upper half of his body in the opposite direction from which he is travelling. The parachute would eventually collapse, but so would the aviator.

"(4) Having found the best method of attaching the parachute, the next important thing is to have a parachute that opens quickly, does not drop too fast and does not oscillate overmuch while descending. The average parachute opens in about a 150 foot drop, then descends at a speed of about 20 feet a second.

"(5) A parachute need not be heavy to be safe, and weight is objected to in aeroplanes because it decreases the useful load of the plane. A parachute of Japanese silk, about 18 feet in diameter, capable of sustaining a man weighing 150 pounds, will not weigh more than 15 pounds. The fear on the part of aviators that a parachute would weigh 40 or 50 pounds is one of the factors which has retarded the adoption of the parachute as a life saver. A large parachute is bad because it oscillates and slides sideways after it oscillates. On the other hand, a too small parachute will travel down too fast.

"(6) Such pioneers as Thomas S. Baldwin and A. Leo Stevens found by practice that they could, to some extent, control the direction of the fall of the parachute by pulling the ropes on any one side of the parachute, forming a sail of that side of the parachute, so that it would result in the wind carrying the parachute in a given direction. They also found that if they were travelling in a current which was taking them away from the desired landing place, they could pull the ropes on two sides of the parachute, and by decreasing the span of the parachute they caused it to drop faster, thereby getting out of that air current which was taking them in the wrong direction.

"(7) Another important thing which must be given attention is the harness which connects the pilot to the parachute while he is descending. With a good harness the pilot will feel fairly comfortable while descending, and he can detach himself immediately upon touching the ground, so as not to be dragged over the ground by the parachute in the event of there being a strong wind close to the ground."

Besides saving the lives of aviators and air travellers in case of accident, it is expected that parachutes will be used extensively in future to drop mail and packages from aerial mail planes at stations where the planes do not land to get mail.

Towards the close of the war parachutes were used by the Allies to supply ammunition to infantry and machine gunners on the front line, who were cut off from the rest of the fighting forces by German barrage fire. Boxes of ammunition were attached to parachutes, which were dropped over the fighting infantry and machine gunners, who were then enabled to proceed with advances and take important positions which could not have been done otherwise.

CAPTAIN BARTLETT'S ARCTIC EXPEDITION

THE report that a British party commanded by Captain Wild is to start for the North Pole in April, by way of Spitzbergen, was welcomed at the Aero Club of America today by Captain Robert Bartlett, Mr. Alan R. Hawley, president of the Club; Read-Admiral Bradley A. Fiske, Henry Woodhouse, Augustus Post, Major Cushman A. Rice, U. S. A., John Hays Hammond, Jr., Henry A. Wise Wood and Charles Jerome Edwards.

"As there is over one million miles of unexplored regions, there is room for a dozen expeditions," said Captain Bartlett, who is to command the American expedition, being sent out under the auspices of the Aero Club of America.

"As Spitzbergen is many hundred miles from Cape Columbia, where our aeroplane base is to be established," said Captain Bartlett, "it is very likely that the two expeditions would not meet or see each other, unless they went out of their way to meet, which we would be likely to do, because while we explorers like competition, we are also interested in each other's success and will go out of our way to help each other.

"American and British aviators worked together to conquer the Germans; it is quite logical that they should work together to conquer the Arctic from the air."

Mr. Hawley pointed out that the despatch does not state whether Captain Wild's expedition will undertake to do more than to explore part of the Arctic regions.

Capt. Bartlett's expedition has three important missions, as follows:

(1) To fly across the top of the world from Cape Columbia on the American side to Cape Chelyuskin on the Siberian side;

(2) To conduct extensive soundings in the Polar Basin and make a map of the floors of the Polar Basin and collect flora and fauna from the ocean bottom.

(*Continued on page* 872)



THE NEWS OF THE WEEK



Aeronautic Exposition to be Held in Madison Square Garden in February

An aeronautic exposition under the auspices of the Manufacturers' Aircraft Association will be held in Madison Square Garden, February 27 to March 6, inclusive.

Arrangements for this show were begun some weeks ago, but were delayed by a peculiar situation which developed in Washington, as a result of precautions taken to protect the country during the great war. On January 1, 1918, a proclamation was issued by President Wilson prohibiting the holding of any aeronautical exposition during the period of the war.

A few weeks ago the Manufacturers' Aircraft Association took up with the War Department the matter of co-operation and display, especially with regard to war trophies and certain military features. The War Department manifested a willingness to do all it could, but immediately discovered that the proclamation might stand in the way of complete co-operation. The puzzle was put up to the Judge Advocate General. It was suggested that the President himself in his speech to Congress, November 11, in which he said "The war thus comes to an end," had provided a literal abrogation of the old proclamation. Officers felt, however, that it would be better not to establish any precedent. But by the time the matter was brought to the White House, the President had gone abroad.

The State Department was appealed to with the result that the whole subject was cabled to Paris. In the meantime the State Department prepared a new proclamation rescinding the old order and in due time received authorization as shown in the following statement which was issued at Washington, Dec. 20:

"At the request of the Secretary of War, the President has authorized the issuance of a proclamation revoking the proclamation of last January, prohibiting the exhibition of aircraft during the period of the war. Pending the formal signing of the new proclamation the Secretary of State has requested the Attorney-General not to prosecute any infringement of the earlier proclamation."

Col. Mars Heads Aircraft Production

Washington.—Lieutenant Colonel J. A. Mars has been appointed director of the Bureau of Aircraft Production, taking the place of W. G. Potter, who has resigned as was previously announced. Colonel Mars is a regular army officer.

Bids Asked for Service Equipment

The Salvage Branch of the Supply Section of the Department of Military Aeronautics has invited sealed bids for the following material:

1,000 Standard J-1 aeroplanes, equipped with Curtiss OX5-90 engines, at Houston, Tex.

200 Standard J-1 aeroplanes with Hispano-Suiza 150 h.p. engines, at Houston, Tex.

Standard J-1 aeroplanes, without engines, Houston, Tex.

10 L. W. F. aeroplanes, with Thomas 135 h.p. engines, at St. Paul, Minn.

2,000 A-7-A four-cylinder Hall-Scott engines at Houston, Tex.

The bids for the above materials will be opened at 11 A. M. on February 1, 1919, at the office of the Salvage Branch, Washington, D. C. Each bid must be submitted in duplicate and accompanied by a certified check for 20 per cent of the amount of the bid. The Government will receive proposals for any item or any quantity subject to the usual reservations. The terms of all sales will be cash, f.o.b. location given, and delivery must be made within ninety days.

No More Civilian Flying Instructors

Under date of December 11 the following information and instructions were telegraphed by the Director of Military Aeronautics to all commanding officers of flying fields, aviation repair depots and acceptance parks:

"The Secretary of War has abolished position civilian flying instructor, effective December 31, 1918. On or before December 31, discharge without prejudice all such, quoting authority Secretary of War, first indorsement December 6, and this telegram. You may grant leave up to and including December 31, provided total leave granted does not exceed thirty days current calendar year. Report by letter names those discharged with dates."

Consolidation of Various A. S. Branches

Announcement is made of the transfer of the Traffic and Storage Branch of the Bureau of Aircraft Production to the Division of Military Aeronautics, and of its consolidation with the Traffic and Storage Branch, Supply Section,



Major-General Charles T. Menohar, who is now en route from France to fill his new appointment as Director of the Air Service. General Menohar commanded the Rainbow Division in France

D. M. A., of which Col. Clinton G. Edgar is chief.

The seven aircraft production depots operated by the Traffic and Storage Branch, B. A. P., are affected by this transfer. These are located at Detroit, Mich.; Buffalo, N. Y.; Dayton, Ohio; Elizabeth, N. J.; Washington, D. C.; and San Francisco and Sacramento, Cal. The two latter named depots have been closed and the others will hereafter be designated as aviation general supply depots. Other storage arrangements include the following:

To the Aviation General Supply Depot (formerly the Aircraft Production Depot) at Tenth and B streets southwest, Washington, D. C., nel at the Washington Aviation General Supply have been transferred all the stock and person-Depot, 1422 First street northeast, which has been vacated.

The Aircraft Production Supply Officer, who was stationed at Port Newark, N. J., has been eliminated and his work taken over by the Aviation Officer, Port of Embarkation, New York City.

This transfer also involves changes on the traffic side. Traffic offices were maintained by the Bureau of Aircraft Production at New York City, Elizabeth, N. J.; Buffalo, N. Y.; Elyria and Dayton, Ohio; Detroit, Mich.; Chicago, Ill.; Jacksonville, Fla.; and San Francisco, Cal., as well as a main office at Portland, Ore., and several branch offices in different lumber districts in connection with aeroplane spruce production. As a result of the consolidation the Chicago, Elyria and San Francisco offices have been closed, and the New York and Detroit offices consolidated with the traffic offices maintained in those cities by the Division of Military Aeronautics. The traffic office of the division at Pittsburgh is retained.

All activities of the Spruce Production Division of the Bureau of Aircraft Production have been discontinued.

Intended for eventual transfer to the Division of Military Aeronautics are the whole of the Aeroplane Engineering Division (including Production Engineering, Experimental Engineering and Design), McCook Field, and also the Technical Information Department of the Bureau of Aircraft Production.

In this connection it is also announced that Erie Warehouse No. 2, maintained at Jersey City, N. J., by the Division of Military Aeronautics for the consolidation of overseas shipments, has been closed and that functions of Radio and Photograph Warehouse No. 1, New York City, are being assumed by the Aviation General Supply Depot at Fairfield, Ohio.

It is pointed out that this consolidation and redistribution of functions and the discontinuance of former offices of both the bureau and division make for reduction of expense of operation and economy of administration.

First Trans-Continental Flight

The squadron of four army training planes flying from San Diego, Cal., reached the Atlantic Coast on December 22. This flight in formation approximates 2,400 miles. The planes left the Pacific Coast December 4 and they have come east across the continent in short flights limited by the size of their gasoline tanks, none of the



A recent photograph of Lt. Meisner and Eddie Rickenbacker, American "Aces", who were awarded Distinguished Service Crosses for bravery

planes carrying more than an hour and a half's supply at any one time. The crews, two men to a plane, have gathered data and statistics on landing fields, also made air maps of the route along which they came.

This work is a part of the big reconnaissance now being made by fliers going out in all directions from over twenty-five fields in various parts of the country. The material collected, as fast as it is returned to the fields, is being forwarded to Washington for analysis and compiling in the form of a government air guide or blue book. Major Albert D. Smith, commanding the air squadron which has come east from the Pacific, reported on December 23, to the Division of Military Aeronautics in Washington, D. C., that his planes left Americus, Ga., at 9 A.M., December 22, and arrived at Jacksonville, Fla., at noon, having encountered rain and fog all the way and at no time having a ceiling of more than 500 feet. Major Smith expects to fly his squadron north to Washington at an early date.

Personnel Board

A board of officers as named below is constituted to consider such matters affecting the personnel of the Air Service as may be brought before it:

Colonel Archie Miller, A. S. A.
Colonel M. F. Davis, A. S. A.
Colonel William E. Gillmore, A. S. A.
Colonel Henry C. Pratt, J. M. A., A. S. A.
Lieut.-Colonel Rush B. Lincoln, A. S. A.
Lieut.-Colonel B. F. Castle, J. M. A., A. S. A.
Lieut.-Colonel M. F. Harmon, J. M. A., A. S. A.
Lieut.-Colonel H. Benington, A. S. A.

Morrow Field

The following letter from the Adjutant General designates the field at Detroit as Morrow Field:

"You are informed that the Air Service Acceptance Park at Detroit, Mich., will be officially known as Morrow Field, in honor of Lieutenant Karl Clifford Morrow, who lost his life in Detroit, Mich., November 11, 1918, while entertaining citizens of the city who were celebrating the signing of the armistice.

(Signed) RALPH HARRISON,
Adjutant General."

Four Noted Aces Quietly Return

Philadelphia.—Major C. J. Biddle, of this city, one of the famous aces of the American Air Service, surprised his relatives by reaching home without previous announcement on December 21. He was accompanied from France by Lieutenant Colonel William Thaw, of Pittsburgh; Captain Edgar E. Tobin, of San Antonio, and Captain Roy C. Bridgman, of Lake Forest, Ill.

U. S. Airmen Downed 854 Enemy Planes

Washington. — American airmen in France brought down a total of 854 German aeroplanes and 82 German balloons, against an American loss of 271 planes and 45 balloons, according to a report cabled by Major General Harbord, made public on December 22 by the War Department. Destruction of 354 of the enemy planes and 57 of the balloons had been officially confirmed.

The total casualties of the American Air Service in action are given as 442, including 109 killed, 103 wounded, 200 missing, 27 prisoners and 3 interned.

When the armistice ended the fighting, the report said, there were 39 American aero squadrons at the front. They included 20 pursuit, 6 day and 1 night bombardment squadrons and 5 army, 12 corps and 1 night observation squadrons. The total personnel was 2,161 officers and 22,351 men at the front, with an additional 4,643 officers and 28,353 men in the service of supply.



Col. Thurman Harris Bane, one of the few J. M. A.'s in the army who is in charge of the Technical Section, Department of Military Aeronautics

Eight American flying officers were detailed with the British army and 49 officers and 525 men with the French forces.

The total strength of the American Air Service in France was 58,090, of whom 6,861 were officers. This was exclusive of the air service mechanics' regiment with the French army, numbering 109 officers and 4,744 men. In addition to these trained men, the air service had eight separate schools in France, where 1,323 pilots and 2,012 observers were under instruction, and graduations up to November 11 included 6,069 pilots and 2,045 observers.

Up to November 16 General Harbord reported, 6,472 planes of all types had been received by the American Air Service in France, including 3,337 pursuit planes for combat work and ninety for schools; 3,421 observation for service and 664 for schools, 421 day bombers, with eighty-five additional for schools, and thirty-one night reconnaissance machines. There were in addition 2,285 training, thirty experimental and 108 miscellaneous machines.

The eight American air schools in France had a capacity for training 3,800 officers and 11,700 men. The largest was the general flying school at Issoudun, where 2,175 officers and 6,100 men could be cared for. The others were at Tours and Chatillon-sur-Seine for observers, at Maucon and Coetquidan and Souge for artillery fire spotters, at St. Jean de Monte for aerial gunnery and at Clermont-Ferrand for bombers.

Lieut. O'Brian Hopes to Make Trans-Atlantic Flight

Kankakee, Ill.—Lieut. Patrick O'Brian, American aviator in British service, whose escape from German captors formed a romantic chapter in the story of the war, announced that he will attempt to be the first to make a Trans-Atlantic flight in an aeroplane. He hoped to make the flight in April.

Capt. I. F. Fuller, an American aviator still on duty in France, and Lieut. C. C. Robinson, an American who was one of O'Brian's comrades in the British Flying Corps, will be associated with him in the venture.

Goodyear Balloon S-11 Makes Record

Balloon S-11, from Wingfoot Lake, recently completed a remarkable trip from the local flying field to Wheatley, Ontario, Canada.

The balloon, piloted by a former Goodyear man, Walter W. Morton, was the third and smallest balloon to make the trip over Lake Erie, a distance of 140 miles.

The trip was completed in two hours and fifteen minutes and the height of 1,500 feet maintained throughout.

Morton was accompanied by C. O. Brown and R. S. Stebbins of the Naval Aviation Service.

Morton was formerly connected with the Balloon Department here, and has been interested in this branch of flying for a number of years.

Rodman Wanamaker Now Colonel

Rodman Wanamaker, Special Deputy Police Commissioner, is now a Colonel on the staff of Governor Alfred E. Smith. His name was one of four announced for the staff by Mr. Smith, the others being Capt. Tracy Hammond Lewis of Great Neck, L. I., a son of William E. Lewis, editor of the *Morning Telegraph;* Lieut. Joseph F. Sabine Meecham of Syracuse and Lieut. Ernest E. Malcomb of this city.

Col. Wanamaker is credited to the infantry branch of the service. Capt. Lewis has just returned from Fort Sill, where he was an instructor in the balloon branch of the army. Lieut. Meecham has been in the Quartermaster's Department and Lieut. Malcomb was an aide to Brig.-Gen. George R. Dyer.

Air Service Detachments Ordered Home

Fourteen Air Service units of different branches of the service have been assigned early convoy back to the United States, according to a statement issued by the War Department on December 26.

The 19th, 30th, 23d, 20th, 36th, 35th and 45th Balloon Companies are listed to sail for the United States shortly.

Aero Squadrons numbers 19, 1099, 466, 480, 481, and 493 have received their embarkation orders. The 6th company of the 2d Air Service Mechanics regiment has also received its convoy assignment.

"Hobey" Baker Dead

Paris.—Hobey Baker, the famous Princeton hockey star and an aviator in the American army, was accidentally killed while flying on December 21.

The fatal flight was the last Baker was to have made before leaving for the United States, papers ordering the airman to return to America being found in his packet when his body was picked up.

Baker will be buried in France, beside two other famous American aviators—Lufberry and Putnam.

H. A. H. ("Hobey") Baker was famous in eastern amateur and college athletic circles for his football and hockey playing. He easily made the Princeton 'varsity eleven, and was a member of the backfield from 1911 to 1913, as well as captain of the team in his senior year. He was also captain and a prominent factor in many of the victories of the Princeton hockey team.



Front view of the De Havilland-4 with a 400 H.P. Liberty "12" Engine, constructed by the Standard Aircraft Corporation

The AIRCRAFT TRADE REVIEW

A. E. J.

Line of Zeppelins to America Planned

Paris, Dec. 26, (Havas.)—Disarmed German Zeppelins will be converted into aerial merchantmen to ply between New York and Hamburg, according to the *Echo de Paris*, which says that it has received its information from "reliable sources."

Alan R. Hawley, President of the Aero Club of America, considers the announced project for converting Zeppelins into merchant carriers to be both feasible and practical.

"We have been reliably informed that large super-Zeppelin type, rigid dirigibles have been constructed which will contain 3,000,000 cubic feet of gas, and have five motors and a length approximately 800 feet," said Mr. Hawley. "These Zeppelins can remain in the air for two weeks without appreciable loss of gas, and can make seventy to eighty miles an hour.

"It has been reported that Zeppelins flew from Jamboli in Bulgaria to Khartum in the Soudan and return, a distance of more than 3,000 miles, carrying a crew of twenty-two men and twenty-five tons of munitions and medicine, intended for the relief of General Lettow-Vorbeck in German East Africa. When over Khartum a wireless was received by the commander of the dirigible that the German officer had been captured, and it turned back without landing."

U. S. Dirigible Sets Record

New York.—What is declared to be a new world's record endurance flight in a non-rigid dirigible balloon—32 hours before a landing was made—will be submitted by the United States naval air station at Key West, Fla., to the Aero Club of American for homologation. Before it can be officially recognized as a record it must be so declared by the Aero Club of America, it was explained, under the rules of the International Aeronautic Federation, of which the American organization is a member.

The flight claimed as a record was made on November 23 by Ensign Thomas E. Haytham, of Buffalo, N. Y., accompanied by Ensign Tulford B. Null, of Denver, Colo., and J. H. Collier. The airship carried a full load, consisting of radio apparatus, anchors, rations and other necessary accessories. The motor was run continuously at cruising speed, and about 600 miles had been flown before a leak and a threatening storm compelled a landing.



Frank H. Russell, president of the Manufacturers' Aircraft Association, who has just been appointed General Manager of the Curtiss Engineering Corporation at Garden City

Cato With Marlin-Rockwell Corporation

J. L. Cato, experimental engineer at the plant of L. W. F. Engineering Company, who developed the L. W. F. Model "G" has resigned to develop for the Marlin-Rockwell Corporation a new all ball bearing aeronautical motor, which later will power a sporting type of monoplane of his own design. Mr. Cato has been connected with aeronautical work since 1909, and with his long experience he should bring out a popular type of sporting plane.

Browning Gun Perfected

Ogden, Utah.—Perfection by John M. Browning of machine guns for aeroplanes so that a flier can, by pressing one trigger, fire three machine guns simultaneously, shooting 3,600 shots a minute at the same target, was announced Dec. 20 upon the return of the inventor from the east.

Uses Parachute in Leap from Plane

Dayton.—Test of a parachute equipment as a protection in air navigation was made at the Wilbur Wright aviation field here December 20 with Rodman Law in the stellar role. He has been experimenting for six weeks along this line using sand bags attached to a parachute to demonstrate how an aviator may jump from a crippled aeroplane and land safely. The parachute weighs 12 pounds and is made of Japanese silk. Army officials watched the first test in which Law leaped from the aeroplane with the parachute.

Aerial Transport Co. In Canada

Aeroplanes are to supplant ferryboats in transporting passengers from Prince Edward Island to the mainland, it has been announced by Major Kennedy, of the Aircraft Manufacturing Company. The Prince Edward Island Aerial Transportation Company has been formed with a capital of $250,000 to carry on the new service.

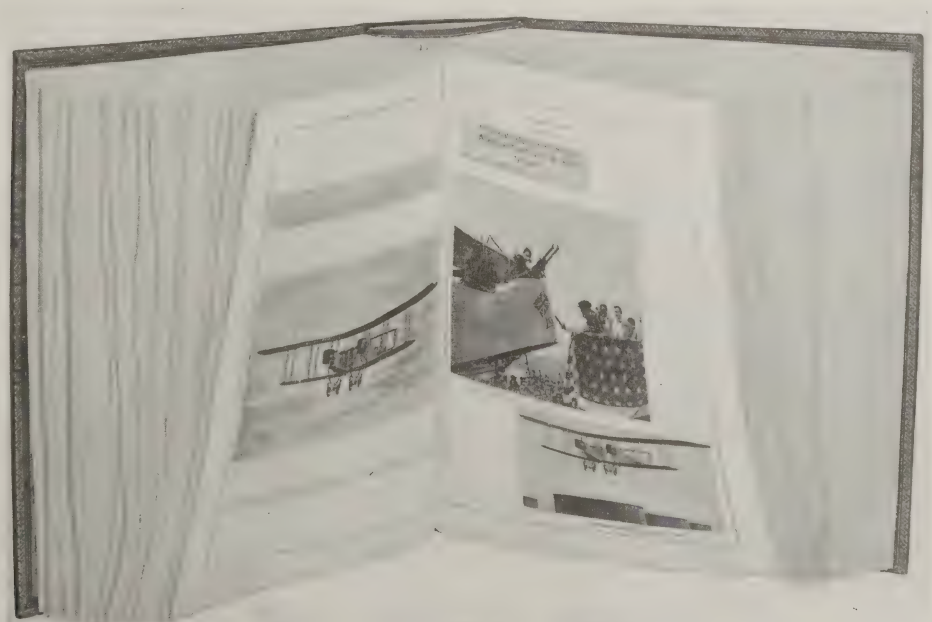
"The aeroplane flight between Charlottetown, on Prince Edward Island, to Montreal, on the mainland, a distance of about 100 miles, will be made in an hour and a quarter," said Major Kennedy. "The West Indies Aerial Transport Syndicate is already operating one plane between all the islands of the West Indies."

Air Fete Over Fleet In Hudson

New York, Dec. 27.—Fifteen large seaplanes and two dirigibles from the naval air station at Rockaway manned by members of the naval air service left Rockaway station shortly before 9 o'clock, flew over the lower bay and circled over the fleet now anchored in the Hudson. The first half dozen were in battle formation, the others flying singly. This is the air squadron that was to meet the fleet Thursday, December 26, but as a result of unfavorable weather conditions, it did not take part in the ceremonies.

After the squadron had circled over the fleet at its farthest northern point, it flew back and forth over the Hudson all the morning.

One of the vessels, the U. S. S. Texas, carries 3 aeroplanes, 2 Sopwiths and a French bombing plane which were taken aboard at Brest, France.



This book was presented to President Mingle of the Standard Aircraft Corporation. It is a complete photographic and written record of "Langley Day" when the first American built Handley Page was launched at Elizabeth, N. J., in July

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
L. T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations

US AERIAL MAIL

PILOTS

Ira O. Biffle
Irving Graeb
Trent C. Fry
Leon D. Smith
L. V. Smith
Dunn K. Steele
Lyman W. Doty
Carroll C. Eversole
Dan Davison
Dana C. DeHart
Edwin W. Hubbard
D. I. Lamb

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Geo. R. Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AVIATOR-MECHANICS

Christopher C. Cole
Julian Sykes
Wm. L. Lindley
August E. Carlson

Boston to Chicago Air Mail Is Next

Washington.—The establishment of an air mail route from Boston to Chicago, with stops at Albany and Buffalo, will be accomplished by the Post Office Department early next summer. Second Assistant Postmaster-General Praeger has determined that the establishment of this important line from the lakes to the coast shall be the next development.

Flying from Boston to Albany represents an air line of 200 miles. The next step of the journey adds practically 300 miles. From Buffalo to Chicago the air line distance is slightly less than 400 miles.

The rate of postage by air mail will be the same as for the established daily service between Washington and New York. The rate as now fixed will remain until the working out of the general use of the system has developed to a point where a reduction is justified.

Mr. Praeger expects that when the Boston-Chicago line is established the actual flying time will be inside an eleven hour limit, inclusive of the two stops.

Aero Mail in Belgium

Aerial mail service for government correspondence has been established in Belgium, according to advice received from Brussels.

Chart New York-Cleveland-Chicago Aero Mail Route

Cleveland, O.—The four aeroplanes which left New York December 28 are not expected to reach Cleveland before December 31. The machines have been flying leisurely in order to chart all possible landing fields between New York and Cleveland.

"Cleveland's aero mail will leave on time January 2, rain, shine or snow, and regardless of whether the mail planes from Chicago and New York reach here on time or not," John A. Jordan, aero mail supervisor, said.

"We will have five aeroplanes in the city Thursday ready to leave with mail for both the East and the West. In the days preceding Thursday we will make every preparation to carry the services through on the opening day."

Three aeroplanes which landed at Ravenna, and Painesville, Ohio, and Sharon, Pa., last week are expected in Cleveland December 31.

Christmas Aerial Mail

The Post Office authorities at Washington at the city office announce that over 27,000 pieces of Christmas mail were delivered at the city office for transport by aerial mail service. This is the largest volume of business that the aerial department has so far transacted in a single day.

Brazil to Have Aero Mail Service

Washington.—Brazil will shortly have an aero mail service between its principal cities. The Government has granted concessions to a corporation allowing it to establish aeroplane mail service between the various capitals of the States of Brazil. Activities will comprise carrying of small parcels of mail, and, with further development of aviation, carrying of passengers. The number of trips and the tariff will be regulated by the Government. All mail matter transported must be properly stamped and postmarked. In time of war the Government may take over the service.

Aero Mail for Chili

Santiago, Chile.—Included in the New Year's festivities here will be a ceremony marking the inauguration of an aerial mail service between Santiago and Valparaiso.

Resume Aero Mail Service to Fleet

Fighting a headwind of forty miles an hour all the way down the Potomac and across Chesapeake Bay, the first mail hydroaeroplane to leave the Anacostia station for a week landed on the storm waves at Hampton Roads, with the official mail for the Atlantic fleet.

This pioneer naval mail service has been interrupted for almost a week by high winds and heavy fogs which have prevailed off the Virginia coast. In the face of threatening weather, the hydroaeroplane at Hampton Roads did not attempt the flight to this city.

It is expected that regular daily service in both directions will be resumed as soon as weather conditions permit. Service will be continued at least until the freezing of the river makes landings impossible.

The consignment of mail carried to the fleet was unusually heavy, being the result of several days' accumulation. It was, for the most part, official matter.

The naval aero mail service between Washington and Hampton Roads was begun on November 16.

Aero Mail Increases 600%

Aero mail has increased 600 per cent during the past month, postoffice officials announced December 20. This is attributed to the mailing of Christmas cards by this novel medium, and also to the rate reduction on one ounce of first-class matter from 16 to 6 cents.



First trip of aerial mail from the Atlantic to the Pacific across the Isthmus of Panama, which was made by Major Walter W. Wynne recently. Major Wynne is shown receiving a pouch from the postmaster at Cristobal, Canal Zone, ready to start for the flight

THE HISPANO-SUIZA ENGINE

(*Concluded from page* 816)

Magneto Mounting

ON ALL models two magnetos are used, firing two sets of plugs simultaneously. On Model A the magnetos attach to platforms integral with the upper half of the crankcase and are situated directly behind the cylinder blocks, with their shafts parallel to the crankshaft. On each magneto shaft a bevel pinion is mounted, engaging with a gear attached to the upper end of the lower vertical shaft. That is to say, immediately beneath the screwdriver connection on the camshaft drive.

On Models E and I the two magnetos are mounted crosswise of the engine on a special bracket bolted to the rear end of the crankcase, and this bracket incloses a spiral gear. The upper member of this gear has a short transverse shaft on each end of which the magneto couplings are mounted, and this runs in ball bearings housed in the aluminum of the bracket. The couplings float, that is, they allow for sufficient universal joint motion. The lower of the spiral gear pair has a shaft of which one end is set in a ball bearing in the bracket while the other end has a tongue which engages with the slot in the end of the crankshaft.

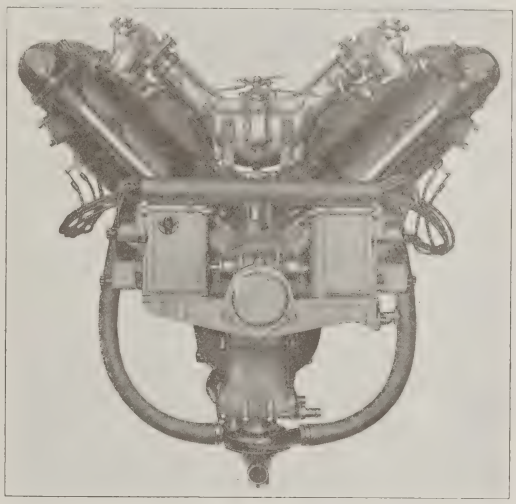
This design enables the magnetos to be detached more readily, since they are driven by couplings of an easily detachable nature. It should also be noticed that on Model A both magnetos are the same and operate with left hand rotation, while on the other models one is arranged for right hand and the other for left hand, as they face apart, but are driven by one shaft.

Pistons and Connecting Rods

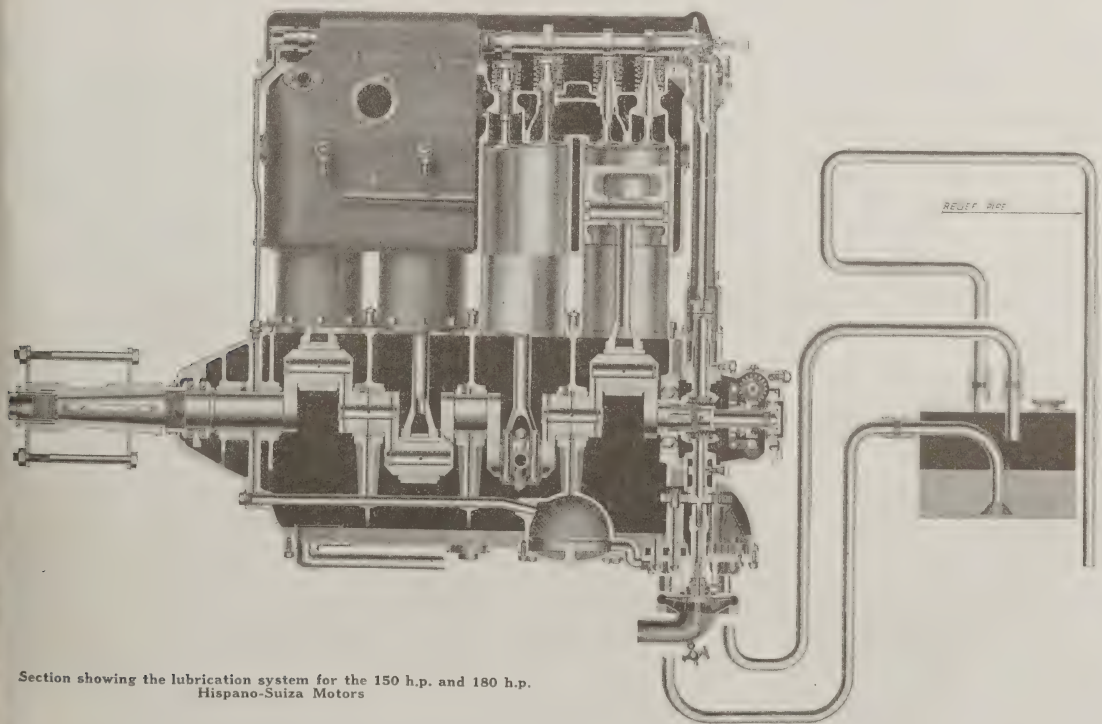
For all models the pistons are aluminum and the connecting rods of round section completely drilled out for lightness, but the detail is different. Model A pistons are webbed beneath the heads and the wrist pins are fixed, being secured by a set screw which passes completely through the wrist pin and piston boss, being itself locked by a cotter. Each piston carries four compression rings which are very narrow and fit in two grooves, while there is also an oil scraper ring near the bottom of the skirt.

Models E and I pistons are identical in form, except that the Model E is of different dimensions, so as to give the increased compression. These pistons have no ribbing beneath the head, the head itself being very thick. The wrist pins float, that is, they are free to turn in the piston bosses as well as in the small ends of the connecting rods. They are prevented from endwise movement by means of a special ring which encircles the piston on the centerline of the wrist pin.

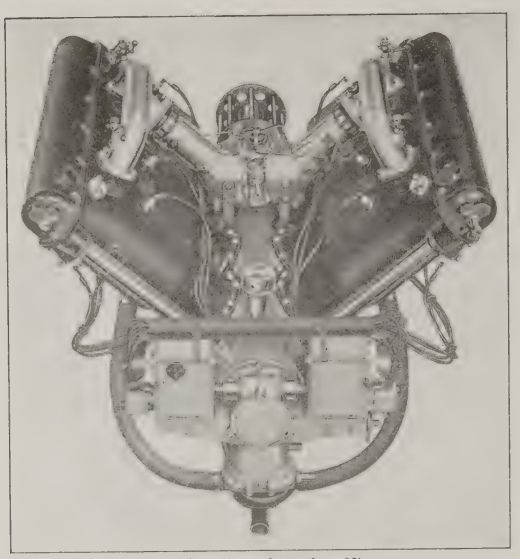
Model A connecting rods consist of an inner rod and an outer. The inner has a lower end which is split like the conventional design of rod, the cap being held on by two bolts. The lower end and cap are not only bored and babbitted on the inside to fit the crankpin, but are also turned and babbitted on the outside, the center portion where the bolts come being kept very narrow. The outer rod is forked, and consequently



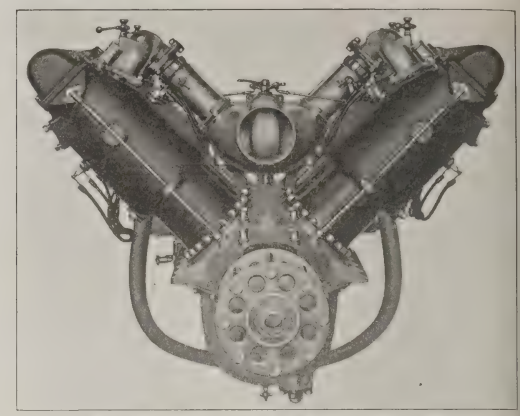
Pump end of the Hispano-Suiza, showing cross driven magneto



Section showing the lubrication system for the 150 h.p. and 180 h.p. Hispano-Suiza Motors



3 Semi plan view of 300 h.p. Hispano



Note small total height of 300 h.p. in end view

has the equivalent of two caps joined together by a sort of bridge. It encircles the inner rod, taking its bearing on the external babbitted portion of the inner rod.

While this construction is extremely light, it is very difficult to make, and the process of babbitting the inner rod is far from easy. Special tools are required for boring the inner babbitt and insuring that the outer babbitt is perfectly concentric with the inner. It is a job which cannot be undertaken without special equipment.

On Models E and I the intricate lower end is replaced by a diecast bronze box of what is called the "marine type." This is lined with babbitt and fits the crankpin. The forked connecting rod terminates in two flat feet and attaches to the bronze box by four bolts which also hold together the two halves of the box, the latter being split in the conventional way.

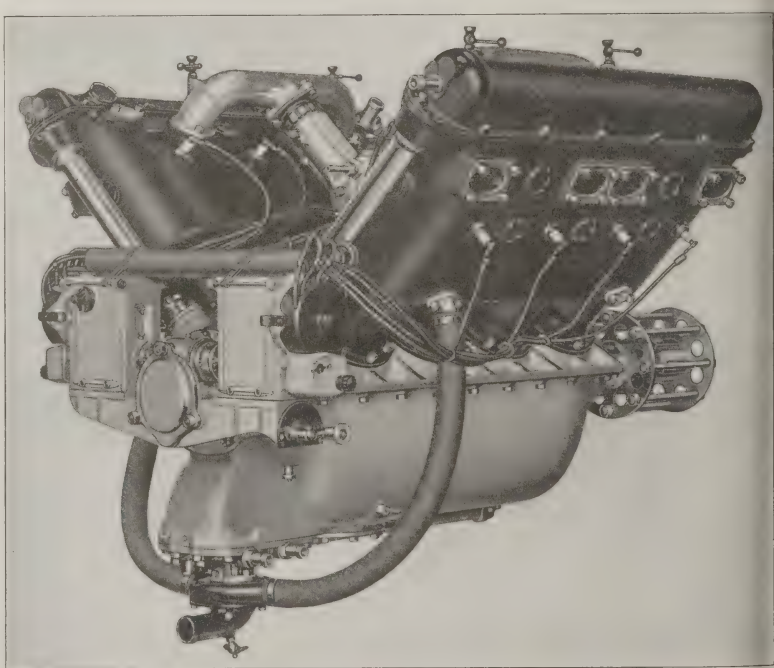
The outside of the bronze in the space between the two feet of the forked rod is turned and forms the bearing for the other connecting rod lower end, this being split in the conventional way and held together by two bolts. This design allows for the fitting of a new set of bearings with ordinary tools and methods. Also the bronze being a very good conductor helps to dissipate the heat produced by the friction.

Oil Pump Lubrication System

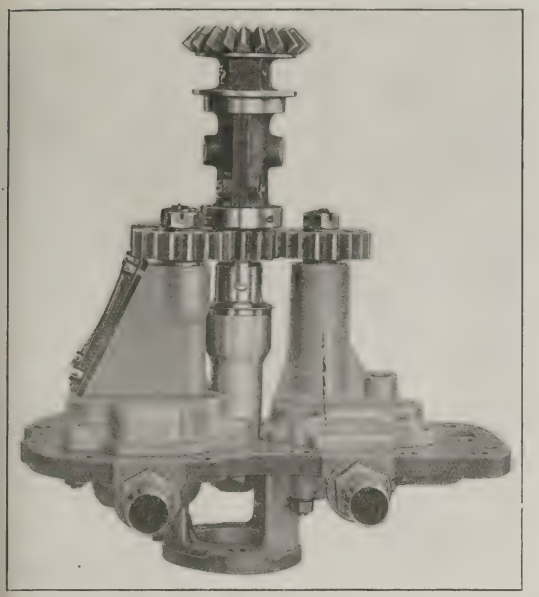
There is one main oil channel, this being a steel tube cast in the lower half of the crankcase, in which the oil pump is located, as already described. From this main channel oil passes to the four main bearing bushings. Each bush is encircled by a groove cut in the aluminum, which is thus kept full of oil. Passing through holes in the bushing oil reaches the crankshaft, and passing on through holes in the shaft completely fills the inside thereof, passing out again through other holes which lead to the lower ends of the connecting rods; further holes in the inner connecting rod members leading oil to the outer rod bearing. Piston and wrist pin lubrication is performed by the oil spray exuding from all bearings.

Camshaft and valve lubrication is obtained by taking oil from the groove around the front end main bearing and leading it up through two small steel pipes, one attached to each cylinder block. These lead to holes in the aluminum, registering with holes in the front end camshaft bearings. Thence the oil enters the camshaft itself, which is hollow from end to end, and small holes drilled in each cam allow lubricant to be discharged directly upon the tappets. These holes are on the opening face of the cam and so oil the tappet head just as the cam begins to lift. The excess not only lubricates the valves themselves, but flows into the bearing supporting the upper vertical shaft. Here it obtains access to the space inside the tube inclosing the vertical shaft, falls down this, lubricates the lower vertical shaft bearings and returns to the crankcase through the hole drilled right through the lower vertical shaft. Every bearing and gear is thus taken care of in proportion to its requirements.

Here occurs another difference between the models. Model A *can* be used with the whole supply of oil contained in the sump, the oil pump sucking from the middle of the sump through another steel tube fixed in the crankcase, but this is very poor practice. Oil on returning to the crankcase should be allowed to run out of the bottom, into an oil radiator, placed well beneath in a good air draft, whence it is drawn by the pump.



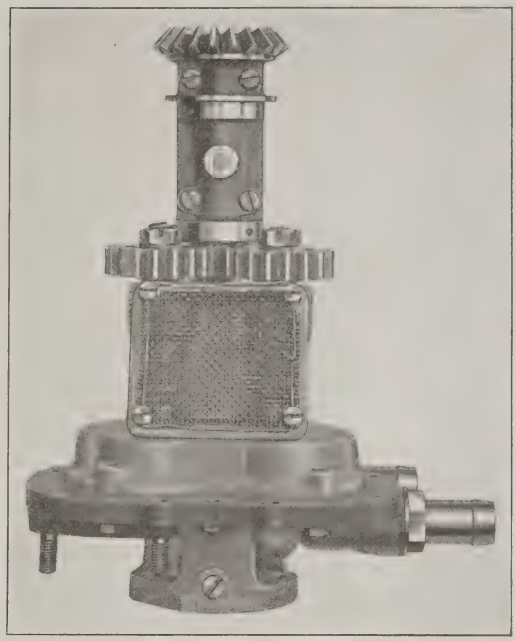
300 h.p. Wright Martin Hispano in shipping condition, in which state it weighs exactly 600 pounds



Complete oil pump assembly for 300 h.p.

On Models E and I there is a second oil pump supplied for the express purpose of keeping the crankcase empty. This is a gear pump attached to the rear of the magneto bracket, taking its drive from the rear end of the magneto shaft. This sucks from the crankcase and forces the oil through the oil radiator to a tank which is mounted on the plane, preferably in some position where it will be kept cool by air draft. The force pump then draws its supply from this tank, getting oil which is well cooled. In aeroplane engines the duty of the oil is not only to lubricate the bearings, but also to carry heat away from them, thus it is important to provide for ample cooling of the oil.

On all three models the pressure oil pump is the same. It consists of a shaft having a slot cut in it in which fit a pair of bronze vanes forced apart by springs. This shaft passes through a hole in the pump body which is eccentric with the shaft. The hole is of the same length as the vanes and the



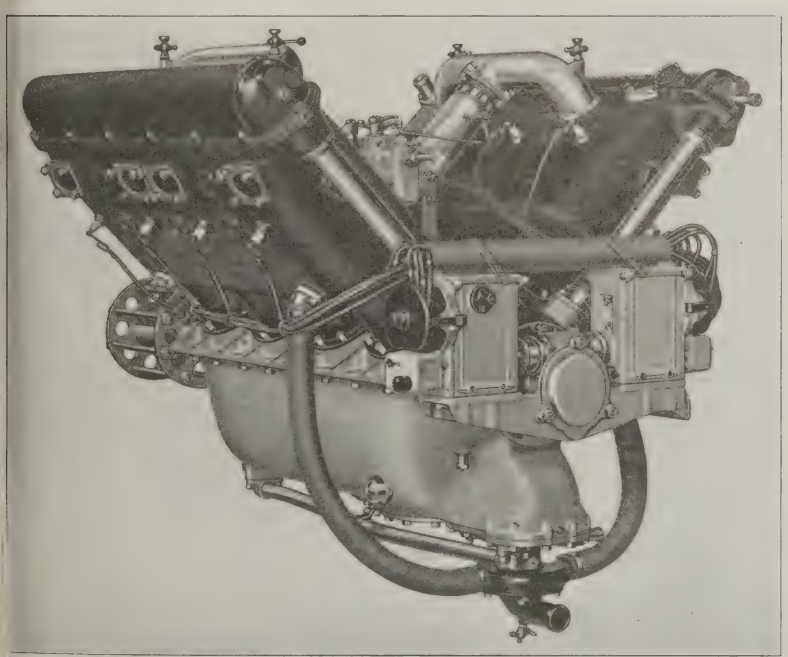
Oil screen on intake of pump

springs hold the vanes pressed tightly against the sides of the hole.

Owing to the eccentricity, as the shaft turns the vanes slide in their slot at the same time that they are being revolved. Suppose now we think of the section of the pump when the shaft is in such a position with respect to the hole in the body that the vanes are truly central, projecting equally on either side of their slot. Then, because of the eccentricity, the space between the shaft and the body on one side of the vanes will be greater than that on the other side.

On the side with the larger space there are holes in the pump body connecting with the suction line, while on the opposite side are holes leading to the pressure lines. As the shaft turns the oil contained on the large side is swept round and compressed into the smaller space on the other side, the process repeating itself twice each revolution.

There is an oil screen between the pressure outlet of the pump and the entrance to the oil supply channel, this screen being screwed into a cavity in the crankcase whence it can readily be removed for cleaning.



This view shows the great compactness of the 300 h.p. design

Water System

The water pump is a simple centrifugal type with two outlets. It is placed directly beneath the oil pump, attached to the crankcase through the medium of a bronze bracket. The lower end of the oil pump shaft is carried out through the crankcase and is furnished with a square hole. Into this hole the squared end of the water pump shaft fits, there being two packing glands, one to prevent

escape of oil downward and the other the conventional gland to retain the water. The pump delivers through two pipes, rubber in some installations and in others copper, to the lower, outside rear corners of the cylinder blocks. From these it passes out to the radiator through two pipes attached to the upper, inside front and corners of the jackets.

Carburetion

Two types of carburetor are used, the Zenith, which is found on all the older engines, and the Stromberg, adopted in the early Summer of 1918. There are two intake flanges on each cylinder block connected together by cast aluminum pipes, and these lie close against the blocks. Above the carburetor there is another aluminum casting having two side outlets and two underneath. To the latter the two outlets of the duplex carburetor connect the side outlets attaching to the center of each intake branch. On one side the connection is by a flange bolting solidly in place, and on the other side there is a short intermediate piece provided with a gland, allowing for expansion. This center casting has a water jacket. This layout with the double form of carburetor is equivalent to two separate carburetors and intake systems, one for each block.

Details

In most aeroplane installations gasoline is fed to the carburetor by air pressure. For this purpose the left hand valve cover carries a small air pump which comprises a bronze cylinder and a piston with a cup leather. The piston is driven from the rearmost exhaust cam, its suction stroke being given by a spring that is compressed on the working stroke of the pump. The pump is not adjustable and supplies air at a higher degree of compression than is ever likely to be required. Various regualting devices for controlling the pressure in the fuel tank are in use, but these are not part of the motor.

The rear end of each valve cover is provided with a threaded boss, and each camshaft has a screwdriver slot in the rear end. In all installations a tachometer or motor speed indicator is used and the flexible shaft for driving this instrument is attached to a special connection supplied with the motor. This consists of a short brass body, screwing in a boss on the valve cover and containing a short shaft meshing with the camshaft slot and arranged at the outer end to take the standard form of fiexible shaft connection.

Normally no accessory is driven from the other camshaft and the hole in the end of the valve cover is plugged, but it is always available for driving another accessory.

On some installations, especially naval planes, a starting crank is attached. In the Model A this replaces the cover usually found on the rear end of the crankcase. The hand starting crank usually has geared to it a small magneto which supplies extra current for starting.

The propeller hub which fits on the taper at the front end of the crankshaft is not an interchangeable part in the ordinary sense of the word. Each hub is lapped by hand till it is a perfect fit on the taper and the key only performs part of the function of taking the drive, since the hub is drawn very tightly on the shaft. If the hub is not a perfect fit too much stress comes on the key and the hub is liable to "work" on the shaft. This will tear the shaft and hub and perhaps make it impossible ever to remove the hub. The nuts used for locking the hub in place differ. On Model A there is a single nut with a coarse internal thread screwing on the crankshaft and a fine external thread, screwing into the boss of the hub. This nut screws on the shaft faster than it screws into the hub, so that the hub is pushed onto the taper with considerable pressure. The reverse of this action, of course, assists the removal of the hub.

On Models E and I there are two nuts which are the equivalent of the single nut of Model A. That part screwing into the hub is free to turn on the outside of the nut screwing onto the shaft. In this instance the hub is pushed on by screwing up the inner nut and then finally locked home by the outer nut.

The 300 H. P. Engines

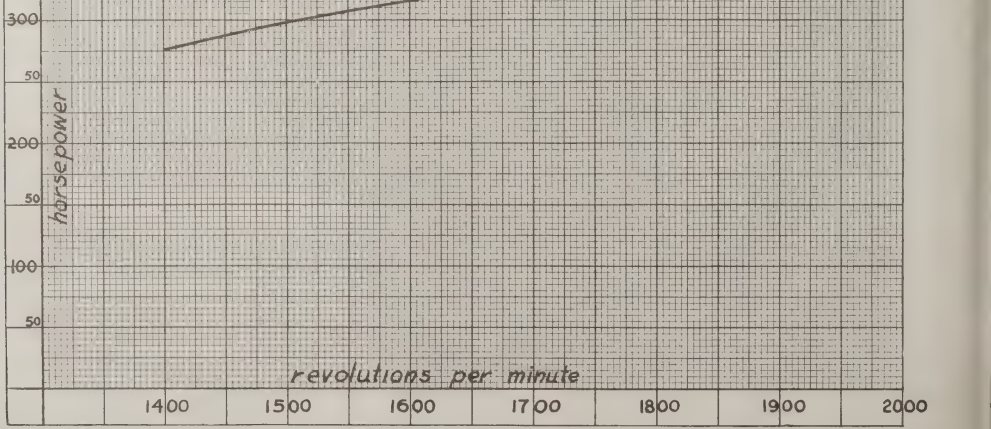
The French 300 h.p. motor is very similar to the original French 150 h.p. except that it has the magnetos arranged crosswise precisely as on the American models E and I. It has bore and stroke 140 by 150 mm. and the average power developed is about 290 h.p. at 1,600 r.p.m.

The Wright-Martin 300 h.p. differs in three salient respects. Firstly it has the Crane design of connecting rod, using marine type lower ends, as in the other Wright-Martin motors. Secondly the lubrication system is altered, the vane pump being abandoned in favor of a gear pump. Thirdly the cylinder sleeves are 30 mm. longer and there is more water space in that portion of the jacket which comes above the valves, and the valve lift is 2 mm. greater.

Due to this last feature, and also to the valve timing, it is possible to obtain a very high mean effective pressure and to maintain this for long periods because the valves do not overheat. Water is carried down very close to the valve seats in sufficient quantity to prevent excessive local heating. On the official test at the Bureau of Standards, Washington, D. C., this engine developed 315 h.p. at 1,600 r.p.m., which is equivalent to a m.e.p. of 139 pounds per square inch, and at 2,000 r.p.m. nearly 360 h.p. was obtained. Repeated tests with different motors have shown that 310 h.p. at 1,600 can be maintained indefinitely without overstressing any part of the engine. In the air it has been operated at speeds in excess of 1,700 r.p.m., delivering nearly 350 h.p.; also for long periods continuously.

The weight of the motor complete with carbureter and magnetos is just 600 pounds, equivalent to one and five-sevenths pounds per h.p. A graph showing the official power curve obtained by the Bureau of Standards is given below.

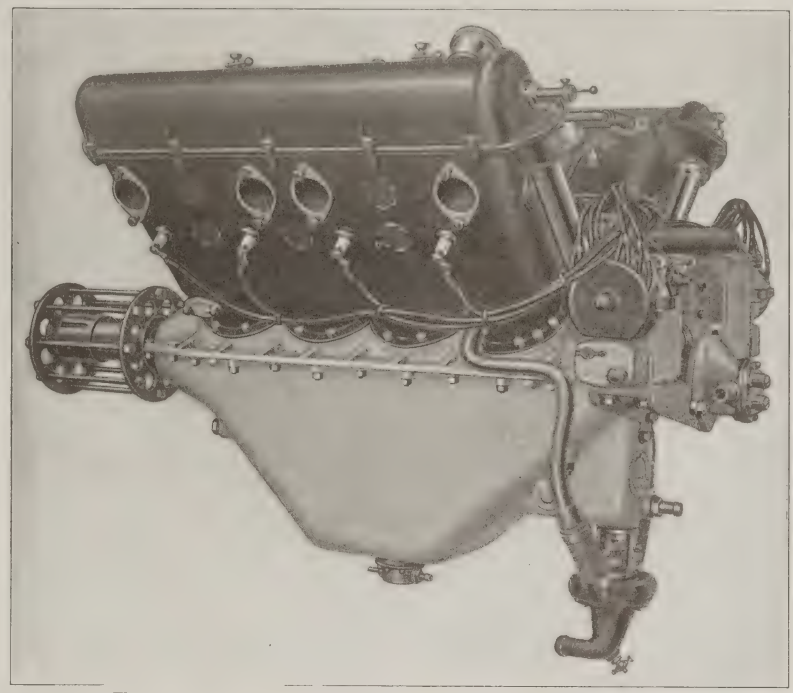
The purpose of making the cylinders longer was largely to do away with the overrun of the pistons. In the French design the pistons come well out of the cylinders at the bottom of the stroke, and thus get deluged with oil. In the Wright-



Martin motor the pistons are always completely within the sleeves and as a result the oil consumption came out only two-thirds that of the French. Actually it is five quarts per hour when operating at full power.

The reason for changing the oil pump design was partly that the gear pumps are a little easier to manufacture, but the principal object was to make a pump which would have no wearing part. Further, the gear pump is so arranged that it sucks from both ends of the crankcase, and the case is thus able to be kept shallow. The engine operates with a dry case, all oil being immediately sucked out of the lower half as it drops from above and pumped to the tank. Inclination of the motor makes no difference, since if the suction port at one end of the case is uncovered, that at the other is submerged.

After being drawn from the case, the pumps force the hot oil through an oil radiator and into a tank, or else direct into a tank, which is so exposed as to act as a radiator. In the new Loening plane, for example, the tank is of narrow section and is placed outside and close against the fuselage, where it obtains ample cooling. However, in any case, oil is taken from the tank by another gear pump and forced to the bearings, the circulation from that point being the same as for the other sizes of motors.



Three-quarter rear view of the complete E or I Hispano-Suiza motor

In the whole oil pump assembly there are three pumps. One, the force pump, is a separate and complete unit; two are the suction pumps for keeping the case dry. One is connected to the front end of the case by an external pipe, the other takes its supply direct through a hole in the pump body. Each pump, of course, has to have a pair of gears, but the three are arranged so that the middle gear wheel serves as one-half for each of the two, thus saving weight and increasing simplicity.

The oil straining is performed on the outlet side of the force pump, there being a very large screen of hemispherical shape located within a chamber cast in the lower crankcase half. This strainer is held in place by a cover and can readily be removed.

Originally the piston of the French motor was similar to the old Model A, with deep webs beneath the head and a fixed wrist pin, the Wright-Martin engine having a simpler piston with a thick head and no ribs, and also a floating wrist pin. This type was later taken up by the French and is the design which was put into European production.

Many experiments have been tried with piston rings and the results show that the four narrow rings generally give better results than two wide ones, but the narrow rings have some drawbacks, so the American 300 h.p. piston is provided with three comparatively wide rings, each in its own groove. There is a scraper ring near the bottom of the skirt, and the piston pin is held from endwise motion by aluminum end pieces. These fit in the pistons, being prevented from turning by tongues, engaging slots cut in the piston itself. In the French design the piston pin is secured by a ring passing across its ends, just as for the American Models E and I.



The Curtiss "NC-1" Type Flying Boat, one of the Largest Navy Flying Boats

THE DE HAVILLAND 4, WITH LIBERTY '12' ENGINE



THE de Havilland 4 with the Liberty engine has been one of the successful associations with America's air program. For reconnaissance and bombing the British have used the de Havilland 4 with a 300 H.P. Rolls-Royce engine, and the adoption of the Liberty 12 has given the United States superior results in both performance and production.

The data and drawings given here are from the de Havilland 4 built by the Standard Aero Corporation, Elizabeth, N. J.

With slight modifications in its equipment, the de Havilland 4 is used for reconnaissance, bomb dropping and fighting. Complete night flying equipment is installed, consisting of green and red port and starboard electric lights near the ends of the lower plane, a rear white light on the deck just aft of the gunner's ring, and wing tip flare lights near the wing tip skids.

Current for lighting and wireless is supplied by two generators attached to the inner sides of front landing gear struts. A camera is clamped to a padded rock on the interior of the body aft of the gunner's ring, where it is conveniently operated by the observer. Dual control is installed, and control stick is quickly detached and removed by pressing a spring catch when it is not necessary for the observer to take control.

Racks are provided for twelve bombs which are held in place horizontally under the lower planes, near the body. The release is accomplished from the pilot's cockpit by means of bowden cable. A sighting arrangement is built into the body just behind the rudder bar.

Four machine guns are installed. Two fixed Browning guns are mounted on the cowling forward of the pilot, operated by the "C. C." automatic interrupter gear or the Nelson direct mechanism, which releases the trigger at each revolution of the engine crankshaft. Two movable Lewis guns are carried on a rotatable Scarff ring surrounding the rear cockpit.

A telescopic sight is provided for the two fixed forward guns and a ring and bead sight for the twin Lewis guns.

Instruments carried are: Two gasoline pressure indicators, speed indicator, tachometer, altimeter, thermometer, clock, hand pressure pump, inclinometer, map board, and compass.

General Dimensions

	Feet
Span, upper plane	42.3
Span, lower plane	42.3
Chord, both planes	5.47
Gap between planes	6.0
Stagger	12.6
Length over all	29.7
Height over all	10.85

Areas

	Square feet
Upper plane	216
Lower plane	205
Ailerons (2 upper and 2 lower)	76
Total wing area with ailerons	421
Stabilizer	33.7
Elevator	23.3
Fin	5.1
Rudder	12.5

Weights, General

	Pounds
Machine empty	2,440
Fuel and oil	452
Military load	848
Total, machine loaded	3,740
Estimated useful load	1,300

Weights, Machine Empty

	Pounds
Engine	858
Exhaust pipes	33
Radiator and water	170
Propeller	92
Gasoline tanks	62
Oil tank	10
Engine accessories, leads, etc	43
Fuselage with cowl	388
Tail plane, incidence gear	6
Body accessories, seats, etc	18
Undercarriage	119
Tail skid	11
Controls	21
Wings	469
Bracing	68
Armament supports	88
Total	2,449

Military Load

	Pounds
Crew	330
Armament	163
Bombs and gears	322
Photographic outfit	22
Wireless equipment	11
Total	848

Performances

Height (*feet*)	Speed (*m.p.h.*)	Time of Climb (*min.*)	Rate of Climb (*ft. per min.*)
0	128	0	1,330
5,000	126	4.6	1,020
10,000	124	11.6	710
15,000	120	20.5	400
20,000	105	....	.....

Main Planes

There is no sweepback, but upper and lower planes are attached to a center section and the body, respectively, at a dihedral angle of 174°.

Aspect ratio of both planes, 7.7. Angle of incidence, 3°.

Fuselage

Veneer is used for covering the fuselage from the radiator to the gunner's cockpit, and no diagonal bracing is therefore employed in this part.

The rear end of the body is constructed in the usual girder fashion, and the longerons, of spruce, are spliced. Veneer is used underneath the tail plane for covering the body.

Tail Plane

Attachment of the tail plane is such that its inclination can be varied from the pilot's cockpit during flight. Its front edge is hinged and the rear end braced by wires attached to a vertical post in the fin. By means of a cable wrapped around a drum and worm at the lower end of the post the rear brace wires are raised or lowered, and the trailing edge of the stabilizer is correspondingly raised or lowered, permitting the setting to be adjustable within the limits of $-2°$ and $+5°$.

Engine Group

Drawings and a description of the Liberty Motor appeared in the December 1st issue of AERIAL AGE.

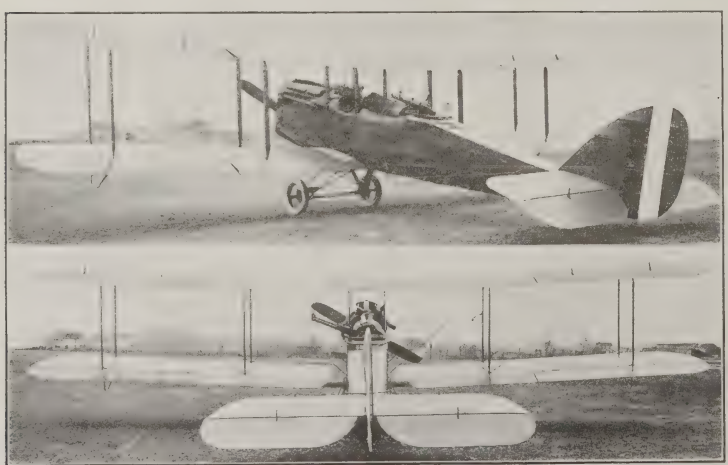
The engine is a twelve-cylinder Liberty "12" which develops 400 H.P. at 1,625 r.p.m. Bore and stroke 5 by 7 inches. Cylinders are set at a 45° V.

Zenith carburetor and Delco ignition are used.

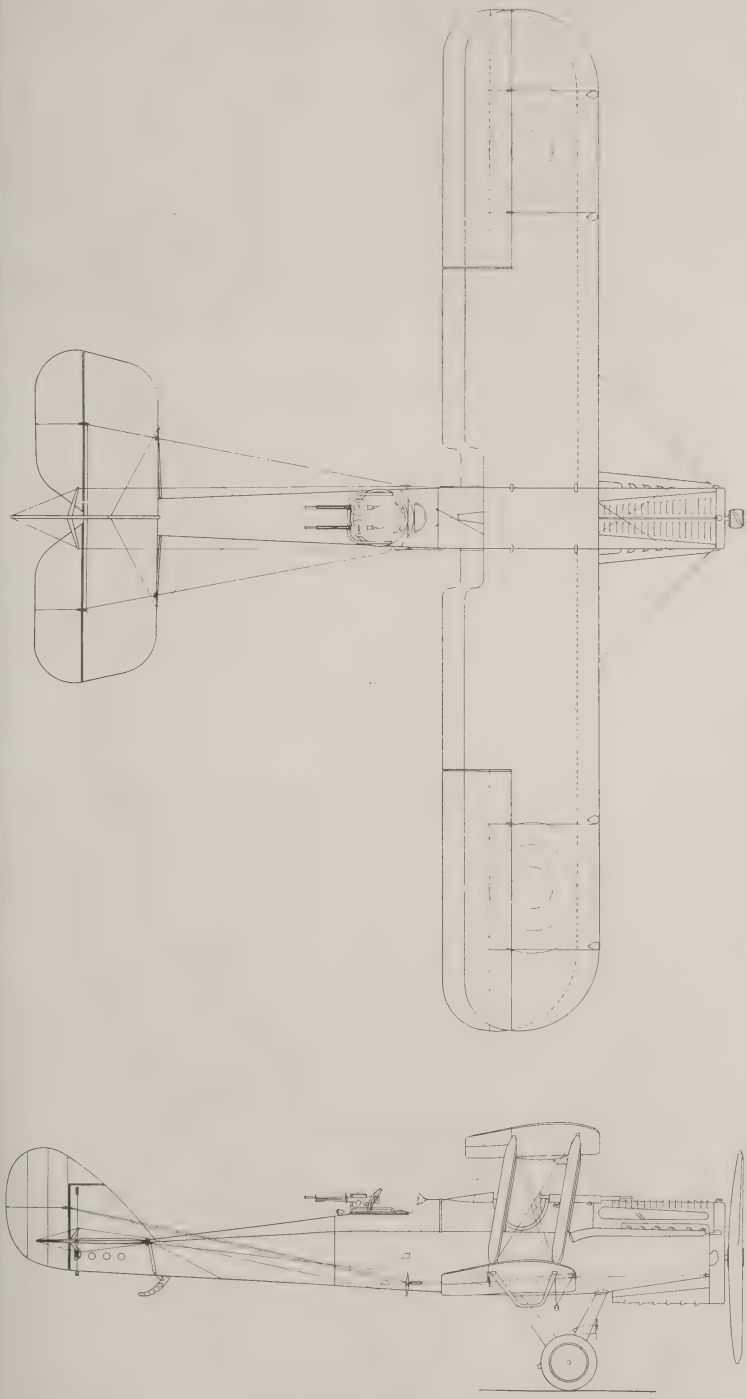
Fuel consumption .54 lbs., and oil .03 lbs. per h.p. per hour. Fuel tanks are located at the center of gravity. Capacity 67.6 gallons. Oil tanks under pilot's seat have a capacity of 5.6 gallons.

The radiator is provided with shutters operated from the pilot's cockpit, to cut off part of the cooling surface when flying at low temperature.

Propeller, 8.6' diameter and 10.7" pitch. When at rest on the ground the propeller hub is 6' 0" above ground, and in flying position it is 5' 0" above ground.



Rear views of the DeHavilland 4 built by the Standard Aero Corporation



DE HAVILLAND 4
400 HP LIBERTY
RECONNAISSANCE PLANE

Scale of Feet

1 2 3 4 5 6 7 8 9

McLaughlin



"THE OPE

Curtiss Achievements"

1—The design and construction of the fastest fighting airplane ever flown. (
Government records credit this triplane, which was built for the U. S.
known as model 18-T, with 160 miles per hour, carrying full military load
and passenger. This is 15 miles per hour faster than any speed ever claim
an airplane, a truly epoch-making achievement, made possible by the develo
of our new model K motor.

2—The design and construction for the Navy of the largest flying boats in the
colossal crafts capable of carrying five tons useful load. It was one of these
that recently carried fifty passengers.

3—The design and construction for the U. S. Navy of the fastest and most e
Seaplane in service anywhere. This craft which is known as the Curtiss mode
with Liberty motor, made an official speed of 126 miles per hour with full n
load, armament, ammunition, pilot and passenger.



The Curtiss Engineering Corporation is today the center of aeronau
Glenn H. Curtiss and his engineers have been busy in drafting rooms, r
of suitable commercial types. Aircraft especially designed for sportsman'
workmanship and performance as Curtiss military planes have proved ther

CURTISS ENGINEERIN

Member

iss

BOOK"

The Great War

velopment and construction of a 12 cylinder, 400 H.P. motor of an entirely d much lighter type, known as the Curtiss model K-12. These motors have one exhaustive tests and are already in production.

velopment and construction of the Curtiss model K-6, a new and much 6 cylinder motor. These engines develop 160 H.P. and possess greatest en- e and reliability.

velopment and construction on a large scale of the Curtiss OXX motors, e J-N-4. training planes, which were used almost exclusively by the United and Canada and largely in England for the training of American and aviators. The training of over seven-tenths of the original land and flying pilots, most of whom entered the service and formed the nucleus United States Training Forces.



es instead of being decreased will be increased by the coming of peace. els and shops in perfecting designs and carrying forward the production peace-time purposes are already available and are as superior in design,

ION, Garden City, L. I.

THE HUGHES AIRCRAFT REPORT

TENTH—SPECIAL MATTERS

(Continued from last week)

1—Purchase of the Plant of the General Vehicle Company

In November, 1917, the Government purchased the plant of the General Vehicle Company at Long Island City, New York, for $1,527,568. The purchase embraced all the real estate, building and machinery constituting the plant, and all other assets, except that patents (other than those relating to internal combustion rotary aircraft engines), franchises, good will, cash, bills and accounts receivable, specified securities and all inventory assets not acquired and used in connection with the manufacture of Gnome engines, were retained by the General Vehicle Company. The Company also agreed to release for the use of the Government its administrative and manufacturing organization so that the Government might take over the plant property and organization as an active manufacturing establishment in full readiness for production. Upon a physical valuation and inspection of the books of the Company by Government appraisers and accountants showing that the price was a fair one on the basis of prices previous to the war, and upon an opinion of the Judge-Advocate General as to the legality of the purchase and as to the propriety of the form of contract, the purchase was recommended by the Aircraft Board.

The advisability of the purchase, however, was doubted at the time by officers of the Government. It appears that at the outset, in formulating the aircraft program, it was supposed that the Gnome rotary engine would be a factor of some importance, and a small order for Monosoupape motors was placed with the General Vehicle Company, but in view of doubts as to the planes to be built, with which such engines would be used, further orders were not placed. Later, on word from overseas that Gnome rotary engines should be put into production, there were negotiations with the General Motors Corporation looking to the acquisition of the General Vehicle plant and the manufacture of these engines in large quantities. Before the matter was closed, the instructions from abroad were changed and the proposed transaction was abandoned. The considerations underlying the purchase are stated in the recitals of the Aircraft Board in the resolution adopted at its meeting of October 19, 1917. It was stated that advices from France indicated a doubt as to the future demand for rotary engines in aviation, but that nevertheless these engines would be used to a greater or less extent for a considerable period to come; that it was desirable that "the technique of manufacture of rotary engines should in any event be studied and developed in the United States in case of need"; that the General Vehicle Company had "the only plant and organization of substantial size in the United States, equipped and organized with the necessary facilities and experience for the manufacture of such engines"; and that the present and future demand for rotary engines was "not sufficient in amount or sufficiently continuous to justify a manufacturer in the maintenance of a plant and organization adequate for a prompt supply of such engines and for the proper study and development of the technique of that type of engine."

In a previous part of this report (*ante*, p. 98), reference has been made to the opinion of the Joint Army and Navy Technical Board, given on November 16, 1917, that in the program for the coming year rotary engines should be considered of secondary importance, but that it was deemed desirable that the art of building rotary engines should be retained in the United States and that for this purpose the organization skilled in rotary engine production should be preserved. While it was thought that an order which had been given to the Union Switch and Signal Company for 2,500 80 H. P. LeRhones was larger than was necessary to preserve the art, it was further recommended that steps be taken to maintain the possibilities of production of the 160 H. P. Gnome engine. The resolution of the Joint Army and Navy Technical Board did not in terms approve the purchase of the General Vehicle Company's plant, nor did it express opposition in any definite way.

The actual necessity of the purchase of the General Vehicle Company's plant is not apparent. As soon as the Government made the purchase, a corporation called the Aeronautical Engine Company, with a nominal capital, was incorporated for the purpose of building Gnome engines at the plant, and contracts were made for the manufacture of small quantities at cost, without profit. This, however, did not continue long. It was found that the Union Switch and Signal Company had mastered the art of making LeRhone engines, and although these were of a different type, it seemed that the necessity of keeping the organization in existence at the plant purchased from the General Vehicle Company soon ceased, or was very much minimized. In April last, it was proposed that the plant at Long Island City be leased to the Wright-Martin Company for the manufacture of the 300 H. P. Hispano-Suiza engines, and an arrangement for this purpose was made soon thereafter, one of the reasons being stated to be "the practical abandonment of the manufacture of Gnome motors."

At the time of the purchase of this plant by the Government, the General Vehicle Company had outstanding notes amounting to $1,530,000, which were held by the Peerless Truck and Motor Corporation. The purchase price paid by the Government was substantially equivalent to the amount of these notes and thus provided for their retirement. The purchase, however, was made on the basis of the value of assets, and whatever difference of opinion there may be as to the advisability of the purchase, there are no facts warranting the conclusion that it was not made in good faith or that the amount paid was in excess of the fair value of the property acquired.

2—Mahogany Manufacturers and Importers Association

True mahogany is a desirable wood (ranking in the opinion of the Government's production engineers next to Black Walnut) for the making of propellers for service or combat aeroplanes. To meet this demand, contracts had been made for Mahogany in the Fall of 1917, but with only one responsible corporation, that is, Lewis Thompson and Company. A contract with one of the companies selected was cancelled because it was apparently without financial resources and could not provide a bond, and in the case of another contractor no deliveries were made.

In the beginning of January, 1918, it appeared that there was a serious shortage in the Government's supply of wood for service-plane propellers, and through the War Trade Board the leading Mahogany manufacturers of the United States were invited to a conference in Washington. This conference was held on January 21st, and at that time, or in the later conferences, the following corporations and firms were represented: Huddleston-Marsh Mahogany Company, Ichabod T. Williams & Sons, George D. Emery Company (said to be closely affiliated with I. T. Williams and Son) and the Astoria Veneer Mills and Dock Company of New York; Palmer, Parker and Company, of Boston; Lewis Thompson and Company, and S. B. Vrooman Company, of Philadelphia; Freiberg Lumber Company, of Cincinnati; C. C. Mengel and Brothers Company, of Louisville; Talge Mahogany Company, of Indianapolis; C. L. Willey Company, of Chicago; and the Otis Manufacturing Company, of New Orleans. At the first conference the manufacturers were notified of the Government requirements for propeller stock, their cooperation was sought, and they were asked to advise the Government of the quantity which each could furnish, and the price. The representatives of the War Trade Board suggested the advisability of an organization of the manufacturers to secure effective cooperation with the Government, and accordingly an association of the manufacturers was at once formed, which appointed a War Committee composed of A. S. Williams, of the Astoria Veneer Mills and Dock Company; C. H. Thompson, of Lewis Thompson and Company; F. C. Leary, of Ichabod T. Williams and Sons, F. G. Otis, of the Otis Manufacturing Company; and J. C. Wickliffe, of the C. C. Mengel and Brother Company. The Committee met at once and passed a resolution expressing the opinion that the best interests of the Government would be served by the purchase by the Government "of all Central American mahogany logs now under contract with the members of the Association at a price to be agreed upon; the Government to arrange transportation of said logs; the manufacturing of the logs into lumber to be done by the mills represented by this Association at a price to be agreed upon." At the same meeting, the officers of the Association were elected: Thomas Williams, of Ichabod T. Williams & Sons, President; R. S. Huddleston, of the Huddleston-Marsh Mahogany Company, Treasurer; and Charles H. Thompson, of Lewis Thompson and Company, Secretary. This proposition was rejected by the representatives of the Signal Corps, for reasons stated at length, which were in substance that it was deemed inadvisable that the Government should arrange for the purchase of logs directly from the loggers in Central America and Mexico in view of the unfamiliarity of the Signal Corps with the logging business, or that the Government should take over existing contracts for purchases of logs on account of the complications that might arise, or that the Government should become directly involved in log purchases. Recognizing the difficulties in the disposal of a largely increased quantity of lumber, the representatives of the Signal Corps felt disposed to pay "a higher price than pre-war or existing prices for propeller stock," in order that the mahogany manufacturers might offset any loss due to the low market value of rejected material. It was then recommended by the Signal Corps that the manufacturers should make a proposition as to the price to be paid for propeller stock, and it was stated for the manufacturers that they could not quote prices on the basis of the existing Signal Corps specifications, as these were too restrictive as to the grade to be selected and permitted the Signal Corps to accept or reject the material based upon the judgment of the inspector. It was finally suggested that the manufacturers should submit a proposition based on what are called 'National Hardwood Inspection' rules (that is, the rules of the National Hardwood Lumber Association) quoting a separate price on "first and seconds, selects and No. 1 common". Discussions continued between the War Committee of the Association and representatives of the Government, among the latter being Lieutenant Ryerson, who was in charge of propeller parts in the Plane Production Section; Joseph S. Otis (who, as the result of a disagreement, had recently severed his connection with the Otis Manufacturing Company and had offered his services to the Government as a mahogany expert) and representatives of the Lumber Committee of the Council of National Defense. At the meeting on January 23rd, according to Lieutenant Ryerson's report, the War Committee of the Association suggested prices for propeller mahogany according to 'National Hardwood Inspection' rules as follows: firsts and seconds, $350 per M feet; selects, $320; No. 1 common, $270. After these figures were submitted a discussion of costs followed, in which Joseph S. Otis, representing the Government, and J. C. Wickliffe, representing C. C. Mengel and Brother Company, gave their respective estimates of costs. Mr. Otis' estimate was considerably lower than the other and was contested by Mr. Wickliffe. The question of specifications was again discussed, and the Signal Corp representatives stated that it would be impossible to place orders on the basis of 'National Hardwood Inspection' rules, which permitted widths considerably less than those required for propeller stock. After further parley, Lieutenant Ryerson stated that it would be preferable to negotiate with the various manufacturers and importers individually for the purchase of such mahogany as they were in a position to offer. It was considered that if negotiations could not be brought to a close on the basis of the prices quoted that it might be desirable for the Government to fix a price for the purchase of propeller stock and agree to provide in its contracts that after partial performance there should be an audit of costs and a readjustment of prices upon a fair basis.

After the negotiations had thus proceeded for several days, the manufacturers submitted to the officials of the Signal Corps the opinion that Joseph S. Otis was not competent to advise the Signal Corps with respect to mahogany costs and suggested that action should be taken by which some one should be put in charge of the purchases of mahogany for the Government "who could develop the actual facts and be fair to the industry." Joseph S. Otis left the Signal Corps on January 29th. On January 31st Henry Lockhart, Jr., was placed in charge of the 'Materials Department, Foreign and United States,' which had the duty of procuring the materials necessary for the production of aeroplanes, with the exception of motors and instruments. About February 5th, Henry K. S. Williams, who had formerly been in the lumber business as a member of the firm of Ichabod T. Williams & Sons,) being a brother of Thomas Williams of that firm) but had retired several years before, was put at the head of the Hardwoods Section, which was a sub-division of the Materials Department and had charge of the orders for woods required for propeller stock. Shortly after, on February 25th, J. C. Wickliffe, who had been for ten years Secretary of the C. C. Mengel and Brother Company of Louisville, and had been active as a member of the War Committee of the Mahogany Manufacturers and Importers Association, entered the service of the Government as assistant to H. K. S. Williams in the Hardwoods Section. The suggestion that he should take this position was made about the middle of February in a conversation between H. K. S. Williams and Mr. Mengel when the latter was asked if he could spare Mr. Wickliffe from his organization. On March 4, 1918, J. Edward McCullough, who had been superintendent at the mill of the George D. Emery Company, one of the members of the Mahogany Manufacturers and Importers Association, was made district inspector of mahogany as well as other woods in the New York district, embracing Boston, New York, Philadelphia and New Orleans. He was selected by S. B. Vrooman, Jr., who about February 10th was given general charge of the inspection of all propeller lumber throughout the country. Prior to his connection with the Government (he started as an inspector in December, 1917) S. B. Vrooman, Jr., had been in the service of the S. B. Vrooman Company, also one of the members of the Mahogany Manufacturers and Importers Association; he was, and has continued to be, during his service with the Government, one of the stockholders of that corporation (*ante*, p. 68).

Mr. Wickliffe, during his connection with the C. C. Mengel and Brother Company, had owned five shares of its preferred stock, which he disposed of some years ago; his wife owned five shares of the common stock, which were sold when he entered the Government service.

His salary as secretary of the Mengel Company had been $500 a month; his compensation from the Government was at the rate of $4,000 a year. When it was suggested that he should become connected with the Government, he said that he could not afford it, but he was informed that Mr. Mengel had offered to continue his salary "as a donation to the Government during the war." Mr. Wickliffe replied that he did not like the arrangement, would not accept it without Mr. Lockhart's approval, and in any event would not consent to be paid for than enough to defray the living expenses of himself and his family. Mr. Wickliffe was paid by the Mengel Company, in addition to his salary from the Government, $250 on March 25th, $250 on March 29th, and $250 on April 15th, a total of $750. This was subsequently adjusted on the basis of $350 for the period to April 1st and $400 was returned by Mr. Wickliffe to the Mengel Company. This was explained in Mr. Wickliffe's letter to Mr. Mengel as follows:

"628 Lexington Place, Washington,
Apl. 13th, 1918.

"Mr. C. R. Mengel,
Prest., C. C. Mengel & Bro. Co.
Louisville, Ky.

"Dear Mr. Mengel:

"The Signal Corps having fixed the salary I am to receive from them at the highest figure they can pay of $4,000.00 per annum, I want to let you know that I think it necessary now that you reduce the amount that you are remitting me monthly to $350.00 per month. As near as I can estimate it, I can get by on Washington living expenses and do such official entertaining as I shall have to do on the sum of these two amounts. If I find that I cannot, I shall frankly let you know the condition. But I feel that living here and doing the necessary at my present job on this figure is about the equivalent of the salary I had when I was with you in Louisville. Therefore, kindly give the necessary instructions to have the remittance cut down.

"Again thanking you and the Company through you, I am,
"Very truly yours,
"J. C. WICKLIFFE."

The arrangement with C. C. Mengel and Brother Company was approved by H. K. S. Williams in his letter of April 24, 1918, as follows:

"Washington, D.C.,
April 24, 1918.

"From: Office of the Chief Signal Officer.
"To: C. C. Mengel & Brother Company,
Louisville, Ky.

"Subject: Services.

"1. In line with the request of your president, Mr. C. R. Mengel, this Section desires to give you this letter stating that at the time it asked you for the services of your former secretary, Mr. J. C. Wickliffe, it was fully understood by it that you or the Mahogany Industry would pay him an amount of money per month over and above the salary the Signal Corps was authorized to pay him, so that the sum of these two would be sufficient to cover his and his family's expenses during their service with the Signal Corps. This was done with the full knowledge of Mr. Henry Lockhart, Jr., Head of the Materials Department, because of the fact that the Hardwood Section needed his services, and in view of the further fact that your offer to do this was made with the distinct understanding that he should sever all connection with your company and with the mahogany industry and assume his new duties, of course, entirely as a member of the Signal Corps organization. This Section would also set forth the fact that your offer was specifically asked by you to be considered in the light of a donation to the war.

"By direction of the Acting Chief Signal Officer.
"HENRY LOCKHART, JR.
"Materials Department, Foreign and United States,
"By H. K. S. WILLIAMS,
"Hardwood Section."

The salary which S. B. Vrooman, Jr., had received from the S. B. Vrooman Company had been continued by that company, and, when J. Edward McCullough entered the service of the Government, the George D. Emery Company paid, until the arrangement mentioned below, the difference between his Government pay and his former compensation from the company.

It was soon arranged that the Mahogany Manufacturers and Importers' Association should assume the payment of the additional compensation to Mr. Wickliffe and to Mr. McCullough. Accordingly, for the period beginning with April this compensation was paid to both in checks from Mr. Huddleston, the Treasurer of the Association. The amounts were raised by voluntary contributions of various members of the Association. The minutes of the Association show the following action in the matter:

"The matter of the difference in compensation between the amount paid by the Government for services to J. C. Wickliffe and to Mr. McCullough and the amount of compensation previously received was discussed. The following resolution was then presented, duly seconded and adopted by the affirmative vote of all present:

"Resolved that such excess compensation be paid by the various members of the Association in the form of an annual subscription, which is made up by various amounts subscribed by the mahogany firms, amounting in total to Fifty-Seven Hundred ($5,700) Dollars.

"The motion was duly made, seconded and carried by the affirmative vote of all present, that a copy of this resolution be sent to Mr. H. K. S. Williams."

Mr. Wickliffe testifies that this arrangement was made "because it was felt that it was not right for any one individual firm to pay it all." Mr. Huddleston testifies that it was "purely a question of cooperation with Mr. Mengel." Early in May there was correspondence between H. K. S. Williams and Mr. Huddleston, the Treasurer of the Mahogany Association, in which a letter in the following form, addressed by Mr. Huddleston to Mr. Wickliffe, was first submitted to H. K. S. Williams and approved by him:

"347 Madison Avenue
"New York, N. Y.,
"May 10, 1918.

"Mr. J. C. Wickliffe,
Materials Department, Foreign & United States,
Hardwood Section, Washington, D. C.

"My dear Mr. Wickliffe:

"A few days ago, when the heads of the various mahogany importing and manufacturing concerns met for general discussion, attention was called to the fact that by virtue of your recent appointment as Assistant to Mr. H. K. S. Williams, your annual income has been cut something in excess of fifty per cent.

"After a general discussion, it was agreed that it would not be fair that you stand alone the burden imposed on you by your services to the Government in this particular Department, therefore, it was mutually agreed that the various mahogany firms, feeling as patriotic as you have demonstrated yourself to be, will make up the difference between your former income and what you are now receiving from the Government, provided such an act would meet with the approval of Mr. H. K. S. Williams, the head of your department.

"I am pleased to advise you that I am today in receipt of a letter from Mr. H. K. S. Williams, approving of this transaction; so acting in the capacity of Treasurer, I will mail you each month a check for $350.00 beginning the month of April, which I am informed will make up the difference in your salary."

A similar letter was written, with the approval of H. K. S. Williams, to Mr. McCullough. Mr. McCullough was paid by the Association for April, May, June and July at the rate of $91.67 a month. He returned to his former employment early in August. In the case of Mr. Wickliffe, the arrangement continued until it was officially disapproved on August 20, 1918, by Mr. J. Gilmore Fletcher, on behalf of the Bureau of Aircraft Production, in the following letter:

WAR DEPARTMENT
Bureau of Aircraft Production
Washington

August 20, 1918.

"Mr. J. C. Wickliffe,
"Hardwood Section,
"119 D Street, N. E.
"Washington, D. C.
"My Dear Mr. Wickliffe:

"In view of the fact that the Government looks with disfavor upon your receiving from the Mahogany Manufacturers & Importers Association your present monthly remittance, which I shall refer to here as a salary of $350.00 per month, I deem it best, and hereby request, that you immediately refuse to accept any further payments from that source, or any other source which comes in direct line with your duties in the Hardwood Section, the Raw Materials Department, Division of Aircraft Procurement, Bureau of Aircraft Production.

"I shall at once take the proper steps to have the salary now paid you by the Government, namely, $4,000.00 per year, increased to $5,000.00 per year, and shall make every effort to expedite a decision on the point of allowing you this increase.

"Yours very truly,
"J. GILMORE FLETCHER,
"Chief of Aircraft Procurement."

Mr. Wickliffe immediately requested Mr. Huddleston to discontinue the payments, and accordingly there has been no payment of additional compensation since the payment for the month of July.

Early in February, 1918, arrangements were made with some of the manufacturers for the taking over of certain mahogany which has been under contract for delivery to British merchants, but the amount was relatively small. After H. K. S. Williams took charge of the Hardwood Section, and also after J. C. Wickliffe became his assistant, negotiations were continued with the manufacturers composing the Mahogany Manufacturers and Importers Association for the purchase by the Government of mahogany in large quantity for propeller stock. On the appointment of H. K. S. Williams, his brother, Thomas Williams (of Ichabod T. Williams and Sons) had resigned as President of the Association, and C. R. Mengel was elected in his stead. On February 14, 1918, new specifications had been adopted by the Signal Corps (No. 15,028-A) modifying and liberalizing the prior specifications which had been adopted in the previous December. At about the same time (February 13th) the manufacturers had submitted two proposals, one under the Signal Corps specifications (No. 15,028-A) at $400 per M feet for firsts, seconds, and selects, and $320 per M. feet for lower grades, f. o. b. cars eastern mills (with corresponding prices for other points according to estimated freight rates), and another proposal under the 'National Hardwood' rules for specified sizes at $350 per M feet for firsts, seconds, and selects, and $280 per M feet for No. 1 common, f. o. b. cars eastern mills. These had been refused. The important difference was with respect to the inspection.

In this situation, a conference was held on March 6th between the manufacturers and H. K. S. Williams, J. C. Wickliffe, and S. B. Vrooman, Jr., representing the Government. The minutes of this conference show that H. K. S. Williams opened the meeting with the announcement that "it was the purpose of the Signal Corps to grant as liberal an inspection as could be given consistent, of course, with the principle that no lumber could be taken that would not make propeller blades." After a discussion of the matter of utilizing lumber which showed scattered pin-worm holes, and the opinion having been expressed by Mr. Vrooman that such stock could be used where it did affect the strength of the board, Mr. Williams stated that he would endeavor to have the Inspection Department accept such lumber. This as Mr. Wickliffe testifies, was accomplished. The minutes show that Mr. Williams "stated that Mr. Vrooman is going to be in charge of the inspection all over the country; that he will appoint various men to do the inspecting at the various mills, and shall show them what is to be done. Mr. Williams further stated that his object in having Mr. Vrooman at this conference was that "the interpretation of the Signal Corps specifications might be as easy as such interpretation could be made consistent with the principle of accepting only propeller material but that the Government might get all such material that it could get." Mr. Williams then requested that each manufacturer advise him of the cost of its logs placed alongside steamer at Central American and Mexican loading points, and these estimates were given.

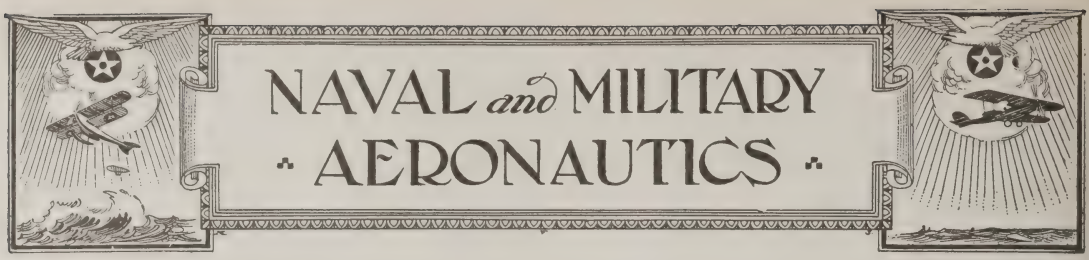
Another conference was held on the same day between the manufacturers and H. K. S. Williams and J. C. Wickliffe, representing the Government, at which, after considerable discussion, Mr. Williams stated that he would recommend the payment by the Government of the following scale of prices on Mexican and Central American mahogany propeller stock under Signal Corps specifications No. 15,028-A, as follows: $350 per M. feet for first, seconds and selects, and $280 for lower grades, f.o.b. eastern and middle western points, and $330 and $265, respectively, at New Orleans; and the same schedule of prices was stated for African mahogany f.o.b. eastern and middle western points. At these conferences Mr. Wickliffe was in attendance as Mr. Williams' adviser. He reviewed the manufacturers' estimates and made calculations for Mr. Williams as to costs, and in view of his extensive experience there can be no doubt that considerable reliance was placed upon his opinion and advice. The terms of the contracts were virtually settled, in accordance with Mr. Williams' proposal, at the second conference on March 6th, and these terms were subsequently approved by Mr. Lockhart. The formal contracts were not made until sometime later. On March 26th the Aircraft Board recommended the execution of the contracts, on the above terms for the following quantities:

For African mahogany:	Minimum	Maximum
Astoria Veneer Mills Dock Co.	2,000,000	3,500,000
I. T. Williams & Sons	500,000	1,500,000
Palmer & Parker Company	600,000	1,500,000
C. C. Mengel & Bro. Company	2,800,000*	2,800,000

*Amended to read 1,700,000 minimum.

Talge Mahogany Company	2,130,000	2,450,000

(Continued on page 872)



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mention in the order named.

Note 2—Report to Middletown, Pa., to Commanding Officer.

Note 3—Report to Virginia Polytechnic Institute, Blacksburg, Va.

Note 4—Report to District Manager, Dayton, Ohio, and wire DAP

Note 5—Report to Little Rock, Ark., to Aviation General Supply Depot.

Note 6—Report to University of Pennsylvania, Philadelphia, Pa.

Note 7—Report to Fergus Motors of America, 370 Jelliffe Ave., Newark, N. J., and wire DMA.

Note 8—Report to H. H. Franklin Co., Syracuse, N. Y.

Special Orders Nos. 289 to 293, Inclusive

A

Arthur, Eber O. ..... FLA
Anderson, Paul Raymond ..... SLA; LHV
Armstrong, James Francis ..... SLA; LHV
Andrews, Roger W. ..... FLA
Ashe, William O'Brien ..... SLA; LHV
Apte, Benjamin Ethan ..... SLA; LHV
Allenberg, Sidney Leon ..... SLA; LHV
Angell, Harry M. ..... CPA
Amis, William N. ..... EOT
Allison, Roy G. ..... CAF
Allen, Albert A. ..... CWT
Allen, Richard C. ..... CAF
Alcorn, Kent A. ..... CAF
Atwell, William B. ..... CAF
Arnold, Warren C. ..... DMA

B

Birdsall, Carl A. ..... FLA
Barnett, Keff Dobs ..... SLA; LHV
Belmont, Morgan ..... FLA
Beverly, Belmont F. ..... CPA
Brown, Jasper C. ..... FLA
Blair, Lyman S. ..... CPA
Baker, Charles D. ..... FLA
Baucom, Byrne E. ..... DMA
Blades, Fred Harris ..... SLA; LHV
Butcher, Adrian M. ..... CPA
Bissell, Eugene Van Name ..... SLA; LHV
Bartlett, Dwight M. ..... CPA
Blake, Thomas J. ..... FLA
Babcock, Philip B. ..... CPA
Buford, Edward ..... CPA
Barrett, Carl Henry ..... SLA; LHV
Bennett, Frank Crim ..... SLA; LHV
Blake, Everett Buell ..... SLA; SMM
Borre, Peter Celestine ..... DMA
Berkley, Scott B. ..... PFO
Beers, George M. ..... DMA
Bentley, Madison ..... DMA
Beverley, Efford A. ..... LHV
Brockman, Ervin ..... CFT
Boothe, Ross ..... KST
Brown, Ronald Wheten ..... EOT
Bagley, Harvey B. ..... FLA
Bagby, Howard ..... EOT
Bonham, John A. ..... PWM
Bacon, Leonard ..... PFO
Butler, Joseph F. ..... KST
Bartlett, Lowell W. ..... CAF
Bunting, Walter M. ..... EOT
Brown, Lucien Seymour ..... SLA; SMM
Burkhardt, Harry L. ..... CAF
Brandon, Joseph F. ..... LDT
Brooks, Thomas ..... EOT
Brown, Kenneth P. ..... CAF
Boyd, William L. ..... CAF
Brandt, Howard C. ..... EOT
Brown, Raymond R. ..... CAF
Blair, James ..... CAF
Bower, Claire A. ..... EOT
Burns, John V. ..... CAF
Bushman, Francis L. ..... CAF
Billiter, Earl D. ..... CAF
Blystone, Raymond J. ..... CAF

C

Cook, Seth W. ..... TMA; DMA; Note 1

Cabot, Thomas D. ..... CAF
Clark, Wilson Truesdale ..... SLA; EOT
Crawford, Otis Black ..... MAC
Christensen, Rudolph ..... SLA; EOT
Comer, E. Hunt ..... SLA; EOT
Corey, Horace Marvin Hoyt ..... ELA
Cole, Chester A. ..... CPA
Clarkson, Fuller ..... SLA; MAC
Camp, Bernard Franklin ..... SLA; CFT
Castner, Charles Beaumont ..... SLA; LHV
Calder, Paul Joseph ..... SLA; LHV
Colgan, John C. ..... CPA
Carlisle, Russell B. ..... FLA
Conley, Arthur John ..... SLA; LHV
Cushman, Harland Burbank ..... FLA
Cannield, Dwight Joseph ..... SLA; LHV
Coleman, Edward Beauclerk ..... SLA; LHV
Crehore, William W., Jr. ..... CPA
Cummings, George B. ..... FLA
Crowley, Arthur James ..... SLA; LHV
Cobb, Vaughn Merwin ..... SLA; RWT
Cameron, Mortimer B. ..... KST
Cleveland, Bruce ..... SLA; KST
Carlisle, Louis George ..... SLA; SBI
Cash, Thomas Henry ..... SLA; EOT
Cohen, Marcus Harris ..... SLA; KST
Coulter, Isaac H. ..... CJW
Cole, Perry C. ..... CAF
Campbell, Theodorick P. ..... Note 3
Carroll, Mitchell B. ..... Note 7
Chandler, Lane T. ..... CAF
Conner, Edward S. ..... EOT
Campbell, Archibald Francis ..... SLA; SMM
Calvin, Warren Ellwood ..... SLA; SMM
Clark, Thomas Alexander ..... SLA; SMM
Clark, Ben H. ..... EOT
Christie, James A. ..... ABC
Caldwell, Alanson T. ..... EOT
Crouse, James A. ..... EOT
Curtis, John Jacob ..... SLA; SMM
Cooper, George W. ..... CAF
Cross, John M. ..... EOT
Coney, William D. ..... CAF
Collier, Robert Kenneth ..... SLA; SMM
Cummings, Charles M. ..... CAF
Coates, Aaron T. ..... CAF
Crawford, Daniel McL. ..... CAF
Craig, Robert M. ..... CAF
Calvin, Warren Ellwood ..... SLA; SMM

D

Decker, Silas M. ..... Note 2
Davis, Fred John ..... DAP
Drennan, Leonard H. ..... DMA
Denton, Edward A. ..... SLA
Davis, George Lewis ..... SLA; PWM
Duer, Beverly ..... CPA
Davis, Homer H. ..... CAF
Dorland, Crester P. ..... RSD
Druschel, D. Henry ..... SLA; LHV
Duncan, Ralph Ray ..... SLA; SMM
Delaney, John J. ..... EOT
Davidson, Rufus B. ..... EOT
Denton, George R. S. ..... LDT
Davis, Trayton Hooker ..... CRI
Davis, William H. ..... KST
Dobie, Richard L. ..... CAF
Drinker, Philip ..... FLA
Day, Harold M. ..... SAG
Dickinson, Roy W. ..... EOT
DeMarest, Robert K. ..... DMA
Dawson, Athel A. ..... DMA
Dry, Paul Homer ..... CFT
Downer, Godfrey K. ..... CPA
Du Puy, Harry Heath ..... MAT
Daley, James Henry ..... SLA; CFT
Day, Henley F. ..... DMA
Doane, Samuel Frederick ..... SAG
Dunford, Samuel W. ..... CAF
Dean, William J. ..... DMA
Driscoll, Egbert G. ..... TMA
Downes, Philip H. ..... CAF
Duke, Thomas Walter Daniel ..... SLA; LHV
Dulaney, Ken Rogers ..... EOT
Delaplane, Edwin S. ..... CA
Darley, Edward Dean ..... SLA; KST
Dwindell, Ralph M. ..... EOT
Drumm, John R. ..... EOT
Davis, Cyril Randall ..... SLA; SMM
Duncan, Ralph Ray ..... SLA; SMM
Diamond, Aubrey F. ..... FLA
Donaldson, William Thomas ..... SLA; LHV
Dorsett, Walker C. ..... CAF

E

Emerson, Wilbur T. ..... DMA
Ehlers, George W. ..... CAF
Emmons, Howard Edward ..... CFT
Eylers, John D. ..... DMA
Evans, Jesse M. ..... EOT
Early, John M. ..... EOT
Easterly, Leon Eugene ..... SLA; LHV
Edwards, Ellis E. ..... CAF
Edwards, Joseph S. ..... CPA

F

Fuller, Willard P. ..... DMA
Fordyce, Addison A. ..... DMA
Flack, Augustus S. ..... MAT
Fisk, James K. ..... MAT
Field, William P. ..... DMA
Friend, William Howard ..... SLA; LHV
Flynn, Edward J. ..... DMA
Fancher, John T. ..... FLA
Fagley, Wilber Mantz ..... CRI
Fithian, Donald C. ..... DMA
Farmer, Glenn ..... SLA; LHV
Franzen, Frank Clarence ..... FLA
Fleeson, Howard T. ..... FLA
Field, David Edwards ..... SLA; LHV
Folker, Arnold Frank ..... SLA; RWT
Ferris, Frank Cagle ..... SLA; LHV
Feick, James William ..... SLA; LHV
Franklin, Ruford Davis ..... CPA
Fisher, Ralph Bentley ..... SLA; LHV
Fitzpatrick, Francis E. ..... EOT
Feeney, Francis J. ..... CAF
Foley, Frank Joseph ..... SLA; SMM
Fletcher, Frederick A. ..... FLA
Foster, Raymond W. ..... EOT
Francis Paul R. ..... EOT
Field, Rex E. ..... LDT
Foley, Frank Joseph ..... SLA; SMM
Fairbairn, George R. ..... EOT
Foster, Thad V. ..... RSD
Flynn, Edward J. ..... CAF
Ford, Fred M. ..... LDT

G

Garnett, Joseph H. ..... CAF
Graves, Thomas E. ..... DMA
Griffith, Frederick W. ..... ALF
Gillern, Maurice F. ..... ABC
Gass, Karl William ..... SLA; LHV
Godlove, Walter ..... SLA; RWT
Getty, Lorenzo T. ..... CPA
Griffin, Clarence J. ..... FLA
Greenwood, John H. ..... DMA
Graham, Ardi McConnell ..... SLA; LHV
Grant, Frederick F. ..... CPA
Greve, Sydney Martin ..... SLA; KST
Greer, Jack ..... EOT
Garrett, Kenneth ..... EOT
Goldsmith, Henry S. ..... EOT
Gaston, Alexander N. ..... RSD
Gray, Ralph M. ..... CAF
Gaylor, Elmer J., Jr. ..... RSD
Grayson, Forrest ..... EOT
Gruny, George R. ..... EOT
Gardner, J. Francis ..... RSD

H

Hall, Frank L. ..... ELA
Howell, Francis K. ..... KST
Hutchins, Benjamin B. ..... LDT
Hill, Edward A. ..... Note 2
Harris, Sidney Louis ..... SLA; RWT
Hunter, Charles Glenn ..... SLA; RWT
Howard, Charles Wilmot ..... SLA; LHV
Heinsohn, Robert A. ..... SLA; LHV
Hyman, Edgar Charles ..... SLA; LHV
Hersey, George F. ..... ABC
Howard, Harley ..... SLA; ELA
Hill, Luther White ..... SLA; RWT
Hawkinson, John L. ..... SLA
Houston, Charles Horace ..... SLA; RWT
Hunt, Arthur W. ..... FLA
Hallonquist, Laurent Cholet ..... SLA; RWT
Hobson, Henry S. ..... CPA
Hills, Jesse Almond ..... SLA; LHV
Hickman, Willis G. ..... FLA
Harding, George R. ..... FLA
Haddaway, Roland ..... SLA; CRI
Holland, Oark ..... SLA; SMM
Humason, Allen B. ..... PWM
Henry, Rufus Francis ..... KST
Hechinger, Michael Vincent ..... CRI
Huebner, Herbert C. ..... FRF
Hawes, Curtis ..... Note 4
Huston, Sylvester ..... EOT
Hamlin, Charles E. ..... RSD
Haasl, Charles M. ..... EOT
Haylor, John R. ..... RSD
Hayes, Fred E. ..... SAG
Hill, John C. ..... RSD
Haines, Frank B. ..... RSD
Holland, Park ..... SLA; SMM
Henry, William H. ..... RSD

I

Isbell, Henry W. ..... DMA
Innis, Cecil R. ..... EOT

J

Johnson, Emil R. ..... KST
Johnson, Arthur Lowell ..... KST
Jamison, Joy G. ..... KST
Jones, James E. ..... CWT
Jones, Lee B. ..... ABC
Johnson, Edwin ..... CAF
Jones, David Clarence ..... SLA; SMM
Johnson, Austin Samuel ..... SLA; CRI
Jolliffe, Carey Coale ..... SLA; LHV
Jewell, Daniel Ashley ..... SLA; RWT
Jackson, Gerard Livingston ..... SLA; LHV
Jackson, Roy O. ..... DMA
Jones, Charles S. ..... HHN
Johnson, Charles Chouteau ..... RSD
Jenkins, Nelson D. ..... EOT
Jackson, Roger W. ..... RSD
Jones, David Clarence ..... SLA; SMM

K

Kennedy, Frank Hopkins ..... SLA; CRI
Kayser, William Edward ..... SLA; SMM
Kuhlman, Lawrence ..... SLA; SMM
Keating, Archie Francis ..... SLA; RWT
Keeffe, Louis R. ..... DMA
Knight, Theodore C. ..... CPA
Kilpatrick, James I. ..... SLA; LHV
Kennedy, Charles Bayara ..... SLA; LHV
Kelly, William H. ..... CWT
Kerfoot, Raymond Whitney ..... SLA; LHV
Kelsey, James B. ..... RWT
Kerr, Charles Phillips ..... CPA
Keith, Warren Irving ..... SLA; SMM
Kennedy, Robert J. ..... Note 8
Keith, Warren Irving ..... SLA; SMM
Kaufmann, Godfrey F. ..... RSD
Kunkel, Henry W. ..... EOT
King, William G. ..... CAF
Kent, Arthur O. ..... RSD
Keough, Wesley L. ..... RSD
King, Edward R. ..... EOT

L

Lawson, Walter R. ..... PFO
Luecke, Christian H. W. ..... DMA
Lerner, Nathaniel M. ..... CPA
Little, James Clinton ..... SLA; SMM
Lingle, David G. ..... KST
Lane, Lee Britton ..... SLA; KST
Lassiter, Robert E. ..... DAP
Loring, Charles G. ..... CPA
LaForge, Robert B. ..... FLA
Lofland, Knox ..... SLA; LHV
Looram, Lucien A. ..... CWT
Larkin, Garrett Francis ..... PWT
Landis, Reed G. ..... CPA

(*Continued on page 875*)



Lieut. W. T. Campbell and the biplane in which he made 151 consecutive loops

FOREIGN NEWS

Marconi Company to Supply Wireless Passenger and Mail Aeroplanes

LONDON.—Godfrey Isaacs announced December 18 that the Marconi Company would outfit aeroplanes employed in air passenger and mail service with wireless and would supply operators in the same way as it now serves ships. It also is intended to receive regular reports of air conditions in different localities and to circulate these for the information of the pilots. As every aeroplane will have either a name or distinguishing number, it will be possible to send telegrams from any part of the world or from any ship to an aeroplane. It is intended that this organization will be ready by the time the peace treaty is signed.

Arrangements recently have been made for the erection of wireless stations in the extreme parts of China, one on the frontier of Cashmere and another on the Chinese side of Siberia. Mr. Isaacs has arranged with Handley Page for the transport of the necessary machinery by one or more of his big machines. The journey inland will take two or three days in place of the same number of months.

583 Bombs Dropped in Paris Air Raids

PARIS.—Figures are now made public regarding the air raids and long range cannon bombardment of Paris, exclusive of the suburbs. In 1914 forty-five bombs were dropped; in 1916, seventy, sixty-two of them March 20; in 1915, sixty-one and in 1917, eleven. During the last ten months of the war there were 1,211 casualties from 395 bombs. The total number of bombs dropped was 583.

Aeroplanes and Zeppelins dropped 228 bombs August 6, killing two persons and injuring 392.

Gen. Rhodes Out Soon

PARIS, Dec. 25.—The condition of Major General Charles D. Rhodes, head of the American Armistice Commission, who was injured in the fall of an aeroplane near Paris on Monday, continued to show improvement today. Unless unforeseen complications occur his complete recovery may be expected shortly.

British Air Force Merged in Army

LONDON, Dec. 13.—The Daily Express understands that Lord Weir has resigned his position of Secretary of State for the Air Forces. The Royal Air Force will cease to rank with the navy and army as a separate organization, and will in future be administered by the War Office as a branch of the army.

Framing Rules for Peace Flying

LONDON, Dec. 18.—The civil aerial transport committee has rejected the ancient claim that the owner of the soil has a right to the air above that soil. Without the repeal of that right the development of peace time flying would hardly be feasible.

It will be necessary in the future to frame air road rules and to make traffic regulations for the sake of public safety and the protection of the national interests. When the rules of the air road are compiled, the experience of the flying men will be found of value. The regulations for "taking off," and matters as to precedence, pace, and landing will have to be observed if accidents are to be avoided. The rules in existence as to doing stunts and low flying will probably be enforced. That different kinds of traffic will be directed to travel at different altitudes is a foregone conclusion. Aircraft meeting or overtaking each other will be ordered to allow a wide margin of safety.

It is possible that captive balloons containing air police may be stationed at specially selected spots. To the balloons may be attached sign posts giving directions as to distances to various places and fog horns in case of mist. Wireless telephones lighted at night as are lighthouses would guide the night fliers. Perhaps the cables of the balloons would be illuminated at intervals. The possibility of huge floating landing stages at which a machine could land or could be moored for making minor adjustments and repairs or refueling are not remote.

Will Confer On Air Rules

PARIS.—Representatives of several Allied powers and the United States will hold a conference in Paris early this year to consider the future of international aerial navigation, the *Echo de Paris* announced. Great Britain, Italy, Belgium, France and the United States will be represented at the conference, which will study the questions of how to prevent aeroplanes of different nationalities from crossing customs barriers and how to prevent postal or commercial aeroplanes from being transformed into bombing machines within a few minutes.

The result of the deliberations of the conference, the paper adds, will have to be accepted by Germany and her former allies in the peace treaty.

War Profiteers Use Aeroplanes to Take Booty Out of Germany

MUNICH, Dec. 26.—An Associated Press dispatch says that the *Munich Post* today prints a statement that German war profiteers, unable otherwise to get their booty out of the country, have resorted to the use of aeroplanes.

According to the newspaper, several aeroplanes have taken securities of enormous value from Frankfort to Switzerland.

The *Post* urges the government to seize capital where it is available, especially in banks.

3,950 Mile Air Flight Ends

LONDON, Dec. 19.—The Air Ministry announces the landing at Calcutta of Major-General Salmon, whose flight from Cairo to Delhi in a Handley Page machine was announced on December 13. This aeroplane previously had been flown in England and took an active part in the final operation against the Turks on the Palestine front.

The total distance of the route from Cairo to Calcutta, via Damascus, Bagdad, Bushire, Bandar Abbas, Charbas and Karachi, is about 3,950 miles, the last stage, from Delhi to Calcutta, measuring 750 miles.

The Handley Page machine "Carthusian," piloted by Major MacLaren, in which General MacEwen is flying from London to India, has reached Pisa.

DELHI, INDIA, Dec. 20 (delayed).—The time occupied in actual flying by the Handley Page aeroplane from Cairo to Delhi was 47 hours 21 minutes for a distance of 3,233 miles, according to a special dispatch to the New York *Sun*. The longest stage of the flight was from Damascus to Bagdad, which was 495 miles, and occupied 6 hours and 53 minutes. The next longest was from Karachi to Nasirabad, a distance of 485 miles, which was made in 6 hours and 35 minutes.

A curious incident occurred when a rat came on board at Charbar and was heard nibbling at the machinery. The animal's career was terminated by falling out of the plane at a height of 7,000 feet above the sand of the desert.

Conversion of War Aircraft

LONDON.—The attention of experts is now focused upon the matter of the conversion of war aircraft for mail and passenger carrying purposes. Once the impediment of war bombs, racks, guns, fittings, and other parts is shed, it is obvious that a large amount of lifting power will be released for passenger carrying, and that plenty of space will be left for comfortable accommodations.

Little is said, however, of the possibilities of the seaplane or the flying boat as a pleasure craft. Either the seaplane or the flying boat is capable of holding from six to a dozen people. It could be purchased and run at a far less cost than a modern yacht for cruising around the coast.

Americans Get Sixty Aircraft from Germans

COBLENZ, Dec. 27.—Sixty aeroplanes of the Fokker type arrived in Coblenz today by special train from Berlin. They were the first of 200 aeroplanes which are to be turned over to the American forces in Coblenz in accordance with the armistice.

Each machine occupied a flat car and a German soldier guarded each car. A number of German aviators also arrived to try out one out of each twenty machines before the planes are turned over to the American commission. The planes for the test will be selected by the Americans and the Germans will make the flights to show that the machines are in good condition. The flights will take place near Coblenz in the presence of American officers.

Slayer of Quentin Roosevelt Found

WITH THE AMERICAN ARMY OF OCCUPATION, Dec. 28.—Christian Donhauser, a youthful German aviator, who claims to have defeated Lieutenant Quentin Roosevelt, son of Colonel Theodore Roosevelt, in the fight in the air in the region of Chamery, which resulted in the death of young Roosevelt, today told the correspondent that the day following the combat his commander informed him the American he had downed was Roosevelt. Immediately afterward German aviators began arranging the details for the funeral of Lieutenant Roosevelt.

Before the war Donhauser was an aviator, although now he is only 23 years old. He is the smallest of the German aviators, weighing only 94 pounds. Soon after the war began he entered the service as an observer, serving on various fronts, but principally on those in France and Belgium. He began pursuit flying July 1, and between that time and the day the armistice was signed he had to his credit thirty planes downed. He wears the Iron Cross and other German decorations. The aviator is credited with twelve planes downed in eleven consecutive days.

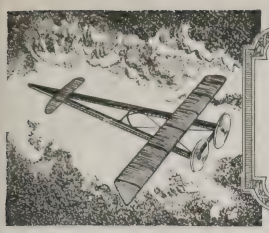
Donhauser's home is Hamburg, but before the war he spent several years in London. Although still in the German army Donhauser is planning a trip to the United States. Furthermore, he says he hopes eventually to take out American citizenship papers and join the American aviation forces.

Norway Enters New Industry

As has been the case in most countries, the efforts which industry has made in Norway to help itself and become independent of foreign markets have had great results. One of the main centers of this great industrial revolution is the district around "Sognefjorden," with its 100-mile water basin. During the past two years a new Norwegian industrial city has been built here. . When all the new plants are running normally they will be Europe's largest aluminum producers.



A French "Salmson" two place combat machine



ELEMENTARY AERONAUTICS
and
MODEL NOTES

By John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

A piece of 2½ x 1" ash is stretched from the apex of the "V's" and acts as a compression strut when the bracing wires are drawn tight. The wheels are set 4 feet apart, the thickness of the axle being determined by the size of the hubs of the wheels.

Four plates are fastened to the apex of the "V's" of the landing chassis. These plates are made of 3/32" steel sheet. The slot is for free movements of the axle up and down.

THE motor is the most important part of the aeroplane, and we should be sure to have it work perfectly before installing it in our machine. To do this it is necessary to give the engine a good block test before using it.

It does not matter how old the motor is, in fact, the older Fords were made lighter in weight.

If we select an old motor, the first thing we must do is to re-bore the cylinders to make them perfectly round. It is not necessary to bore them out much larger than they are now, only get the scratches, scores, or pits out of the walls. If the reader cannot do this work, or if he does not think he could do a good job, I would advise sending the motor block to some good machine shop and have the work done right.

When the cylinders are finished, Alluminium Alloy Pistons should be fitted in place of the other old cast iron pistons. These pistons can be purchased from The Walker M. Levitt Company, 415 East 23rd Street, New York City, and they sell for $24.00 per set. The pistons weigh 15 oz. each.

The valve seats should next be inspected, and if they show any roughness or unevenness they should be ground and new valves fitted.

The connecting rods must be lightened by drilling holes of different sizes, small holes through the smaller section and larger holes through the larger section. When holes are drilled, the rods should be weighed and balanced. Some rods weigh a few ounces more than others. In this case it is necessary to grind the burr off the side of the heaviest rods until the weight is equal to the smaller ones.

The bearings of the connecting rods should be in perfect condition, and if necessary new bearings fitted.

The crankshaft must be trued up and the crankshaft bearings adjusted. It is necessary to cut the front bearing away on the outside as well as the small gear on the crankshaft. This is done to enable us to get a thrust bearing in between the pinion gear and the bearings to take the pull of the propeller when in flight. The space necessary is ⅝", and a two piece ball thrust bearing of light weight can be used. This can be purchased from any auto supply house.

Four 3/16" holes should be bored in the crankcase at points exactly in the center of the line of crank throw travel. These holes are made in order to allow us to run a force oil line to these points.

The oil pump can be purchased from the M. L. Oberdorfer Brass Company, 154 Nassau Street, New York City, represented by Mr. M. M. Rountree, who sell a very powerful and light gear pump. The pump only weighing one and a quarter pounds. This is attached to the front of the motor and is connected directly to the bottom of the crankcase. This allows the pump to be primed out at all times. The outlet consists of a piece of 3/16" O. D. copper tube with branches solder with silver solder. These branches are four in number and are inserted into the holes in the crankcase, to allow the oil to squirt on the bearings.

A new oil retainer must be made because we must cut off the fly wheel transmission, etc., from the rest of the motor. This eliminates the bottom of the oil crankcase, and, of course, a new one must be made from heavy aluminium. The cover plate for the timing gears must be made from aluminium also.

When the fly wheel is removed, we will find a flange at the end of the crankshaft. It is necessary to have a hub made to the same size of the flange, with an extension and a hub for the propeller fastened to it. This should be done at a good machine shop.

A Zenith Carburetor should be fitted to the engine. The Zenith Company makes an aluminium manifold which is very light, and the whole combination presents a very good looking job.

The valves should be timed late, that is, set the inlet valve of No. 1 cylinder to start opening just as the piston reaches a point of ⅛" below top center on its down stroke.

The water outlet in the head of the motor must be changed around because the motor is now turned in the opposite directions. It is necessary to plane off the old outlet and weld on a flat iron plate, or to close up the opening with a plate. Then weld an elbow into the outlet facing the reverse to what it does now. The inlet to the motor block from the radiator must be changed as well.



A scale model of the British F E 8 Pusher. This model was constructed of wood and it has a small rotary motor and a four bladed propeller



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

An Aviator's Alphabet

A—is the air man who looped the Hun-guffin,
For his own pleasure. (He is now in his coffin.)
B—is the batman who dirties the quarter,
Ruins our boots, and forgets our hot water.
C—is the Castor the rotaries use,
It bucks up both engines and humans—excuse.
D—is the drift, if you land with it on,
You will, almost at once, realize you are wrong.
E—is the engine which causes the motion
Which gives you the lift (not caused by promotion).
F—is the fairy you love with a pash,
She is sure to be there on the day that you crash.
G—is the gas which makes things go roun',
And sometimes does not, in which case you come down.
H—is the hangar one greets with such smiles,
On return from a run of some ninety-odd miles.
I—is the incidence out on each plane,
From which you get lift, I need hardly explain.
J—is the joy-stick—I mean control lever—
Which the Hun always clings to, as if in a fever.
K—is keel surface, it stops you from spinning,
Perhaps, if you know when the spin is beginning.
L—is the loop you're intending to do,
If the wind will do down, and the sky get blue.
M—is the man who keeps crashing on landing,
Why he flattens out, passes all understanding.
N—is the nacelle of a fast pusher scout
Twixt you and the earth, if you crash there is naught.
O—is hot oil, when it gets in your eyes
You will surely wear goggles at last and be wise.
P—is the prop which makes sticks which are sold,
It has other uses as well, I am told.
Q—is for Quirk, a machine of stability,
Of peculiar design, but unbounded utility.
R—is R. A. F., who designed a machine,
And an engine as well, such as never was seen.
S—is for stunting, if down near the ground
It is stupid and silly and grossly unsound.
T—is the tarmat I stand on all day,
And hope for a chair in an optimist's way.
U—is the union of pipe and of tank,
When the union gave out the aeroplane sank
V—is the vickers gun, gruesome affair,
Used to wind up the Hun in the air.
W—is wash-out and wash-in as well.
Their meaning's a secret I hardly can tell.
X—is the pilot, whose glory and fame
We'll remember in England, tho we don't know his name.
Y—is the yell of a man (or its echo)
When this engine's gone dud on a long-distance recco.
Z—is the letters of letters, my friend,
It involves the word Zeppelin (this is the end).

—The Aeroplane.

Real Grit!

Pullman Attendant (*to sleeping aviator home from the front on short leave*): "Reading, sir!"

Aviator (*rousing up*): "Ready? Right ho." (*Switches on the electric light.*) "Contact!"

Muzzling the Gas-bags

A Congressional debate on what shall be appropriated for aeronautics is a scheme for keeping people from finding out what they are talking about.

Antique Monoplanes

"For Sale: 40 year old hens."—*Blackburn Telegraph.*

The restaurant we went to the other day must have answered this advertisement.

At a Theatrical Lodgings

Servant (*rushing in, all excitement*): "Oh! Mum! The Zeppelins have come!"

Old Lady: "Well, tell 'em we've already let the rooms to the Brothers Egbert!"

Up-to-Date

The Aviator (*who has just fallen into a river*): "Lemme go I'm all right; I can swim."

The Girl: "I don't care. I'm going to save you. I want a medal."—*Chicago Herald.*

Bungling Buglers!

The Eleventh June replacement detachment has a pup named Reveille and a cat named Retreat. Reveille gets 'em up on time and Retreat sounds for mess. The men call for Reveille, which is something out of the ordinary. Retreat sounds after taps. When Retreat and Reveille come together Reveille follows Retreat.

Oh, Hollow Fame!

Lieut. S. B. Jacobson who heads the Kelly Field players was enjoying a production which he assisted in producing, and which was being shown at the Knights of Columbus hall. A rookie liked the show but was disturbed by a ray of sunlight which came through a window.

"Hey Kid," yelled the rookie to the officer, "pull down the shade."

Lieut. Jacobson complied with the request, and as he rose the loud-voiced recruit noticed the gold bars and the leather leggins. The soldier reduced himself to his minimum size and slunk out of sight.—*Kelly Field Eagle.*

OUI, THIS IS FRANCE

By "Alex"

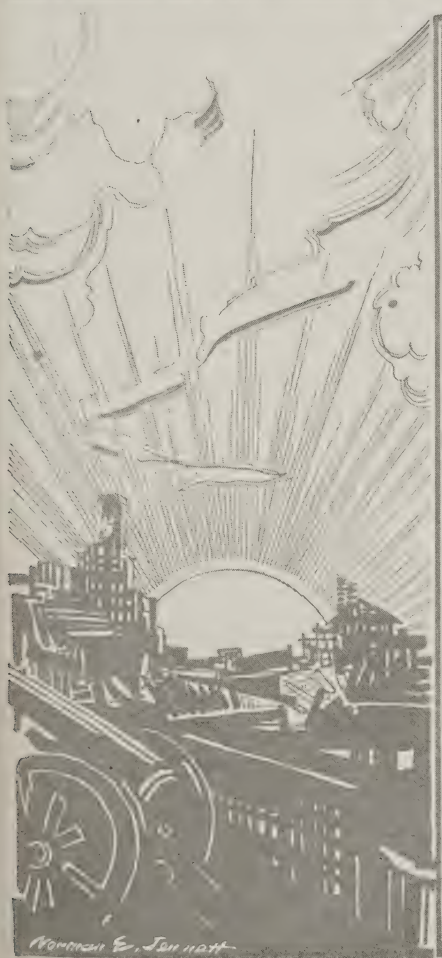


An After-War Type

This new machine is built especially for commercial and sporting use by the Aircraft Engineering Corporation, New York. It is a small plane of sturdy construction and handsomely finished. Low first cost and low up-keep. It is Valsparred.



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VALSPAR
The Varnish That Won't Turn White



The Airplanes of Peace are Valsparred—

In the air-fleets of America and the Allies throughout the war Valspar proved its supremacy as the most reliable and durable varnish for the wood, metal and fabric of airplanes and seaplanes.

With the coming of peace the development of the flying machine takes another turn, and Valspar is again the chosen varnish of the leading manufacturers.

Many new types of planes, one of the latest of which is shown here, are being produced. They are Valsparred of course.

Valspar is proof against all kinds of exposure to water, air, sun, mud and dust, and also against the terrific vibration of air service. It won't turn white under the severest conditions. It resists oil and gasoline, acids and alkalies. It is a long-oil varnish of exceptional brilliancy and drying qualities and retains its elasticity long after ordinary varnishes have perished.

We invite you to make your own tests. Our Airplane Service Department will gladly give you every possible assistance and information. To Purchasing Agents and Superintendents of Production, we will send our valuable book on airplane varnishing, free on request.

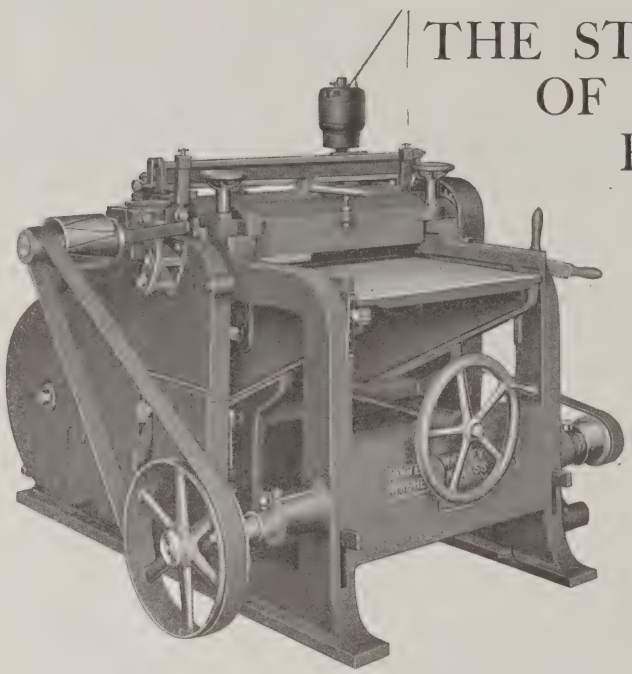
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THE STRONG POINTS OF WHITNEY PLANERS

appeal to every wood-worker, such as a

RIGID FRAME with ample weight of metal—

BED raised and lowered on Solid Wedges operated on wide tracks—

HARDENED CENTER TABLE made extra thick—

AUTOMATIC CHIPBREAKER working concentric with the Cutter Head—

CLAMP CUTTER-HEAD BOXES easily removed from the machine—

CUTTER HEAD with long bearings of large diameter.

These are but a few of the features that enable Whitney Surfacers to do superior surfacing at the lowest cost.

For further information write

Baxter D. Whitney & Son

Winchendon, Mass.

F. C. Cherry, Grand Rapids, Michigan, Agent for Michigan.

Jenkins Machine Co., Sheboygan, Wis., Agents for Wisconsin and Indiana.

The Hughes Aircraft Report

(*Continued from page* 865)

For Central American and Mexican mahogany:

	Minimum	Maximum
Huddleston & Marsh Mahogany Co.	1,750,000	3,000,000
Astoria Veneer Mills & Dock Co.	1,500,000	2,500,000
Lewis Thompson & Company	1,500,000	2,000,000
Otis Manufacturing Company	1,000,000	2,000,000
Frieburg Lumber Company	500,000	1,250,000
I. T. Williams & Sons	750,000	2,000,000
Palmer & Parker Company	300,000	750,000
C. C. Mengel & Brother	2,800,000	2,800,000

On April 16, the Aircraft Board recommended the making of a contract with the S. B. Vrooman Company for Central American or Mexican mahogany, 500,000 feet, minimum and 1,500,000 maximum.

It is hardly necessary to say that it was a gross impropriety for corporations or firms, either individually or collectively, to pay additional compensation to an employee of the Government, and for the employee to receive such compensation, for services in relation to contracts and transactions in which the corporations or firms were directly and pecuniarily interested. It is not found, however, that there is any statute making this a criminal offense unless it is a case within the statute against bribery, or proves to be part of a fraudulent scheme to take advantage of the Government, or part of an endeavor to induce a violation of law.

The Act of March 3, 1917 (*ante,* p. 25) making it a crime to pay additional compensation to an employee of the Government, or for an employee to receive such additional compensation, only applies to such contributions after July 1, 1919. The occasion of this statute, it is understood, was criticism of payments of additional compensation made to experts in the employ of the Government, where, however, the employee in the Government service was not acting in matters in which the person or corporation contributing had any pecuniary interest or motive of gain. Contributions for the support of those who have made sacrifices in undertaking war work for the Government are doubtless made in many instances, but there is no analogy between cases of this general description and payments of additional compensation to employees of the Government by those having direct pecuniary interest in the transactions in which the employee acts as the Government's agent. But under the statute against bribery (Criminal Code, Secs. 39, 117) it must be proved that the payment was made or received with intent to influence the decision or action of the representative of the Government on a question which may be brought before him in his official capacity or in his place of trust or profit, or to influence him to commit, aid, collude in or allow a fraud, or to make opportunity for the commission of a fraud, on the United States, or to induce the employee to do or omit to do an act in violation of his lawful duty. Whether in the present case, in the circumstances disclosed, any charge of this sort could properly be made would largely depend upon the question whether the terms and prices secured by the mahogany manufacturers were fair and reasonable, or could be deemed excessive and the result of improper influence. In view of the intimate relation of the representatives of the Government, who took part in the negotiations, to the manufacturers, it is obviously appropriate that there should be a fair and impartial examination of the transactions by a body competent to make a survey and determination of questions of costs and profits. Testimony has been given in the present inquiry tending to show that the prices were high. Lower prices under prior orders and offers are referred to. On the other hand, the manufacturs urge that in view of the peculiar conditions of the industry, the difficulties attending the procurement of logs, and the risks taken by reason of the small percentage of lumber suitable for propeller material, the prices and terms were in all respects fair; that Mr. Williams, Mr. Wickliffe, Mr. Vrooman and Mr. McCullough took their positions simply because of the necessity of having men in their respective places who were qualified by experience, and that throughout the transactions all the persons concerned have been moved solely by the desire to serve the Government. It was manifestly impossible in the course of the present inquiry to make such a survey of the mahogany industry as to reach a satisfactory conclusion with respect to the cost of producing the required mahogany and as to the fairness of prices and terms. This sort of investigation would require special facilities of the kind which are at the command of the Federal Trade Commission, and through its instrumentality it is believed that such a survey of the industry and a determination of fair costs and profits can be made. Upon its report as to the cost of producing the required mahogany it can readily be decided whether there is ground for prosecution by reason of the transactions which have been disclosed in this inquiry.

(*To be concluded*)

(*Continued from page* 850)

(3) To send up sounding balloons and explore the upper air of the Polar regions, gathering meteorological data.

Captain Bartlett gave further details of the work of his expedition as follows:

"Over 1,000,000 square miles of territory in the center of the Polar Basin still remain to be explored, and it is quite possible that we will find land in that region.

"During a period of time in the summer it is so warm that snow and ice disappear entirely in the sub-Arctic regions. I have a number of photographs which I took at Etah during my last expedition which shows that there was no snow left even on the Rookeries near Etah, where such birds as the Auks and Loons nest. The photograph of Cape Alexander, the Gateway of the Arctic, and Cape York, North Greenland, show that there was no snow left.

"It is hard to make people believe that there is a period of time in the Arctic regions when the weather is warm and there is vegetation. We picked flowers on some of our expeditions about 400 miles from the North Pole. But the warm weather only lasts for about two months, and ships are handicapped through the ice further north and are usually caught in the ice in the returning cold weather before we can get very far. With the aeroplane it is different. We can cover a good deal of ground in a very short time, and we can land on established bases at different points from which to make soundings to get data from the bottom of the Polar Basin as well as from the upper air, to ascertain the direction of air currents and other meteorological data."



132 Army Fliers Released

San Diego, Cal.—Orders authorizing the discharge of 132 aviators and ground officers attached to Rockwell, Ream and East fields, were received December 26.

One of those to leave the service is Lieutenant William Wellman, of Boston, American ace in the Lafayette Escadrille.

Army Aerial Squadron Turn Southward Again

The War Department authorizes the following:

The four training planes coming east from San Diego, Cal., which reached Eufaula, Ala., from Montgomery, Ala., have turned south again headed for Florida. They were given permission to come to Washington, D. C., but requested that they be allowed to fly through Florida before coming north, and this consent being secured by wire, they started for Jacksonville. From there they will proceed to Arcadia. By reaching Jacksonville they will have completed a transcontinental flight, the first on record for formation flying.

None of these planes carries more than an hour and a half's supply of gasoline, being the planes in which cadets are taught to fly. They left the Pacific coast on December 4, each carrying two men, and have come steadily east in hops of one and one-half hour each, mapping the country as they went along for the purpose of laying out a southern transcontinental air route.

Y. M. C. A. Uses Aeroplanes as Secretarial Jitneys

Wash., D. C.—Y. M. C. A. secretaries who help supervise association work at a "down river" camp, have found a way of avoiding bad roads. They go in aeroplanes.

Upon invitation of the Navy Department, Charles N. Ramsey, in charge of personnel, and Ralph I. Hickok, religious work director, went in an aeroplane to Mackadoc, the lower station of the naval proving ground, about forty-five miles down the Potomac from Washington.

The secretaries made a survey preliminary to starting Y. M. C. A. work at that point where there now are about 200 men. They were the guests of Lieutenant Caldwell and Lieutenant W. J. Lee.

The "down river" trip took fifty-three minutes, and one hour and five minutes was required for the return trip.

Photo Section News

During the week the Photographic Branch of the Training Section reported that a mosaic containing 4,200 prints had been completed of Fort Sill. The whole map measures 8 by 16 feet. Mosaic maps of Venice were recently received from the Italian Mission.

There were on December 21, a total of 482 cadets attending the protographic schools at Cornell and Rochester.

Air Service in Santa Role

Some sixty wounded soldiers stationed in Washington were made happy on Christmas by the donations of the officers and employees of the D.M.A. and the B.A.P., amounting to $210.68.

Christmas morning an Army truck laden with sixty well-stuffed Christmas stocks, and packages of tobacco, books, fruit, candy, note paper and a dozen other things, as well as twenty-five out of town, and more or less lonesome girls, drew up at Wards 1, 2, 3 and 4 at Walter Reed Hospital, and Christmas for the boys confined to their cots began in earnest.

This little Christmas party was made possible by the activities of Mrs. E. R. Boughton, of the Finance Branch of the D.M.A., mother of Captain W. E. Boughton of Camp McClellan. Mrs. Boughton herself collected the money, and it is interesting to know that while she only asked for nickels, quarters, halves and even dollars were donated by the Air Service for use in this worthy project.

Major Peterson Returns

Major David McK. Peterson, A. S., A, Junior Military Aviator, and formerly of the 94th Aero Squadron, with a fine record behind him in the Lafayette Escadrille, returned from overseas in November. Major Peterson was detailed in the Training Branch of the D.M.A., and was recently transferred to Dorr Field, as Officer in Charge of Flying. Major Peterson's home is in Honesdale, Pa. He has received the American Distinguished Cross and an Oak Leaf, and some French decorations for his service overseas.

D. M. A. Board on Peace Times Organization

The Board appointed by the Director of Military Aeronautics to work out a Peace Times Organzation for the Air Service has announced its personnel and the functions of its Sub-Boards to be as follows:

Board of Organization

Colonel C. G. Edgar, Colonel F. R. Kenney, Colonel A. Woods, Major E. Hubert Litchfield, Recorder.

Operating under this Board are the following Sub-Boards:

Demobilization of the Division of Military Aeronautics

Lt. Colonel George B. Hunter, Chairman; Lt. Colonel Rush B. Lincoln, Major Walter George Rogers.

Air Service Operations in Peace Times

Colonel William E. Gillmore, Chairman: Colonel Gerald C. Brant, Lt. Colonel Thomas Duncan, Lt. Colonel Barton K. Yount, Lt. Colonel Colonel Ira Longanecker, Lt. Colonel Benjamin F. Castle, Captain John W. Davis.

Mustering Out

Major E. Hubert Litchfield, Chairman; Lt. J. J. O'Brien.

Committee on Training

Colonel Milton F. Davis, Chairman; Lt. Colonel John Armstrong Drexel, Lt. Colonel Seth W. Cook, Major William A. Robertson, Professor Edward L. Thorndike.

Invention and Research

Captain Adelbert Ames, Jr., Chairman; Captain Robert R. McMath, Professor Wallace C. Sabine.

Supply

Lt. Colonel Thomas G. Gallagher, Chairman: Lt. Colonel Harold Bennington, Major C. S. Benton, Major Walter G. Rogers, Major Eugene E. Deacon, Major Harold R. Eyrich, Captain David R. Wheeler.

Demobilization

The Officer in Charge of Demobilization announces recently that reports from all Air Service activities show the following preferences on the part of the personnel, both commissioned and enlisted:

One-eighth request complete separation from the Service.

Three-eighths request to enter the Regular Army.

One-half request to enter the Reserve Corps.

Here It Is—The Practical Aeroplane

READY FOR IMMEDIATE DELIVERY

Designed for civilian use—for the man who rides his ranch, and the man who loves the air—regardless of the business that calls him.

Low in Cost of Upkeep



High in Factor of Safety

Dispatch Model, $2,500 f.o.b. factory

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N. W. DALTON, Chief Engineer.....2 East End Avenue
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(*Continued from page 867*)

Larsch, Joseph F. ....RWT
Lockwood, Lyman B. ....HHN
Leitner, Clarence W. ....GLC
Leigh, Kenneth G. ....CAF
Lahey, William P. ....EOT
Lenihan, Thomas J. ....FLA
Lawrence, Millard Choate ....PMT
Lober, Clarence Beaver ....ABC
LaParle, Walter E. ....RSD
Lyons, Edward T. ....EOT
Layne, Edward G. ....EOT
Lucas, Malcolm ....DMA

M

Maranville, Clarence H. ....FRF
Mosher, Hugh E. ....FLA
Maxwell, Geoffrey C. ....FLA
Matson, David Hase ....SLA; LHV
Malloway, Jesse S. ....DMA
Mulvihill, Mead J. ....DMA
Michael, Berkeley S. ....LDT
Minter, Hugh Cromer ....SLA; SMM
Moore, Joseph F. ....FLA
Myers, Clarence G. ....EOT
Moore, Lewis E. ....FLA
Mitchell, Thomas Franklin ....SLA; LHV
Mahoney, Augustine Francis ....SLA; LHV
Murphy, Glenn Ross ....SLA; SMM
Morris, John Paul ....FLA
Morris, Howard D. ....HHN
Mills, Harry H. ....CAF
Meyer, Charles Louis ....CAF
Myers, Ray G. ....EOT
Moore, James ....DMA
Meredith, Russell L. ....DMA
Menkel, William ....Note 5
Marr, Kenneth ....RSD
Metcalf, Thomas N. ....DMA
Monger, Walter V. ....EOT
Moon, Charles M. ....RSD
Miller, Heber C. ....EOT
Morris, Glenn D. ....RSD
Mowry, James B. ....CRI
Mars, James A. ....DAP
Moore, Walter F. ....RSD
Muncie, Floyd H. ....RSD
Minter, Hugh Cromer ....SLA; SMM
Massey, Bert V. ....RSD
Mook, Harold F. ....RSD
Mann, Merrill D., Jr. ....DMA
Moon, Ruthven K. ....EOT
Miller, Royal M. ....EOT
Murphy, Glenn Ross ....SLA; SMM

Mc

McGough, William J. ....SLA; SAG
McCutchen, Vernon Ingersol ....SLA; SMM
McNaul, Hollis Olin ....SLA; LHV
MacRae, Harry B. ....CAF
McNulty, Peter H. ....CPA
McCarty, Jack ....SLA; LHV
MacIntyre, Duncan Lauchlan ....SLA; LHV
McAvoy, William H. ....PWM
McKinstry, Augustus T. ....RSD
MacKey, George B. ....RSD
McTaggart, James M. ....SLA
McCullough, Joseph H. ....GLC; WDM; Note 1
McKittrick, Roy Emerson ....SLA; SMM
McDonough, Andrew L. ....EOT
McGill, Raymond J. ....RSD
McGowan, George J. ....EOT

N

Newhall, Edward ....SLA; LHV
Nester, Howard Waltham ....CPA
Newcomb, Walter D. ....CJW
Nimocks, Alfred B. ....CPA
Newberry, Hawley D. ....EOT
Newman, Samuel H. ....EOT

O

O'Sullivan, John Reilly ....SLA; SMM
O'Brien, Fred Flattery ....SLA; SMM
Owens, Robert L. W. ....FLA
O'Leary, Dorman ....KST
Ordway, Lucius P. ....HHN
Owen, Richard Lewis ....SLA; PWM
Older, Fred R. ....EOT
O'Brien, Bernard J. ....RSD

P

Pitkin, Loren H. ....KST
Patterson, Robert W. ....DAF
Pease, Robert Alvaro ....SLA; LHV
Place, Charles Irving ....SLA; LHV
Payne, Richard Hammond ....SLA; LHV
Pike, John ....FLA
Powell, George Newett ....SLA; LHV
Peterson, Glenn ....FLA
Phillips, Clay A. ....CPA
Price, Neil ....SLA; SMM
Puryear, Alfred L. ....FLA
Porter, George H. ....Note 5
Pingenot, Augustus C. ....EOT
Putnam, Marion G. ....LDT
Parker, Earl K. ....RSD
Perlman, Samuel G. ....RSD
Provosty, Albin A. ....EOT
Pinckney, Dunbar W. ....EOT
Prosser, Harvey W. ....RSD
Pinckney, Francis M. ....RSD
Patterson, Lyman ....RSD
Price, Albert A. ....RSD
Perrin, Elmer D. ....RSD
Pickup, Christopher V. ....RSD
Price, Neil ....SLA; SMM

R

Raiguel, William O. ....EOT
Russell, Everette P. ....CJW
Roup, Glenn Marion ....SLA; SMM
Rohrer, Francis Sheppard ....SLA; LHV
Riley, William Edward ....ABC
Ryan, Robert E. ....CAF
Roberts, Lloyd Southwick ....SLA; LHV
Robbins, Oliver K. ....EOT
Rawlins, Albert Whiteley ....SLA; LHV
Rhodes, Lewis Boling ....SLA; LHV
Rozar, Foster R. ....FLA
Ryan, David L. ....DMA
Reid, Walter H. ....KST
Robertson, Lawson ....Note 6
Reynolds, James T. ....EOT
Roddy, Norman Lee ....SLA; SMM
Robinson, Fernando A. ....RSD
Roup, Glenn Marion ....SLA; SMM
Reid, Ted ....EOT
Roeder, Frank E. ....RSD
Rivers, Harold R. ....RSD

S

Seavey, Calvin C. ....CAF
Smith, Charles Daniel ....SLA; SMM
Slate, Everett Joseph ....SLA; SMM
Sedgwick, Robert, Jr. ....DMA
Sturtevant, James Alvin ....SLA; LHV
Schermerhorn, Howard Fera ....SLA; LHV
Stout, Carter W. ....SLA; LHV
Scott, Roger McCormick ....SLA; LHV
Soule, Edgar ....OMA
Sanchez, Julius ....SLA; LHV
Smith, Walter James ....DAP
Stenson, Irving C. ....LOT
Speed, Frederick Rice ....CPA
Street, Theodore Emerson ....SLA; SMM
Sillers, Alexander Graham ....SLA; SMM
Story, Robert Earl ....SLA; LHV
Sheridan, James Edward ....SLA; LHV
Shreve, Lemuel Morse ....SLA; SMM
Seaborn, Walter John ....CPA
Smith, Lewis A. ....FLA
Stevens, Louis W. ....CPA
Suydam, James ....CPA
Smart, Oliver M. ....DMA
Schermerhorn, Samuel S. V. ....RSD
Scott, Henry Thomas ....PFO; DAP; Note 1
Shackelford, Thaddeus Washington ....SLA; SMM
Sillers, Alexander Graham ....SLA; SMM
Smith, Edward T. ....WFO
Shreve, Lemuel Morse ....SLA; SMM
Swift, Arthur D. ....RSD
Sullivan, Edwin ....EOT
Street, Theodore Emerson ....SLA; SMM
Scouton, Harry E. ....RSD
Switzer, Byron R. ....RSD
Slate, Everett Joseph, Jr. ....SLA; SMM
Sanderford, John R. ....RSD
Severson, Thor J. ....RSD
Smith, Charles Daniel ....SLA; SMM
Snow, George W. ....RSD

T

Ten Eyck, Charles Lloyd ....SLA; SMM
Tuohy, John F., Jr. ....LDT
Tucker, McKendree ....CAF
Turner, Lawrence E. ....SLA; SMM
Thode, William Henry Banga ....SLA; LHV
Thebaud, Louis B. ....FLA
Turpin, Paul R. ....GLC
Taylor, Alfred B. ....RSD
Todd, Clarence W. ....RSD
Taylor, Bayard C. ....RSD

V

Vincent, Paul Henry ....FLA
Volandt, William F. ....DMA
Vines, John O. ....EOT
Vassar, Edgar L. ....RSD

W

Weeks, Harold H. ....DMA
Walde, Raymond Leonard ....SLA; LHV
Webber, Charles Leland ....SLA; SMM
Winning, Samuel Evans ....SLA; SMM
Weldie, Ralph Edison ....SLA; LHV
Webb, William Henry ....SLA; LHV
Wilder, Myles S. ....DAF
Watson, Arthur Gillette ....SLA; SMM
Weeks, Richard Bedford ....SLA; SMM
Whiteside, Robert B. ....EOT
Wade, Charles W. ....CPA
Wiggins, James Middleton ....SLA; LHV
Woodring, Daniel W. ....FLA
White, William Wallace ....SLA; LHV
Wilder, Harold ....CPA
Wyly, Lawrence T. ....FLA
Whiteside, Whit ....SLA; SMM
Wood, Glen Eyre ....SLA; SMM
Walker, Warren H. ....FLA
Williams, Paul D. ....MAC
Webster, Robert C. ....CAF
Walker, Edward Winston ....SLA; MAT
Wilbur, Jerry F. ....CAF
Warfield, Gaither P. ....RSD
Williams, Warren L. ....CAF
Welsh, William W. ....CAF
Winkle, William E. ....CAF
Warde, Arthur F. ....RSD
Wood, Glen Eyre ....SLA; SMM
Winning, Samuel Evans ....SLA; SMM
Wilson, Frank G. ....CAF
Warren, George Stanley ....DMA

Y

Young, David H. ....CPA
Young, Thomas Alphonsus ....SLA; MAT
Young, Evan D. ....CAF

Z

Zane, Robert T. ....EOT

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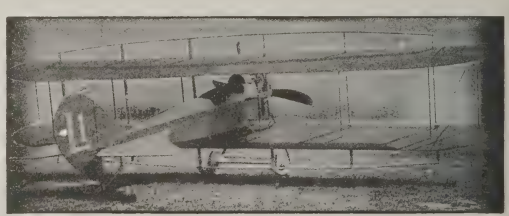
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OCT 2 0 1919

AERIAL AGE WEEKLY

Vol. 8, No. 18 JANUARY 13, 1919 10 CENTS A COPY



The British Flag-ship "Queen Elizabeth" as seen from the air during the surrender of the German fleet

Aerial Transportation Committee Organized by the Aero Club of America

Manufacturers' Aircraft Association Banquet Huge Success

LISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
Domestic, $4. Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879.



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AERIAL AGE WEEKLY

VOL. VIII JANUARY 13, 1919 No. 18

TABLE OF CONTENTS

	PAGE
Theodore Roosevelt	891
Four Thousand Miles in Fifty Hours	892
Aerial Transportation Committee Organized by the Aero Club of America	892
The News of the Week	893
The Aircraft Trade Review	895
U. S. Aerial Mail	896
Cited for Distinguished Service	897
Manufacturers' Aircraft Association Banquet Huge Success	898
The Le Pere Fighter	904
The Hughes Aircraft Report	908
Honor Roll of American Airmen	909
Naval and Military Aeronautics	910
Foreign News	912
Elementary Aeronautics and Model Notes	913
Aeronitis	914

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., Jan. 13, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, JANUARY, 13, 1919 NO. 18

THEODORE ROOSEVELT

IN the death of Theodore Roosevelt the world has lost its greatest personality and the United States its greatest leader.

The Colonel died at Oyster Bay, New York, at 4:15 A. M. on January 6, of pulmonary embolism, blood clot in one of the arteries of the lungs.

Alan R. Hawley, President of the Aero Club of America, Tells of Colonel Roosevelt's Pioneer Contributions to the Development of Aeronautics

"The death of Colonel Roosevelt deprives the aeronautic movement of one of its strongest supporters," said Mr. Alan R. Hawley, the President of the Aero Club of America.

"The Colonel's support to aeronautics began in 1897, when he was Assistant Secretary of the Navy and by his energetic efforts in Congress secured the appropriations needed by Professor Langley to continue his experiments.

"It was during the Roosevelt Administration in 1907, that the United States Army ordered the first aeroplane and first dirigible. At that time no other country had aeroplanes, therefore this progressive step gave to the United States the distinction of being the first Nation to give aeroplanes to its Army.

"The Colonel supported his belief in the safety of flying by making flights himself. He made his first flight in St. Louis in 1911, when very few people dared to fly, because the idea of flying was so new. He flew a number of times later and was the first person of national importance to go up in an aeroplane equipped with a Liberty motor.

"In 1915, at a Conference held on board Mr. Harry Payne Whitney's yacht "The Whileaway," he told the members of the Board of Governors present, who were Messrs. Henry A. Wise Wood, Robert J. Collier, Henry Woodhouse, and myself, that he believed that aircraft would be the most effective weapon in case of war, and urged haste in training two thousand aviators.

"At that time there were only ten aviators in the Army and about eight in the Navy, and the very idea of preparing to train 2,000 aviators was laughed at in Washington. We all know now that had that been done, and had the United States been in a position to send even only 1,000 aviators to France when we entered the War, the war would have been won months before and tens of thousands of lives and billions of dollars would have been saved."

Colonel Roosevelt was also an Honorary Member of the Aerial League of America.

Notable Events in Roosevelt's Life

Oct. 27, 1858, born in New York city.

1880, was graduated from Harvard.

1881, elected to the New York Legislature as a regular Republican.

1882, 1883, reelected.

1886, as the Republican candidate for Mayor of New York he was defeated by Abram S. Hewitt.

1889, engaged in civil service reform work, being a member of the United States Civil Service Commission from 1889 to 1895.

In 1895 was made president of the New York police board.

1897, appointed Assistant Secretary of the Navy by President McKinley.

1898, after raising the Rough Riders regiment, the first volunteer regiment in the war with Spain, and after the victory of San Juan Hill, he was nominated by the Republican party for the Governorship of New York.

1900, nominated for Vice-President on the ticket with McKinley.

1901, succeeded to the Presidency on the assassination of William McKinley.

1904, elected President by the largest popular majority ever given to any candidate in any Presidential election.

March 23, 1908, sailed for Africa to make a scientific collection of fauna and flora of that continent's tropical regions.

June 18, 1910, after magnificent receptions by the peoples and rulers of Europe he returned to New York city and received a great national ovation.

1912, after campaigning in the May Presidential primaries he was defeated for the Republican nomination at Chicago, was subsequently nominated for President by the Progressive party, and in the campaign ran second to Woodrow Wilson.

May, 1913, won a complete victory in his suit against Editor George A. Newett of the Ishpeming, Mich., *Iron Ore*, who in the course of the 1912 campaign had accused him of drunkenness.

January, 1914, explores the River of Doubt in Brazil, which is afterward formally named the Rio Theodoro by the Brazilian Government.

May 22, 1915, the suit of William Barnes against Theodore Roosevelt on an allegation of crooked business and crooked politics resulted in a complete victory for Colonel Roosevelt.

July, 1916, defeated for the Republican Presidential nomination at Chicago, he refused to run on the Progressive ticket and supported Charles E. Hughes on the principle that America should have promptly resisted Germany when attacked by her on the seas.

1916 and 1917, active leadership on American patriotic issues. The Administration refused to permit him to complete raising his division for service in France. His four sons, Theodore, Archibald, Kermit and Quentin, go to fight in France, and his son-in-law, Dr. Richard Derby, goes to France as a Major in the Army Reserve Corps.

In 1918, assumed leadership of public opinion and demanded vigorous prosecution of the war and a 100 per cent. Americanism on the part of all citizens. Did not hesitate sharply to criticize Administration when he considered that its actions failed to measure up to requisite standards. Gave $40,000 Nobel Peace Prize he had received in recognition of the settlement of the Russo-Japanese War to war work, dividing fund between Red Cross, Y. M. C. A. and Knights of Columbus.

FOUR THOUSAND MILES IN FIFTY HOURS

FROM Rockwell Field, San Diego, Cal., to Bolling Field, Washington, via the Southern route, a distance of approximately 4,000 miles in fifty flying hours, is the record of the squadron of four army planes commanded by Major Albert D. Smith. This is an average of about eighty miles per flying hour.

With the exception of three stretches, covering 520 miles, the entire flight was made against a steady wind, which cut down the speed of the squadron materially.

The measured distance for the trip, taking the direct air line between all points at which stops were made, was 3,610 miles. It was not possible to take the direct air line between some points, and the detours made increased the distance covered by approximately 400 miles.

Accompanying Major Smith were Major James H. McKee, flight surgeon; Lieuts. Robert S. Worthington, H. D. McLean, Albert Pyle and John M. Evans, and two mechanics, Sergts. Blanton and Lewis, both master signal electricians.

"We made no attempt whatever to establish a speed record on this trip," said Major Smith to a reporter for the *World*. "We started out to map an aerial mail route between San Diego and El Paso, Tex., and were permitted to pick our own course from El Paso on.

"The course to El Paso was carefully mapped and landing places selected. Lieut. Evans is the official photographer of the party, and he took some fine pictures along the route. We also made photographs and notes covering the entire distance.

"We made the entire trip without changing a plane or a motor. The plan is to fly back to San Diego, and a start probably will be made about the middle of this month.

"Our motors have gone through sixty-five hours of actual flying and will be replaced by new motors for the trip home. We expect to use the same planes on the return journey.

"The entire distance from sea to sea and up the coast was covered in formation. For three solid weeks we were compelled to remain idle on account of bad weather."

The squadron left Rockwell Field on Dec. 4 and was on the road thirty-three days, or four weeks and five days.

In 1912 Col. Rogers flew from New York to Los Angeles for the purpose of advertising a certain product. He covered the distance in about forty days. The only other cross-country flight was made by a pilot named Fowler, who flew from Los Angeles to Jacksonville and spent about three months en route. He had a train along with him.

On the return trip the army flyers plan to make much better time. Their route has not yet been chosen, but it is probable weather conditions will require them to go back via the Southern route.

Major Smith brought the carcass of a young deer to Washington in his machine, and the party dined on venison at a local hotel. They shot six bucks near Tillman, S. C., where a stop was made. The flyers shot ducks near Phoenix, Ariz., wild pigs in Texas and quail in Florida.

There were no serious mishaps on the long journey and Major McKee had nothing to do but enjoy the ride and "patch holes in the air," to hear the flying men tell it. The aviators look none the worse for their long flight and are keen to take the air again for the journey to New York. A stop will be made in Philadelphia for fuel.

The planes are patched up and show signs of hard usage, but are said to be as strong as when they left Rockwell Field. At one time, while over the southwestern mountains, the two mechanics made repairs on the motors in the air. They climbed on top of the motors, and did their bit with the machines, cutting capers of all kinds.

The original squadron contained five planes, but the fifth pilot lost his way on the first lap of the journey. Major Smith modestly gives credit to the junior pilots for the success of the flight, but they insist he is entitled to 90 per cent. of it. The planes used were Curtiss J. N. 4 H.'s.

Just as AERIAL AGE goes to press we learn that the squadron of Army planes completed the trip across the continent and landed at Hazelhurst Field, Mineola, just as darkness fell January 7th.

AERIAL TRANSPORTATION COMMITTEE ORGANIZED BY THE AERO CLUB OF AMERICA

MR. ALAN R. HAWLEY, the President of the Aero Club of America, announced on January 6 the appointment of a committee of important members of the Club to develop plans for the employment of aircraft for transportation and the drafting of regulations to govern aerial navigation.

Rear-Admiral Robert E. Peary has been selected as Chairman of this important "Aerial Transportation Committee", of which the following prominent members of the club have been nominated to be members:

Col. Bion J. Arnold, Roger W. Babson, Sir F. W. Baillie, Major T. F. Baldwin, U. S. A., Bernard M. Baruch, Capt. R. A. Bartlett, Alexander Graham Bell, Major August Belmont, U. S. A., Laurence V. Benet, Walter Berry, Lieut. Commander P. N. L. Bellinger, U. S. N., Lieut. Commander W. Starling Burgess, U. S. N., James M. Beck, General Theodore A. Bingham, Lieut. Col. James A. Blair, Jr., William H. Bliss, Col. G. C. Brant, U. S. A., Rear Admiral Mark S. Bristol; Lieut. Col. A. R. Christie, Col. C. C. Culver, U. S. A., Lieut. Godfrey L. Cabot, U. S. N., Manuel Estrada Cabrera, President of Guatamala, Gianni M. E. Caproni, Col. Charles deF. Chandler, Edward B. Close, Alexander Smith Cochran, T. Jefferson Coolidge, J. Parke Channing, W. Redmond Cross, J. S. Cullinan, Glenn H. Curtiss, Capt. Bronson M. Cutting, Edgar B. Davis, Col. Milton F. Davis, U. S. A., H. P. Davison, James Deering, Charles Dickenson, Capt. Earl W. Dodge, Lieut. W. E. Doherty, U. S. N., Eben S. Draper, Irenee duPont, T. Coleman duPont, Brig.-Gen. Robert K. Evans, U. S. A., Rear-Admiral Bradley A. Fiske, Major Max Fleischmann, Col. A. F. Fuller, U. S. A., Major Robert Glendenning, Major Howard L. Goodhart, Major C. C. Goodrich, Major David M. Goodrich, Major Edwin Gould, Alan R. Hawley, William Hawley, John Hays Hammond, Jr., J. R. Harbeck, A. A. Harriman, Peter Cooper Hewett, Dr. A. L. Hipwell, W. S. Hogan, Lt. Col. F. L. V. Hoppin, Hon. Murray Hulbert, Col. H. B. Hersey, Prof. J. F. Haworth, Col. E. Lester Jones, Major-General W. A. Kenly, Major Fiorello H. La Guardia, Capt. B. B. Lipsner, Henry Lockhart, Jr., Capt. Pierre Lorrilard, Harold F. McCormick, Clarence H. Mackay, Emerson McMillan, Lord Northcliffe, Glenn L. Martin, Col. Archie Miller, U. S. A., Major J. C. McCoy; W. W. Miller, Harry Bowers Mingle, Wm. H. Page, Augustus Post, George W. Perkins, L. C. Phipps, Col. James Prentice, Major Cushman A. Rice, U. S. A., Prof. C. L. Poor, R. B. Price, N. G. Rost, Hon. William G. Sharp, Allan A. Ryan, Alberto Santos-Dumont, Herbert L. Satterlee, F. A. Seiberling, J. DeMont Thompson, Rodman Wanamaker, Lt. Col. Wm. Thaw, Brig. Gen. Cornelius Vanderbilt, W. K. Vanderbilt, G. Douglas Wardrop, Felix M. Warburg, Sidney B. Veit, Henry Woodhouse, Major Orville Wright, Harry Payne Whitney, John N. Willys, K. M. Turner.

"One of the purposes of the Aerial Transportation Committee," said Mr. Hawley, "will be to advise the representatives of scores of cities in the United States who are constantly applying to the Aero Club of America and the Aerial League of America for information, advice and guidance in establishing aerodromes.

"Another purpose will be to co-operate with the Post Office in establishing aerial mail lines and extending the aerial mail service.

"Preliminary reports on the subject of aerial transportation and regulations to govern aerial navigation have been made to the Board of Governors of the club and data has been collected showing what England, France and Italy are planning to do. These countries are planning most extensive air lines, although their geographic conditions are not as favorable for aerial transportation as they are in the United States. We should do likewise in this country and utilize the 20,000 Liberty motors which are being stored away and the tens of millions of dollars worth of aeroplanes which will be entirely wasted unless used during the coming six months, as aeronautic equipment deteriorates fast."



THE NEWS OF THE WEEK



Fly 215 Miles in 75 Minutes

Cleveland.—What is believed to be a new world's aeroplane speed record was set January 7 in a 215-mile flight from Dayton to Cleveland by Eric Springer, pilot, and Ernest Longchamp, mechanician, in a Martin bombing plane driven by two Liberty motors. The time was 1 hour and 15 minutes. The previous record between the two cities was two hours flat.

The machine carried gasoline, tools and baggage weighing 2,500 pounds. It was the first machine turned out by the Glenn L. Martin factory here and had been at Dayton for several months undergoing army tests. The flight was not intended as a speed test.

Kenly in Record Flight from Washington

Mineola.—What is said to be a record aeroplane flight from Washington to Mineola was made January 7 by Major General William L. Kenly, chief of the Department of Military Aeronautics, with Major William C. Ocker as pilot. The flight was made in a specially designed De Haviland aeroplane, equipped with a 400 h.p. Liberty motor. The 250 miles was covered in 1 hour and 39 minutes, which is an average of 160 miles an hour. The aeroplane landed at Hazlehurst Field.

Major Ocker said that he flew from Washington to Philadelphia in 55 minutes and from Philadelphia to New York in 44 minutes. No stop was made at Philadelphia. General Kenly and his pilot took a lunch of coffee and sandwiches in midair.

General Kenly said that he was very well pleased with the flight, but believes that an even better record will be made next time.

A Glenn L. Martin aeroplane, carrying five army officers, flew from Washington to Mineola in two hours on January 7. This aeroplane was equipped with two Liberty motors and was piloted by Captain Roy N. Francis. Those in the aeroplane were Lieutenant Colonel C. K. Rheinhardt, Major W. H. Frank, Lieutenant Ried F. Behan and Lieutenant Colonel Archie Miller.

British Flier Sets Record for Height

London.—The world's record for altitude for an aeroplane was broken at Martleshall, near Ipswich, recently by Capt. Lang, R. A. F., and Lieut. Blowers, the former acting as pilot, the latter being a passenger. The feat was accomplished on a British two-seater biplane fitted with a British-designed and British-built engine. At 2,000 feet there was 31½ degrees of frost. A height of 25,000 feet was reached in 38 minutes and 20 seconds, and the final barograph reading of 30,500 feet was made in 66 minutes and 55 seconds.

At 20,000 feet Lieut. Blowers turned on the oxygen supply, and 6,000 feet higher, feeling faint, he turned on his own supply an extra pound, but with no better result. He found that the main pipe connected with the oxygen bottle was broken through vibration. He wrote a note to the pilot telling him what happened, but collapsed before he could get the message to the pilot, who therefore carried on in ignorance of his observer's pligiat. At 28,000 feet the pilot's heating apparatus was working erratically, and at 29,000 feet the shortage of oxygen was apparent. The pilot, however, carried on till 30,500 feet was reached.

Here the engine stopped through lack of petrol. The pressure of the air at this height was so slight that it could not drive the small propellers connected with the petrol and oil pump.

Descending slowly, the machine got to 10,000 feet, where the observer regained consciousness. The observer was sent to a hospital suffering from frozen hands and toes. Capt. Lang was suffering from frostbite on his fingers and face.

Capt. R. W. Schroeder, an American pilot of the Wilbur Wright aviation field, held the altitude record just broken by Capt. Lang. He reached an altitude of 28,900 feet on September 18, 1918, which he made in a Hispano-Suiza motored Bristol Biplane.

"Gulf to Lakes" Flyers Triumph

Detroit.—An observation De Haviland aeroplane reached Detroit this afternoon from Ellington Field, Houston, Tex., making the 1,650 mile trip in 724 minutes of flying time and the last lap from Indianapolis at the rate of 122 miles an hour, under adverse weather conditions.

The machine was one of three which left Ellington Field on a "Gulf to Detroit and return" map making an observation trip, December 21, and was piloted by Capt. L. J. Robinson, with Lieut. A. A. Adams, observer.

Capt. Robinson made the flight under the direction of the Technical Department of the Engineering Corps for observation and to test the operation of the Liberty engine under severe weather conditions.

Capt. Robinson stated on his arrival here that the flights from St. Louis to Indianapolis, and from Indianapolis to Detroit, were made through weather and at continued low temperatures that it had hitherto been held could not be contended with. The Indianapolis-Detroit flight was made with temperatures ranging from zero to 10 below, but no engine or oil troubles were experienced, although no special engine equipment had been provided.

The two mapmaking machines, in charge of Lieut. Hill, are at Indianapolis awaiting weather favorable for mapmaking and reconnaissance.

Students of Walter E. Lees, Please Note

So that the *entente cordiale* existing between the students tutored by Walter E. Lees may be revived, the editors of AERIAL AGE are glad to state that communications addressed to Walter E. Lees, 54 West 37th Street, New York City, will be delivered promptly. Mr. Lees would also like to hear from his fellow instructors of the early days—that is, 1914 and 1915.

Bureau of Aircraft Production Changes

The following assignments of Aircraft Production officers is published:

Lieut. Col. R. M. Jones, A. S., A. P., was appointed Assistant and Executive Officer to the Acting Director of Aircraft Production on December 28. In addition to his present duties as Executive Officer, he will also be charged with such activities as pertain to laison, correspondence with the War Department and other Departments or Bureaus of the Government.

Lieut. Col. H. C. Clark, A. S., A. P., in addition to his other duties, will take over the duties of Adviser and Assistant to the Acting Department on matters pertaining to personnel for the Bureau.

Lieut. Col. O. Westover, A. S., S. P., is appointed Assistant to the Acting Director of Aircraft Production.

Major George F. Lyons, A. S., A. P., is hereby appointed Assistant to the Acting Director of Aircraft Production.

"On the Wing" Ceases Publication

It is regretted that the Puget Sound District of the Spruce Production Division, publishers of *On the Wing*, have announced the last issue of that interesting paper. It was conceived as a soldiers paper and published as such, without advertising, for seventeen weekly issues.

Hunting in Service Aeroplanes Forbidden

The Director of Military Aeronautics has ruled against the shooting of wild fowl with machine guns from aeroplanes.

"The shooting of wild fowl with machine guns from aeroplanes is absolutely forbidden. Aeroplanes will not be used in any manner for hunting or shooting wild fowl. Aeroplane flights along the coast, or at any place where migratory wild fowl may be found, will be conducted in such a manner as to interfere as little as possible with the habits and feeding of the wild fowl.

"Commanding Officers will use every means to carry out the regulations and will bring to trial any offenders that may in the future be guilty of breaking any of them."

Class II Flying

No more instruction known as "Class II Flying" will be given at Army Air Stations. All such instruction now being given will be discontinued by direction of Major General Kenly.

Air Service Units to Sail

The War Department announces that the following organizations have been assigned to early convoy:

Fourth Regiment Air Service:
Mechanics 17th Company, 3 officers and 161 men;
18th Company, 3 officers and 152 men.
19th Company, 1 officer and 168 men.
Air Service Casual Company No. 2; 2 officers and 185 men.
162nd Aero Squadron, 2 officers and 51 men.
400th Aero Squadron, 7 officers and 153 men.
34th Balloon Company, 11 officers and 170 men.
155th, 147th, 27th, and 95th Aero Squadrons, 24 officers and 725 men.
13th, 49th and 139th Aero Squadrons, 18 officers and 545 men.

The assignment of the 500th Aero Squadron to early convoy was an error.
483rd Aero Squadron, 4 officers and 154 men.
489th Aero Squadron, 4 officers and 154 men.
490th Aero Squadron, 4 officers and 154 men.
21st Aero Squadron, 5 officers and 152 men.
30th Aero Squadron, 5 officers and 134 men.



The Murray-Carns Biplane, one of the latest American machines. The fuselage is made of thin rolled steel. It is powered with a Hispano-Suiza motor © Central News

31st Aero Squadron, 5 officers and 150 men.
32nd Aero Squadron, 5 officers and 135 men.
33d Aero Squadron, 5 officers and 143 men.
37th Aero Squadron, 5 officers and 142 men.
640th Aero Squadron, 5 officers and 148 men.
43rd Aero Squadron, 4 officers and 155 men.
101st Aero Squadron, 4 officers and 150 men.
257th Aero Squadron, 4 officers and 154 men.
469th Aero Squadron, 2 officers and 116 men.
184th Aero Squadron, 2 officers and 147 men.
492nd Aero Squadron, 2 officers and 147 men.

Twenty-seven casual air service officers are reported as having sailed on the *Nieuw Amsterdam* on December 27, and 45 officers on the *Siboney* on December 25.

Marine Corps Aviators Return

Major A. A. Cunningham, commander of the United States Marine Aviation Corps, has just arrived here from France. With him came three squadrons of his foreign unit, numbering 115 officers and 700 men. His fourth squadron, with 180 men and 36 officers, returned two weeks ago.

Major Cunningham was made the first marine aviation officer in 1912, and for a time constituted the whole of the marine aviation section. He is extremely proud of the performance of his corps of air fighters.

Major Cunningham went to Europe in 1917 for the purpose of inspecting their methods of training fliers. He came back a few months later and put into effect the results of the aviation wrinkles observed abroad. The prime factor being a course of stringent training, and a few months later an organization of a thousand men were started for France. For the efficiency of his corps Major Cunningham was highly commended by the major general commanding. Major Cunningham says of his "boys": "Our men who went over were trained for a year and a half, and they were picked from hundreds of good men. They jumped into the thickest of battles from the first and stayed right with the oldest and best of the allied fliers. Some of their individual deeds of bravery will go down in history."

They were in France but four months, but saw service to the very day the armistice was signed. Their losses total eight officers and forty men. In France they were known as "The Day Bombing Wing." Major Cunningham will be temporarily attached to the headquarters division of Marine aviation at Washington.

Pacific Fliers Approach Washington

The hazards of cross-country flying when the route is not known, was illustrated in the flight of the squadron of four Army planes coming North from Savannah on December 30th, when on account of engine trouble, one of the four which had come across the continent from the Pacific, had to make a forced landing. The other planes in order not to separate, followed it down. All landed safely in rough country but after making repairs, it was found that the field in which they had landed was too small to take off from and all the planes had to be dissembled, carted out by road into a larger field and assembled again before the trip might be resumed. This job took longer than was anticipated and the delay cost them a day, but a report received by wire from the squadron commander December 31 stated that he hoped to leave for Washington early that morning.

Tillman, the town near which the planes landed, is on a straight line north towards Columbia, South Carolina, and thirty miles from Savannah from which the day's flight was started. The Pacific aero squadron probably will not reach Washington until January 3. The day's incident shows the value of the air mapping work now being done. If this route over which the squadron was flying had been previously air mapped, the pilots would have been able to "spot" a good landing field from their charts immediately, effected an easy landing, made their repairs and come on without loss of time. Good landing fields and many of them are essential to cross-country flying.

The planes made the two hundred miles along the coast between Daytona and Savannah on Saturday, December 28, reporting landing fields all the way. Recently they have been averaging 200 miles daily in good weather.

Last reports state that bad weather holds the planes at Raleigh, North Carolina. The commanding officer of the squadron said that he had encountered rain all the way north from Florida. If the weather improved today he said he would start for Washington direct and omit the Langley Field stop. He hoped to arrive in Washington on January 3 or 4.

Gen. March Announces Air Service Units With Third Army

"I have heretofore announced the composition of the Third Army, the Army of Occupation along the German frontier, in terms of divisions, and during the past week we cabled General Pershing to send any other auxiliary troops which actually comprised part of that army so that we might let the people of the country know where their relatives were. The following air units, outside of divisions are serving with the Third Army:

Third Army Air Service Headquarters, First Pursuit Group, Pursuit Squadron No. 4, 4th Air Park, Headquarters Bombardment Group. Day bombing squadron 166 Headquarters Army Observation Groups, Aero Squadrons 9 and 91, Photo Sections 2 and 10 branch Intelligence office 462 D and 463 D Constitution Squadrons.

Headquarters 3rd Army Corps Air Service, First Aero Squadron, 6th Photo Section, 3rd Corps Balloon Groups Reconnaissance, First Balloon Company branch intelligence office.

Fourth Corps Air Service Headquarters, 12th Aero Squadron, Photo Section Number 4, Branch Intelligence office, Balloon group headquarters, 4th Corps, 2nd Balloon Company Army Corps, 88th Aero Squadron and 3d Balloon Company.

We have given out during the week the assignment of various units in France by General Pershing to early convoys, so they will not be repeated, but the sum total is 6,821 officers and 168,239 men, who are assigned to early convoys for return home. The number of men in the United States who have been ordered discharged, which I reported last week as amounting to 900,000, has now been increased to 937,000 by the introduction of some new units. This number with the 168,239 selected by General Pershing brings the number of men slated for discharge up to 1,005,239. The sum total of men who have actually been discharged in the United States up to date is 533,334 The number of officers who have been discharged up to Dec. 27 is 35,400.

U. S. Fliers Lost 21 Balloons in Last Allied Offensive

During the last Allied offensive, between September 26 and November 11, twenty-one American balloons were lost. A report on the balloon companies of the 1st Army in France shows that fifteen balloons were destroyed by German aeroplanes and six by shells, and that the enemy lost at least fifty.

An idea of how hot was the action in which the American units were engaged was indicated by the statement that the 11th Balloon Company was attacked four times on October 6, and that Lieutenants J. A. McDevitt and G. D. Armstrong, attached to that company, were forced to jump twice to escape enemy attacks. Lieutenant W. J. R. Taylor, 6th Company, and Lieutenant B. T. Burt and J. A. Higgs, 7th Company, also made four jumps each. American officers in all, during the offensive, made thirty parachute jumps.

Lieutenant C. M. Reeves, a student observer with the 7th Company, was in the air only four hours and made three parachute jumps, two balloons being burned over his head.

Major-General Summerall, in a communication to the commanding officer of the corps balloon group, commended the companies for their work.



The forty passengers which Clifford B. Proedger, the American pilot, took on a journey over London recently in the latest type of four motored Handley Page Biplane © Western Newspaper Union

The AIRCRAFT TRADE REVIEW

Sees Express Sent Soon By Air Routes

Within a year fast aerial express and passenger carrying lines, connecting all parts of the United States, will be an accomplished fact, according to a prediction made by Glenn L. Martin of the Glenn L. Martin Company, inventor of one of the many flying machines developed during the war. In the next three years, Mr. Martin believes a system of commercial transport will be developed which will be cheaper than other modes now in use.

"The important future of aircraft," said Mr. Martin, "is the wonderful commercial application in making accessible by aircraft rich outlying districts tributary to important industrial and business centres. Disastrous delays, such as have been encountered on railroads, will be obviated, and the speed of delivery by aeroplane is of course apparent.

"Coast patrol, forest patrol, and mail carrying will be extensively developed. British Columbia has established a system of aerial forest patrol and the United States is arranging a similar system. The success of the mail route between New York and Washington is known to all."

Those who expect commercial aeronautics to develop shortly, according to Mr. Martin, are making their preparations on sound and scientific foundations, looking toward ton-mile economy and reliability. The Government, he said, should take steps immediately to establish landing fields adjacent to manufacturing and industrial centres.

Manufacturers of aeroplanes were already adapting the military aeroplane for commercial uses, the inventor said, but new designs would be forthcoming. He had already adapted his heavy bombing machine, capable of carrying a ton with ease he added.

"The type of machines adapted and developed for commercial uses," Mr. Martin said, "will undoubtedly be multiple motored, which will make the possibilities of forced landings remote and will permit travel in all kinds of weather. Instruments to enable airmen to meet adverse weather conditions need development, and their production is vital to insure the successful use of the aeroplane to commercial uses."

The United States, Mr. Martin said, should take cognizance of the preparations foreign countries were making to adapt the aeroplane to commercial uses.

Rost Returns from France

N. G. Rost, the General Sales Manager of the Duesenberg Motors Corporation, has just returned from England and France where he has been for the past three months in the interests of his company.

Trumbull With Wellman-Seaver-Morgan

Horace N. Trumbull, who has recently received his discharge from the Engineer Officers' Training School at Camp A. A. Humphreys, Va., has been appointed Advertising Manager of the Wellman-Seaver-Morgan Company of Cleveland, Ohio.

Before entering the service, Mr. Trumbull was Advertising Manager of the SKF Ball Bearing Company of Hartford, Conn.

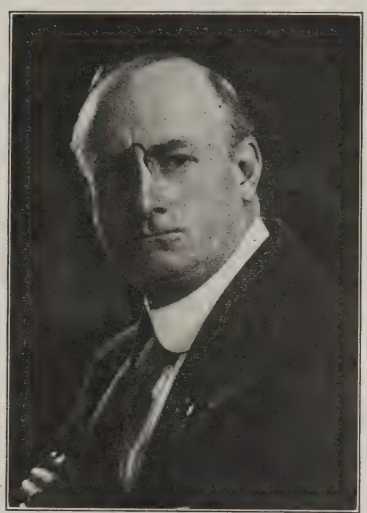
Spark Plug with Priming Cup

Those who have experienced the difficulty of starting a cold engine on a winter's day know that it is not a simple or easy task. Many a good spark plug has been condemned through its failure to perform when the temperature hovered around the freezing point.

According to F. B. Caswell, sales manager of the Champion Spark Plug Co., Toledo, Ohio, this loss of time and effort is entirely unnecessary. His contention is that a set of Champion priming plugs installed in an engine will do away with all the uncertainty of cold weather starting.

This type of spark plug is manufactured with a little priming cup right on the plug, itself, so designed as to form a direct connection with the sparking point. When a drop or two of gasoline is placed in the priming cup, it trickles down through the plug right to the sparking point. A slight turn of the little pet cock puts the gas right where the spark jumps and it cannot fail to ignite.

The slight increase in cost of this priming plug over that of ordinary types together with its time and labor-saving advantages has made it a popular cold weather plug, and quite adapted for aviation use.



Dr. Wm. W. Christmas, designer of the "Christmas Bullet" biplane

Crates for Construction Work

During the past six months the salvage branch has endeavored to find a method, advantageous to the Government, of returning empty wing and fuselage crates to the manufacturers. The long freight haul, the flimsy character of the crates themselves and the long time they must be held at a field before a carload accumulates, made their return inadvisable except in a few instances. It is believed that the Government will receive more benefit from their use in construction work at the fields than in any other way and it is recommended that the commanding officers take steps to use them locally, in some way which will not be wasteful and will tend to eliminate the piles of this material which are unsightly and carry a considerable fire menace.

Flying Insignia

The Adjutant General of the Army has approved certain changes in Flying Insignia.

Paragraph 64 (o) Special Regulations No. 41, Uniform Regulations, 1917, is changed as follows:

"Qualified military aviators, junior military aviators, reserve military aviators, military aeronauts, junior military aeronauts, reserve military aeronauts and observers will wear insignia on the left breast above the line prescribed for badges and medals to show their qualifications. Flying instructors of the Air Service will wear insignia on the right sleeve of the coat just above the cuff."

Paragraph 36½, Special Regulations No. 42, Uniform Specifications, 1917, is changed, and paragraph 39½ is added, as follows:

36½ Insignia On Left Breast (Air Service)

Qualified officers will wear insignia on left breast as follows:

(a) Military aviators, junior military aviators and reserve military aviators.—A device of oxidized silver consisting of a pair of wings with the shield between. Device to measure 3 inches from tip to tip.

(b) Military aeronaut, junior military aeronaut and reserve military aeronaut.—A device of oxidized silver consisting of a pair of wings with a balloon between. Device to measure 3⅛ inches from tip to tip.

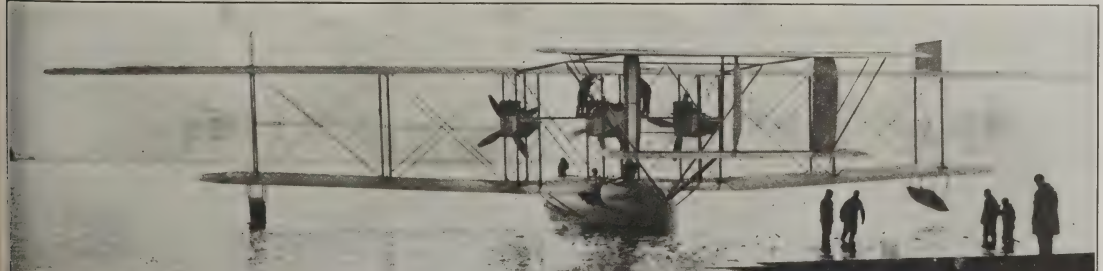
(c) Observer.—An oxidized silver single wing to the left of the letter "O" in bright silver; the "O" to encircle the letters "US" inoxidized silver in relief on an oxidized silver background. The device to measure 1⅞ inches in length.

39½ Insignia On Sleeve (Air Service)

Flying instructors.—Gilt insignia of the same design and size as the insignia for officers of the Air Service, omitting the propeller. To be worn just above the right cuff on all coats.

Cited for Bravery

First Lieutenant Winfred C. MacBrayne, Field Artillery, observer, Air Service. For extraordinary heroism in action near Fismes, France, August 26, 1918. While he was conducting an aerial reconnaissance and general surveillance from his balloon, Lieutenant MacBrayne was repeatedly attacked by hostile aeroplanes, and continued his mission despite the proximity of strong enemy air patrols against which he had no defense. When an enemy Fokker emerged from low-hanging clouds, firing at the balloon with incendiary bullets, Lieutenant MacBrayne remained in the basket until his companion, who was making his first ascension, had safely jumped. He leaped when the balloon was nearer the ground and his parachute opened as he crossed into the woods. Lieutenant MacBrayne insisted upon reascending immediately, thereby displaying conspicuous coolness and determination. Home address, Mrs. Marguerite V. MacBrayne, wife, 400 East Merrimac Street, Lowell, Mass.



The Curtiss NC-1 returning from a trip

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
L. T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations

PILOTS

Ira O. Biffle
Irving Graeb
Trent C. Fry
Leon D. Smith
L. V. Smith
Dunn K. Steele
Lyman W. Doty
Carroll C. Eversole
Dan Davison
Dana C. DeHart
Edwin W. Hubbard
D. I. Lamb

George Langley Conner, Chief Clerk to Second Assistant Postmaster Praeger
Charles M. Kight, Special Representative
John A. Jordan, Special Representative
Louis T. Bussler, Special Representative
Geo. R. Bowie, College Park, Md., Representative
H. Thomas, Belmont Park, L. I., N. Y., Representative
R. Smith, Bustleton, Penn., Representative

AVIATOR-MECHANICS

Christopher C. Cole
Julian Sykes
Wm. L. Lindley
August E. Carlson

Official Statement Concerning New York-Chicago Aero Mail Service

Important progress in preparation for the New York-Chicago aero mail service was announced on January 4 by the Post Office Department. While Otto Praeger, Second Assistant Postmaster General, in charge of aerial projects, was unable to announce the exact date on which the Atlantic Seaboard-Great Lakes route will be in operation, he declared that thorough plans for the utilization of war material as far as possible and the modification of unsatisfactory equipment should be completed within a few weeks and that flights would be made on schedule.

"Very few persons realize what an undertaking this is," said Mr. Praeger. "Never has a trip by air been undertaken whereby a ship leaves for an 800-mile voyage, one each way a day, flying over mountains with very few landing places—an undertaking which, six months ago, would have been regarded absolutely impossible. When you consider that this is being done with a single-motored plane, the task is stupendous. This has never been attempted, either in America or in any other country of the world, and great credit is due to the organization undertaking it.

"Through the absence of the fullest degree of cooperation the New York-Chicago air mail service was deprived of essential support. Our experiments demonstrated that military construction, especially the type available last December, was neither safe nor economical for mail purposes; and the Post Office Department, with a full appreciation of the desirability of utilizing all material left over from the war, is endeavoring to work out a system whereby there can be developed a ship capable of carrying at least 250 pounds of mail and yet afford the pilot the maximum degree of safety.

"A military plane is designed for military purposes, not mail or commerce. Its weight distribution is faulty, when it comes to carrying letters, and the hope in the future is to have in the New York-Chicago service a machine provided with a distinct compartment. This will do away with the makeshift of using the gunner's cockpit. The reason we have had success in the service between New York and Washington is that training planes and not fighting ships have been available.

"When the New York-Chicago service is resumed we expect to have low-compression Liberty engines, rather than the high-compression, military type. This is a point now being worked out. The high-compression motor is designed for altitude work; in carrying the mails we fly at a comparatively low height and so require a motor that functions efficiently at the proper level.

"The Post Office Department feels that it will be possible to use much of the military equipment, though the fuselage and landing gear of available army planes must be strengthened or altered to meet commercial conditions. This work is under way. With regard to motive power, which caused some trouble at the start of the New York-Chicago service, the Post Office Department has on its staff the most competent Liberty motor mechanics and, in addition, has the help of expert mechanics and riggers placed at our disposal by the aeroplane industry.

"Further preparations also are being made along the New York-Chicago route. The Department has established five landing fields and emergency stops for the 800-odd miles. Leaving Belmont Field, N. Y., the air mail pilot will have an emergency haven at Lehighton, Pa., 105 miles distant. One hundred and fifteen miles further he will have a regular stop at Bellefonte, Pa. Across the crest of the mountains, a stage of 87 miles, he will have a safety field at Clarion, Pa. From this point he will have a clear flight of 128 miles into Cleveland. His next stage and landing field will be 157 miles to Bryan, Ohio, and, 166 miles further on, the Chicago terminal. Each of these fields, regular and emergency, will have an extra ship, a hangar, an extra flyer and a mechanic and watchman, in addition to fuel and other facilities. The staff of pilots engaged for the New York-Chicago route numbers twelve, all of whom have flown more than 1,000 hours. Five of these have seen battle service and a number are aces."

Italy to Have Aero Mail Service With Colonies

Rome.—The colonial minister announced on January 2 that aero mail routes will be developed between Italy and Eritrea and other colonies. Special pilots and machines have already been received for this service.

Two new giant Caproni triplanes, each carrying twenty-two passengers, flew from Ferral to Herva, a distance of 400 kilometers, in three hours.



The Standard type plane used in the Aero Mail Service

CITED FOR DISTINGUISHED SERVICE

THE commander in chief, in the name of the President, has awarded the Distinguished Service Cross to the following named officers and soldiers for the acts of extraordinary heroism described after their names:

First Lieutenant William W. Palmer, pilot, Air Service, 94th Aero Squadron. For extraordinary heroism in action in the region of Doulcon, France, October 3, 1918. Lieutenant Palmer encountered three enemy planes (Fokker type). Despite their numerical superiority he attacked and, in a decisive combat, sent one down in flames and forced the others to retire. Home address, H. W. Palmer, father, Bennettsville, S. C.

First Lieutenant Edward P. Curtis, pilot, Air Service, 95th Aero Squadron. For extraordinary heroism in action in the region of Stenay, France, September 27, 1918. Lieutenant Curtis volunteered to perform a reconnaissance patrol of particular danger and importance 30 kilometers within the enemy's territory. He made the entire journey through a heavy anti-aircraft and machine-gun fire, and flew at an extremely low altitude to secure the desired information. Home address, Mrs. G. T. Curtis, mother, North Goodman Street, Rochester, N. Y.

Captain James A. Wallis, observer, Air Service, 1st Army Observation Group. For extraordinary heroism in action in the region of Metz, France, September 13, 1918. While on a reconnaissance under the most adverse weather conditions, which necessitated flying at extremely low altitude, Captain Wallis, with his pilot, penetrated the enemy's territory to a depth of 25 kilometers. Attacked by five enemy planes, they destroyed one and forced the others to retire. Under heavy fire from the ground, they continued on their mission until it was completed. Home address, Mrs. James A. Wallis, Sr., 11 Bigelow Street, Cambridge, Mass.

First Lieutenant Arthur F. Seaver, pilot, Air Service, 94th Aero Squadron. For extraordinary heroism in action in the region of Etain, France, September 16, 1918. Lieutenant Seaver, with his squadron, started on a bombing raid. The formation was broken up because of various troubles to the machines. Lieutenant Seaver, with his observer, Lieutenant Stokes, continued on and joined a formation of another bombing squadron. After crossing the lines their plane was struck by an anti-aircraft explosive shell, throwing the machine out of control. When Lieutenant Seaver gained control of the machine it had fallen away from the protection of the other planes. With their crippled plane and missing motor they continued until they had reached their objective, when their motor died completely. An enemy plane attacked, but Lieutenant Stokes kept him off until his machine coasted to their own lines. Home address, Charles A. Seaver, father, 12 Rue D'Aguesseau, Paris, France.

First Lieutenant Willis A. Diekema, pilot, Air Service, 91st Aero Squadron. For extraordinary heroism in action in the region of Metz, France, September 15, 1918. While on a photographic mission Lieutenant Diekema's formation was attacked by a superior number of enemy aircraft. In the course of the combat Lieutenant Diekema's companion planes were driven off. Disregarding the fact that his machine was without protection, he continued on his mission until his observer, Lieutenant Hammond, had completed the photographs. On the return they fought their way through an enemy patrol and destroyed one of the machines. Home address, G. J. Diekema, 134 West Twelfth Street, Holland, Mich.

First Lieutenant Leonard C. Hammond, observer, Air Service, 91st Aero Squadron. For extraordinary heroism in action in the region of Metz, France, September 15, 1918. While on a photographic mission Lieutenant Hammond's formation was attacked by a superior number of enemy pursuit planes. Notwithstanding that the enemy planes succeeded in driving off the protecting planes, Lieutenant Hammond and his pilot, Lieutenant Diekema, continued on alone. Continually harassed by enemy aircraft, they completed their photographs, and on the return fought their way through an enemy patrol and destroyed one of the machines. Home address, A. B. Hammond, 2252 Broadway, San Francisco, Cal.

Major John W. Reynolds, Air Service, commanding officer, 1st Army Observation Group. For extraordinary heroism in action in the region of Verdun, France, October 10, 1918. Major Reynolds proceeded over the enemy lines without benefit of protection planes on a mission of great urgency. He flew about 12 kilometers over the lines when he was suddenly set upon by 14 hostile planes. He fought them off and succeeded in downing one of the enemy. He continued his flight with his badly damaged plane and concluded his mission. A bronze oak leaf for extraordinary heroism in action in the region on Grand Pre, France, October 29, 1918. While on a mission Major Reynolds was suddenly set upon by six enemy aircraft. Although in the German territory, without protection and in danger of being cut off in the rear, he entered into combat with the hostile aircraft. He succeeded in shooting down two of the enemy and dispersing the rest of the formation. With his machine severely damaged, he continued until he had completed his mission. Home address, Mrs. John N. Reynolds, Dora Apartments, Twentieth Street and Florida Avenue, Washington, D. C.

First Lieutenant Alexander W. Schenck, pilot, Air Service, 49th Aero Squadron. For extraordinary heroism in action in the region of Doulcon, France, October 4, 1918. Lieutenant Schenck was one of an offensive patrol of six planes that attacked and engaged in combat 17 enemy machines (Fokker type). While he was engaging one of the enemy, he observed a comrade about to be sent down by an enemy plane that had maneuvered to an advantageous position. Lieutenant Schenck immediately left off the combat he was engaged in and shot down the plane, thereby saving the life of his comrade. Home address, Mrs. R. R. Parkhurst, mother, 500 Grant Avenue, Plainfield, N. J.

First Lieutenant Stirling Campbell Alexander, pilot, Air Service, 99th Aero Squadron. For extraordinary heroism in action in the region of Landres-et-St. Georges, France, October 6, 1918. Lieutenant Alexander, with Lieutenant Atwater, observer on a photographic mission, was forced back by seven enemy pursuit planes. A few minutes later he returned over the lines, and while deep in enemy territory was cut off by 12 enemy planes (Pfals Scouts). He maneuvered his plane to give battle, and so effectively managed the machine that he with his observer were able to destroy one, and forced the others to withdraw. With his observer severely wounded, he managed to bring his plane safely back to his own aerodrome, with his mission completed. Home address, Mrs. Lucine Hughe Alexander, mother, Chestnut Hill, Philadelphia, Pa.

Second Lieutenant Frank K. Hayes, pilot, Air Service, 13th Aero Squadron. For extraordinary heroism in action in the region of Chambley, France, September 13, 1918. Lieutenant Hayes was one of an offensive patrol of five planes, attacked by seven enemy scouts (Fokker type), that dived down on them from the clouds, catching the American patrol in a disadvantageous position. In the course of the combat which followed, both of Lieutenant Hayes's machine guns jammed. By an extraordinary effort he cleared his guns and drove off the adversary. He then observed his flight commander in a dangerous situation with two enemy planes behind him. He attacked and destroyed one and forced the other to withdraw. Home address, C. L. Hayes, father, 2000 West One Hundred and First Place, Chicago, Ill.

First Lieutenant Harold R. Buckley, pilot, Air Service, 95th Squadron. For extraordinary heroism in action near Perle, France, Aug. 10, 1918. Lieutenant Buckley was on a patrol protecting a French biplane observation machine, when they were suddenly set upon by six enemy planes. Lieutenant Buckley attacked and destroyed the nearest, and the remainder fled into their own territory. He then carried on with his mission until he had escorted the allied plane safely to its own aerodrome. A bronze oak leaf, for extraordinary heroism in action near Neville, France, and Bourcuilles, France, September 16-27, 1918. Lieutenant Buckley dived through a violent and heavy anti-aircraft and machine-gun fire and set on fire an enemy balloon that was being lowered to its nest. On the next day, while leading a patrol, he met and sent down in flames an enemy plane while it was engaged in reglage work. Home address, Daniel H. Buckley, father, Federal Street, Agawan, Mass.

Second Lieutenant Valentine Burger, observer, Air Service. For extraordinary heroism in action near Hill 360, over the region of the Meuse, France, October 27, 1918. Lieutenant Berger, with his pilot, flying at an altitude of less than 15 meters within close range of numerous machine guns and light artillery pieces fired continually on them, staked the American advanced lines and helped silence enemy machine-gun nests, which were holding up the advance of the infantry at this point. Although the plane was riddled with over 300 bullet holes, and the pilot severely wounded, Lieutenant Burger gathered valuable and accurate information and assisted his pilot to a safe landing within reach of the post of command and delivered his valuable information. Home address, Miss Katie Krauss, aunt, 135 Christie Street, Leonia, N. J.

Second Lieutenant Frank Luke, Jr., deceased, 27th Aero Squadron, Air Service. For extraordinary heroism in action near St. Mihiel, France, September 12 to 15, 1918. Lieutenant Luke, by skill, determination, and bravery, and in the face of heavy enemy fire, successfully destroyed eight enemy observation balloons in four days. Next of kin, Frank Luke, father, 2200 West Monroe Street, Phoenix, Ariz.

Second Lieutenant Otto E. Benell, S. C., 135th Aero Squadron. For extraordinary heroism in action near Thiaucourt, France, September 12, 1918. Lieutenant Benell went out on a two-hour counter attack artillery adjustment under adverse weather conditions. Soon after he suffered an accident to his right hand, which made it useless. In spite of this injury, he continued to operate his wireless key with his left hand, directing the fire of the batteries on concentrations behind the enemy lines. Home address, Mrs. Mary Benell, mother, R. F. D. No. 2, P. O. box 111, Fort Collins, Colo.

First Lieutenant Lloyd G. Bowers, Air Service, United States Army. For repeated acts of extraordinary heroism in action near Gironville and Chatelchesery, France, August 14-29 and October 27, 1918. On August 14 this officers' balloon was attacked by four enemy chase machines and, though urged to jump, he remained at his post and secured information of great value. On August 29 he was attacked by enemy planes using incendiary bullets, but would not leave his post, before his balloon caught fire; he insisted at once upon reascending, although

(*Continued on page* 916)



The Curtiss NC-1, the largest naval flying boat, taking off

MANUFACTURERS' AIRCRAFT ASSOCIATION BANQUET HUGE SUCCESS

AERO SHOW TO BE HELD IN MADISON SQUARE GARDEN

A THOUSAND members and guests of the Manufacturers' Aircraft Association, including more than a hundred pilots in the army aviation service, attended the banquet given by the association at the Waldorf-Astoria January 7. Major General William L. Kenly, chief of the Division of Military Aeronautics of the army, and several other prominent aviators flew from Washington to Mineola to be present at the dinner. Several of the army pilots who just completed the transcontinental flight from San Diego, Cal., to Washington, were present also.

It was announced at the banquet that an aeronautic exposition is going to be held in Madison Square Garden from February 27th to March 6th. The Acro Club of America and the Aerial League of America will co-operate with the Manufacturers' Aircraft Association in making the show a success. The combined membership of the Club and the League is 9,000, most of whom are not connected directly with the aeronautic industry, and who will attend the show out of pure interest.

When the diners were seated the lights were dimmed and Frank H. Russell, toastmaster and president of the association, called for a silent toast in memory of Theodore Roosevelt. The toast was drunk standing while taps were sounded by a bugler in the gallery.



Those at the guest table besides Mr. Russell and Major General Kenly included Charles F. Kettering, president of the Society of Automotive Engineers; Major H. Dourif, of the French Aviation Mission; H. Snowden Marshall; Captain N. E. Irwin, director of naval aircraft production; W. C. Potter, formerly assistant director of naval aircraft production; Henry A. Wise Wood, vice-president of the Aero Club of America; Dr. John R. Freeman, of the National Advisory Committee for Aeronautics; Dr. Grosvenor B. Clarkson, director of the Council of National Defence; Benjamin S. Foss, secretary of the Manufacturers' Aircraft Association; John D. Ryan, former director of the Bureau of Aircraft Production; Brigadier General J. D. Cormack, of the British Flying Mission; the Rev. Nehemiah Boynton, pastor of the Clinton Avenue Congregational Church, Brooklyn; Colonel J. A. Mars, director of aircraft production; Otto Praeger, Second Assistant Postmaster General; Lieutenant Alberto Cantoni, of the Italian Aeronautical Mission; Lieutenant H. H. Emmons, U. S. N., chief of engine production; Colonel William A. Bishop, R. F. C., Canadian ace of aces, and Harry B. Mingle, treasurer of the association.

The dinner formed a part of the campaign of the aircraft manufacturers to solicit the co-operation of the government in a constructive programme for the future development of aviation in this country for government and commercial purposes.

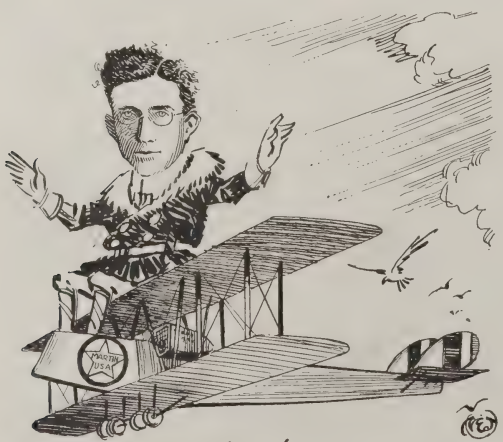
Telegrams of regret were read by Toastmaster Russell from Secretary Baker, Secretary Daniels, General George O. Squire, chief signal officer of the United States Army; Orville Wright, pioneer aviator; Lieutenant Pat O'Brien, an aviator made famous by his activities at the front; Charles D. Walcott, of the Smithsonian Institution; Senator Harry S. New, of Indiana, and others. Secretary Baker said:

"I regret that I cannot have the pleasure of attending the dinner. It will celebrate the conclusion of the great service rendered by the manufacturers of aircraft to the government and to the country. The art was new and the time was short, but the zeal, loyalty and ability enabled the manufacturers to accomplish great results, and the future of aircraft in this country is assured by the success already attained."

There were three aeroplanes exhibited in a reception room adjoining the grand ballroom. The Curtiss-Kirkham triplane aroused a great deal of interest.

In general form, it is quite different from the prevailing American types and has little in common with the European designs. From the end of its sharp nosed monoque fuselage to the tip of its tail it is entirely of American design and American manufacture.

The body is elliptical in section, and carefully modeled to secure the wonderful streamline form which high speed demands. It is powered with a new Curtiss 400 horsepower







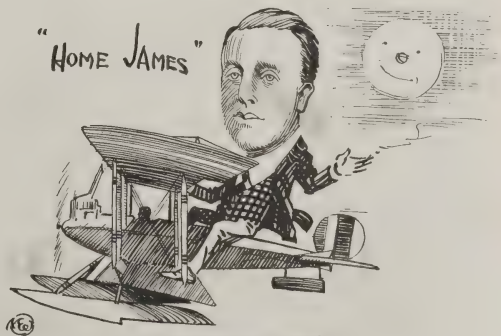
was there with his usual enthusiasm and optimism

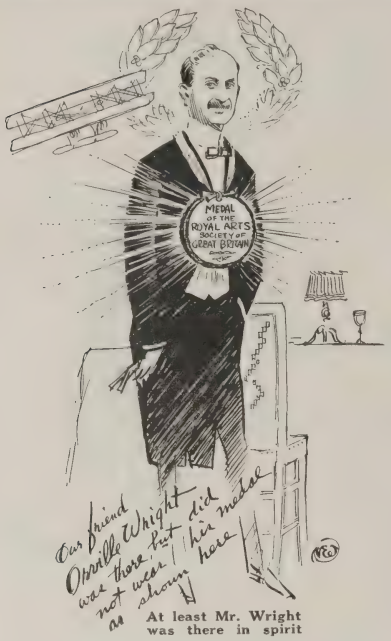












At least Mr. Wright was there in spirit





K-12 engine, which is also a recent development and which makes the tremendous speed possible.

Despite its moderate dimensions, the plane is only 32 feet wide, 24 feet long and 10 feet high, it will carry a useful load of over half a ton. The government report credits it with 160 miles an hour, carrying a full military load, armament. pilot and passengers, a feat that is regarded by experts as truly epoch making.

The Thomas-Morse Type S4-E, which was shown, is a further development of the Type S4-E which was used so extensively for training by the War Department during the war. This new machine was designed for the purpose of furnishing the War Department with a faster advanced training machine than the S4-C Type.

It has superior performance in all particulars. The wing area has been reduced from 230 sq. ft. to 145 sq. ft and the weight has been reduced throughout to make a lighter and handier machine. It has a wing spread of about 22 feet, while the overall length is approximately the same as the S4-C Type. A novelty is shown in the fitting of tapered wings, the cord length being less toward the wing tips. This results in a more efficient lifting aerofoil and at the same time offers advantages from a structural standpoint. The total weight of the machine is 1,150 lbs., providing three hours flight duration. Fitted with a 80 H.P. LeRhone engine, this machine has the following performance: Speed, from 55 to 105 miles per hour; Climb, 7,000 feet in ten minutes; Ceiling, 17,000 feet.

The Standard ME1 Scout was also exhibited.

A record flight for speed was made by Major Gen. William L. Kenly in getting to the Banquet. The distance of 250 miles was covered in one hour and thirty-nine minutes, averaging 160 miles an hour. The flight was made in a specially designed De Haviland plane, equipped with a 400 horsepower Liberty motor. The machine arrived at Hazelhurst Field, Mineola, L. I., at 12:30 P. M., having flown from Washington to Philadelphia in fifty-five minutes, and from Philadelphia to New York in forty-four minutes without a stop. The General and his pilot, Colonel W. C. Ocker, had a luncheon of hot coffee and sandwiches on the way.



Col. C. K. Rhinehart, Major W. H. Frank, Captain Roy N. Francis, Lieut. R. F. Behan, and Lieut. Col. Archie Miller came over from Washington in a Glenn Martin Bomber.

The speeches at the Banquet will be recorded in our next issue.

The committee of arrangements comprising J. G. White, chairman, Harry Bowers Mingle, and R. F. Hoyt are to be heartily congratulated on the completeness of their work, and particularly on the appropriateness of the Banquet hall decorations and layout.

The following is a list of guests present: G. H. Abel, A. Adams, F. B. Adams, L. H. Allen, H. W. Alling, F. N. Ames, Dr. J. S. Ames, D. G. Anderson, J. H. Anderson, R. C. Anderson, W. P. Anderson, Colonel H. H. Arnold, U. S. A.; Com. A. K. Atkins, U. S. N.; M. H. Avran, L. H. Austin.

H. D. Baker, Lieutenant L. H. Ball, U. S. A.; R. C. Ball, E. H. Ballard, Colonel T. H. Bane, E. J. Barnard, Major James Barnes, U. S. A.; G. E. Barnhart, W. E. Barrett, Captain R. A. Bartlett, A. W. Bassick, A. G. Batchelder, W. L. Batt, Lieutenant W. Battle, U. S. A.; R. A. Bebb, Professor F. Bedell, L. K. Bell, L. M. Bell, Lieutenant L. Beloni, Lieut. R. F. Benham, W. N. Bennett, Lieutenant H. M. Benstead, U. S. A.; Captain A. A. Berger, U. S. A.; Lieutenant G. Berger, U. S. A.; Ira Berry, K. A. Bickel, P. Bigelow, Jr., Cortlandt F. Bishop, Major Wm. A. Bishop, R. A. F.; J. H. Blackburn, H. N. Bliss, P. W. Bliss, W. P. Blodgett, H. Bonright, B. H. Blood, R. A. Bohn, Lieutenant C. H.Borntrager, U. S. A.; G. de Bothezat, Bouldin, R. V. Borunonville, Rev. N. Boynton, D.D.; S. S. Bradley, Caleb S. Bragg, F. F. Brewster, Colonel W. Briggs, R. A. F.; Lester Brion, C. W. Brook, E. G. Brookman, A. H. Brown, H. L. Broughton, A. L. Brown, Lieutenant-Colonel H. S. Brown, U. S. A.; Lieutenant J. H. Brown, U. S. A.; H. E. Brubaker, H. A. Bubb, Lieutenant J. H. Burke, U. S. N.; H. B. Burndt, C. A. Burrell, Lieutenant George Burton, J. S. Butcher, Captain H. W. Butler, U. S. A.;

W. J. Calhoun, J. A. Callahan, W. J. Cameron, Lieutenant B. F. Camp, M. S. Cannon, Lieutenant A. Cantoni, Lieutenant W. H. Cantwell, W. H. Carpenter, Lieu-

MACHINES EXHIBITED AT THE MANUFACTURERS' AIRCRAFT ASSOCIATION BANQUET



The Curtiss Model K Triplane Scout



The Thomas-Morse Type S4-E advanced training machine



The Standard ME-1 Scout

tenant B. F. Castle, U. S. A.; J. R. Cautley, F. S. Channonhouse, J. F. Chidsey, E. N. Chilson, Major Chism, J. K. Choate, Captain R. E. Christie, H. E. Clark, L. Clark, Colonel V. E. Clark, C. F. Clarkson, Hon. Grosvenor B. Clarkson, Lieutenant H. H. Cobe, U. S. A.; Lieutenant-Com. F. G. Coburn, U. S. N.; P. M. Coco, Major E. A. Coleman, U. S. A.; J. H. Collins, W. Colman, Chas. Colvin, R. U. Conger, H. A. Connell, C. H. Conner, J. H. Conners, E. Conrad, M. Cook, E. Cooper, Brigadier-General J. D. Cormack, R. J. Coulter, A. S. Crane, H. M. Crane, Jos. E. Crane, Captain J. Van D. Crisp, U. S. A.; Ensign Theodore Crisp, W. Benton Crisp, W. Benton Crisp, (Guest) W. Benton Crisp, (Guest), W. Redmond Cross, G. H. Crossan, G. H. Crossan (Guest), G. H. Crossan (Guest), A. Crozier, J. H. Cryer, H. B. Culver, F. Curtis, G. S. Curtis, C. W. Curtis, Glenn H. Curtiss, S. M. Curwen.

H. N. Dalley, A. H. Dalzell, J. B. Dane, P. V. Daniel, E. J. David, J. P. Davies, J. Davis, S. Davis, W. E. Davis, W. L. Davis, C. H. Day F. J. Dearden, S. B. DeBeltrand, Colonel E. A. Deeds, U. S. A.; H. G. Delabar, Paul Deloye, R. Dennett, G. Desaulles, W. Detlef, Dr. H. C. Dickinson, C. W. Diffin, F. G. Diffin, Captain R. Dinnwiddie, R. A. F.; W. Dinnwiddie, M. J. Dodge, W. F. Doerflinger, W. J. Dornan, T. R. Doud, Major H. Dourif, Colonel A. C. Downey, U. S. A.; Lieutenant R. P. Dyer, U. S. A.

Lieutenant E. M. Earle, U. S. A.; W. K. Earle, Major C. B. Ely, U. S. A.; Lieutenant H. H. Emmons, U. S. N.; W. J. Erdle, H. Evers, Captain O. R. Ewing, U. S. A.; Joseph Ewing.

E. R. Fallon, F. L. Faurote, J. H. Faw, J. H. Faw (Guest), J. H. Faw (Guest), E. W. Fenn, F. D. Findlay, M. J. Finkelstein, A. A. Fisher, Rear-Admiral Bradley A. Fisk, J. M. Fitzgerald, A. G. Flackbar, E. M. Flaherty, R. E. Flanders, A. H. Flint, B. S. Foss, Noble Foss, M. L. Fouquet, E. B. Freeman, J. A. Fried, H. M. Friends, J. H. Fuller, R. B. Fuller, Lieutenant G. Fulton, U. S. N.; H. Fundstedt, K. Fukui, Lieutenant R. W. Furman, U. S. A.

E. F. Gallaudet, H. L. Garber, L. D. Gardner, H. L. Gascoigne, W. D. Gash, Captain N. B. Gatch, John Gavin, J. W. German, C. C. Gibson, E. C. Gieher, P. H. Gill, Colonel W. E. Gillmore, U. S. A.; M. Gillmore, W. L. Gilmore, Lieutenant-Colonel T. E. Gilmore, S. Gokous, Lieutenant-Colonel Chester



Goodier, F. G. Gordon, W. R. Graef, J. Graham, B. P. Green, Colonel H. W. Gregg, U. S. A.; T. Gregory, W. Gregory, H. B. Griffin, Captain S. Griffis, U. S. A.; A. Griffith, E. S. Griffith, P. M. Grimm, Herbert Griswold, E. O. Gude, H. Gulick, C. W. Gutzeit, B. A. Guy.

Lieutenant P. Haaren, U. S. N.; H. E. Hahl, E. C. Hait, Lt.-Com. N. B. Hall, U. S. N.; T. F. Hamilton, J. A. S. Hand, E. P. Harmon, Lieutenant-Colonel W. F. Harmon, U. S. A.; W. A. Harriman, A. C. Hartich, L. Hassenger, Chas. Hayden, A. S. Hearn, Captain C. Hemphill, U. S. A.; H. Herrick, A. Herschfelder, D. N. Hess, W. C. Hess, J. P. Hilands, N. W. Hill, J. G. Hofgaard, A. Hogan, M. Hollenberg, Lieutenant L. A. Holley, H. J. Horn, Lieutenant-Colonel L. S. Horner, U. S. A.; Dr. H. A. Houghton, G. H. Houston, J. Olin Howe, A. R. Howell, C. W. Howell, F. R. Hoyt, R. F. Hoyt, T. H. Huff, Hon. Murray Hulbert, A. B. Humphrey, C. E. Hunter, Lieutenant J. E. Hutchinson, Jr.

R. F. Ingram, Captain N. E. Irwin, N. S. N.; H. O. C. Isenberg.

John C. Jay, Jr., A. M. Jeffords, A. H. Jennings, C. S. Jennings, A. Johns, Rex Johnston.

L. Kalisher, Dr. F. P. Keatch, O. A. Keenan, Captain T. J. Kehoe, Major-General W. L. Kenly, U. S. A. S.; H. Q. Kennedy, Colonel F. R. Kenney, U. S. A.; J. E. Kepperley, C. F. Kettering, C. M. Keys, G. Keys, A. C. Kleberg, A. Klemin, H. M. Kieswetter, H. King, T. H. King, C. B. Kirkham, V. W. Kliesrath, Arthur Knapp, L. Knapp, G. W. Knappman, W. M. Knaus, B. G. Koether, W. S. Koithan, C. Kolodiz, M. D. Koppel, Edmond Krause.

W. L'Hommedieu, Paul La Croix, Major H. W. Lake, U. S. A.; W. C. Lange, H. A. Lardner, F. D. Lawley, R. P. Lay, Lieutenant Leaycraft, U. S. N.; Brigadier General C. F. Lee, Lieutenant W. Lee, U. S. N.; Major L. B. Lent, G. C. Leoning, H. V. Lewis, S. C. Lewis, Captain D. M. Liddell, W. B. Lidherz, Lieutenant Lieberman, U. S. N.; M. L. Lieberman, Lieutenant-Colonel R. B. Lincoln, U. S. N.; A. W. Lishawa, Captain H. F. Littlejohn, U. S. A.; M. Vernon Longacre, E. Lowe, Jr., I. Ludlow, Captain A. P. Lundin, Lieutenant H. B. Luther, U. S. N.; C. L. Lyngaas.

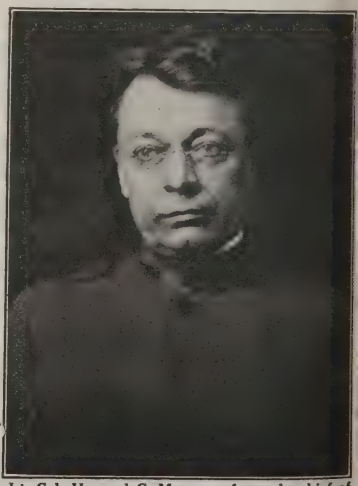
H. P. MacDonald, J. J. MacElroy, Dr. J. S. MacGregor, H. MacMurray, E. K. Mackintosh, J. O. Madison, E. H. Magee,



Fay L. Faurote, who worked hard for the success of the banquet



R. F. Hoyt, an industrious member of the Banquet Committee



Lt.-Col. Howard C. Marmon, formerly chief of the Experimenting Department, was there minus his uniform

E. H. Magee (Guest), C. H. Manly, F. C. Manning, J. A. Manson, C. R. Manville, T. Frank Manville, Tracy F. Manville, R. B. Marchant, G. L. Markland, A. H. Marks, Lieutenant-Colonel H. C. Marmon, U. S. A.; Colonel J. A. Mars, U. S. A.; Hon. H. Snowden Marshall, Glenn R. Martin, G. L. R. Master, S. L. Mather, John May, Lieutenant F. J. Maynes, U. S. A.; Lieutenant J. H. McCann, U. S. A.; C. H. McCarthy, Captain Peter McCoy, Jr., A. A. McDonald, A. McEwen, F. H. McFarland, H. C. McGuire, T. T. McGuire, W. F. McGuire, W. B. McKibben, Lieutenant T. McKinnon, U. S. A.; S. P. McMinn, J. M. Meirick A. J. Meyer, A. J. Meyer (Guest), H. W. Meyer, Colonel Archie Miller, U. S. A.; Ensign R. R. Miller, U. S. N.; A. Milne, Karl R. Miner, H. B. Mingle, G. D. Mitchell, Lieutenant-Colonel G. W. Mixter, U. S. A.; W. O. Monroe, John T. Moore, Major A. C. Moore, U. S. A.; C. H. Morehouse, T. A. Morgan, A. M. Morrell, Ensign H. B. Morrill, U. S. N.; J. N. Morrison, A. C. Morse, F. L. Morse, H. E. Morton, W. W. Moss, J. J. Mossman, W. W. Mountain, G. H. Mueller.

Chas. Neave, A. A. Nelidow, H. C. Nelson, George Newbold, E. de B. Newman, P. C. Nicholson, H. F. Noyes.

J. Kingsley Ohl, A. F. Old, T. Y. Olsen M. J. Oswald, H. T. Owens, H. T. Owens (Guest).

Lieutenant R. M. Page, U. S. A.; J. A. Paine, G. Q. Palmer, R. R. Paradies, J. H. Pardee, Colonel W. L. Patterson, U. S. A.; G. S. Patterson, E. E. Pennewill, L. H. Perkins, G. T. Perry, Franklin Pettit, F. A. Pezet, Carlo Pfister, M. Allen Pickering, H. L. Pope, F. G. Porter, Augustus Post, W. C. Potter, Hon. Otto Praeger, E. R. Preston, A. L. Priddy, J. F. Prince, R. W. Pryor, Lieutenant J. L. Purdy, G. M. Pynchon.

O. F. Quartullo.

J. W. Rapp, M. W. Raynes, Lieutenant-Com. L. M. Ream, U. S. N.; M. W. Reed, A. G. Reid, R. W. Reid, Captain F. B. Rentschler, U. S. A.; Lieutenant G. A. Rentschler, U. S. A.; H. M. Richmond, A. M. Rickert, J. P. Rippley, J. D. Robbin, E. W. Roberts, C. I. Robinson, H. M. Robinson, J. K. Robinson, Jr., M. T. Robinson, Captain W. D. Rogers, U. S. A.; W. M. Rose, Austin Rowe, Leon Rubay, F. H. Russell, Hon. John D. Ryan.

E. T. Sargent, Hon. W. L. Saunders, J. P. Sauteer, W. D. Sayle, J. M. Schoonmaker, Lieutenant G. Scragg, U. S. A.; Willard Seiberling, K. Seko, J. W. Sheetz, Dwight S. Simpson, J. H. Simpson, F. W. Sinon, H. W. Slauson, J. P. Sloane, R. B. Sloane, W. D. Sloane, Lieutenant-Com. A. B. Smith, A. C. Smith, A. H. Smith, D. C. Smith, F. H. Smith, Hinsdale Smith, R. C. Smith, J. Allen Smith, L. Smith, Lieutenant-Colonel F. E. Smith, U. S. A.; R. C. Smith, Lieutenant W. H. Smith, U. S. A.; Rear Admiral Wm. S. Smith, U. S. N.; Sidney A. Smith, W. Hinckle Smith, W. F. Spencer, L. B. Sperry, F. L. Spiro, W. J. Spiro, L. C. Sprague, S. B. Steele, J. H. Steenson, M. Steinfels, L. G. Stern, L. W. Stetson, Chas. A. Stewart, J. A. Stewart, J. B. Stewart, J. B. Stewart (Guest), J. B. Stewart (Guest), J. B. Stewart (Guest), S. V. Stewart, H. G. Stoddard, W. B. Stout, F. G. Straat, J. R. Strain, Dr. S. W. Stratton, W. B. Stratton, K. Sukui, Lieutenant-Colonel J. A. Sullivan, U. S. A.; H. H. Suplee, H. R. Sutphen, W. P. Sutton, H. R. Swartley.

H. E. Talbott, Jr., B. F. Tallamy, L. V. Tallamy, G. L. Tarbox, J. P. Tarbox, R. C. Taylor, Captain J. Terry, Hon. H. B. Thayer, B. D. Thomas, W. T. Thomas, H. B. Thomson, H. E. Thorn, M. M. Titterington, G. J. Tobin, Major H. W. Torney, Com. J. H. Towers, U. S. N.; F. W. Trabold, A. H. Trageser, E. A. Tunis, W. E. Tuttle, Jr., W. E. Tuttle, Jr. (Guest), W. J. Tyman.

I. M. Uppercu.

P. F. Vaitses, C. W. Valentine, L. B. Valentine, G. W. Vaughn, F. Vernon (A. H. F.), F. Vernon (F. G. D.), W. A. Viall, J. F. Victory, T. S. Vierow, Colonel J. G. Vincent, U. S. A.; H. Voltmann, C. M. Vought.

Major G. R. Wadsworth, U. S. A.; G. H. Walbridge, Charles Wales, J. Wales, J. Bannard Walker, Rodman Wanamaker, J. Ward, G. Douglas Wardrop, R. Ware, W. C. Ware, Ensign J. Washington, W. J. Waterhouse, T. J. Watts, C. W. Webster F. W. Weed, Major H. Wehrle, U. S. A.; A. Weiland, M. Weinsier, D. H. Wells, Lieutenant-Com. H. Wesson, U. S. N.; Lieutenant-Colonel Oscar Westover, U. S. A.; E. C. Whitbeck, C. White, D. McClal White, J. G. White, Lieutenant E. White, U. S. A.; Thomas J. White, C. Whitford, F. C. Whitney, Captain S. M. Wiley, U. S. A.; C. F. Willard, E. G. Williams, H. M. Williams, B. L. Williams, G. M. Williams, John N. Willys, E. H. Wilson, Griswold Wilson, H. Wilson, Mr. Wilson, P. W. Wittemann, C. R. Wittemann, W. Wittemann, J. Wolf, Lieutenant-Colonel S. E. Wolf, U. S. A.; H. A. Wise Wood, J. W. Wood, J. W. Wood (Guest), Henry Woodhouse, W. T. Woodruff, A. K. Woods, Captain Woods, Lieutenant Wooley, C. B. Wortham, G. Wynkoop.

M. Yasamoto, Major R. H. Young, U. S. A.; V. H. Young. H. W. Zuege.



Gallaudet D-4 Light Bomber, making 110 knots (126.7 miles) per hour, piloted by Lieut. E. F. Stone, U. S. N.

THE LE PERE FIGHTER



CAPTAIN G. LE PERE, an aeronautical engineer in the French Air Service, designed the "Lepere Fighter" with a Liberty engine, for production in the United States. It was intended for use as a fighter or reconnaissance plane and carries two fixed guns firing forward, synchronized with the engine, and two Lewis guns attached to a movable Scarff ring surrounding the rear cockpit.

General Dimensions

Span, upper plane	39′–0¼″
Span, lower plane	39′–0¼″
Chord, both planes	5′–6″
Gap between planes	5′–0⅝″
Stagger	2′–0–15/16″
Length over all	25′–4⅝″
Height over all	9′–10⅞″

Weights

	(*pounds*)
Machine empty	2468
Pilot and Gunner	360
Fuel and Oil	475
Armament	352
Total	3655

Performances

Height (*feet*)	Speed (*m.p.h.*)	Time of Climb (*min. & sec.*)
0	136	0′– 0″
6,000	132	5′–35″
10,000	127	10′–35″
15,000	118	19′–15″
20,000	102	41′– 0″

Ceiling, or height beyond which the machine will not climb 100 feet per minute, 20,800 feet.

Main Planes

Planes are flat in span and have no sweepback. Top plane is in three sections; a center section over the body, and two outer panels. Lower plane in two sections attached at lower sides of fuselage in the usual manner.

Upper and lower planes are similar in shape, and with ailerons 21¾″ wide by 94¼″ long attached to both. An interconnecting streamlined rod is used between each pair of ailerons, located behind the outer wing struts.

Leading edge of upper plane is located 49 9/16″ from front of propeller hub. Middle struts located 94⅜″ from center of machine; outer struts, 98½″ from middle struts; overhang, 41″. Interplane strut design is unique inasmuch as it eliminates the usual incidence wires.

Fuselage

Veneer is used for exterior finish. Over all length of fusilage, 22′ ⅛″. Maximum section at the gunner's cockpit, 32½″ wide, 45½″ deep.

Center of gravity occurs at a point 6′ 3″ from nose of fuselage.

Axle of landing gear 22⅜″ forward of center of gravity. The landing gear wheels have a 65 9/16″ track and are 28″ in diameter.

Tail Group

Over all span of stabilizer, 98¾″; chord, 35½″. It is fixed at a non-lifting angle, and attached to upper fuselage longerons.

Tail flaps or elevators measure 158½″ from tip to tip. Their chord is 31⅜″, and in addition to this there are small balancing portions extending beyond the tail plane.

Rudder is 30″ wide and has a balancing portion above the fin, 25″ wide.

Engine Group

A Liberty "12" 400 h. p. engine is used. A description of the Liberty engine was published in the December 16, 1918, issue of AERIAL AGE. It develops 400 h. p. at 1,750 r. p. m. Bore, 5″; stroke, 7″; weight, without propeller and water, 858 pounds. Two Zenith Duplex carbureters are used.

The radiator is located in the upper plane center section, and its location has necessitated some slight modifications in the engine to increase the water circulation.

Propeller, 9′ 4″ in diameter. Front propeller plate projects 11¾″ forward of fuselage nose.

Propeller axis 15 7/16″ below top of upper longerons. In flying position the propeller hub is 5′ 2⅞″ above the ground line; when at rest on the ground the propeller hub is 6′ 1⅜″ above ground.

Reconstruction at Gerstner Commended

At the request of the Executive Section the attached communication from the Assistant Secretary of War commending the work of reconstruction at Gerstner Field at a cost of less than a third of the original estimate.

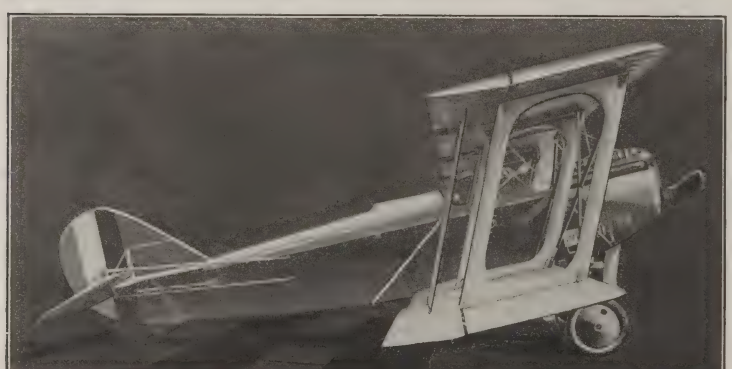
Gerstner Field was practically destroyed by a hurricane on the afternoon of August 6, 1918. Memorandum for Col. C. G. Edgar:

The Assistant Secretary of War has read with much interest your memorandum of December 19, in regard to the reconstruction of Gerstner Flying Field and asks me to say to you how extremely gratifying it is to him to know that the work will be completed for a cost not to exceed $130,000, although the original estimate amounted to $466,000. The use of troop labor has been fully justified and the results far beyond anyone's expectations.—C. H. Hare, for the Assistant Secretary of War.

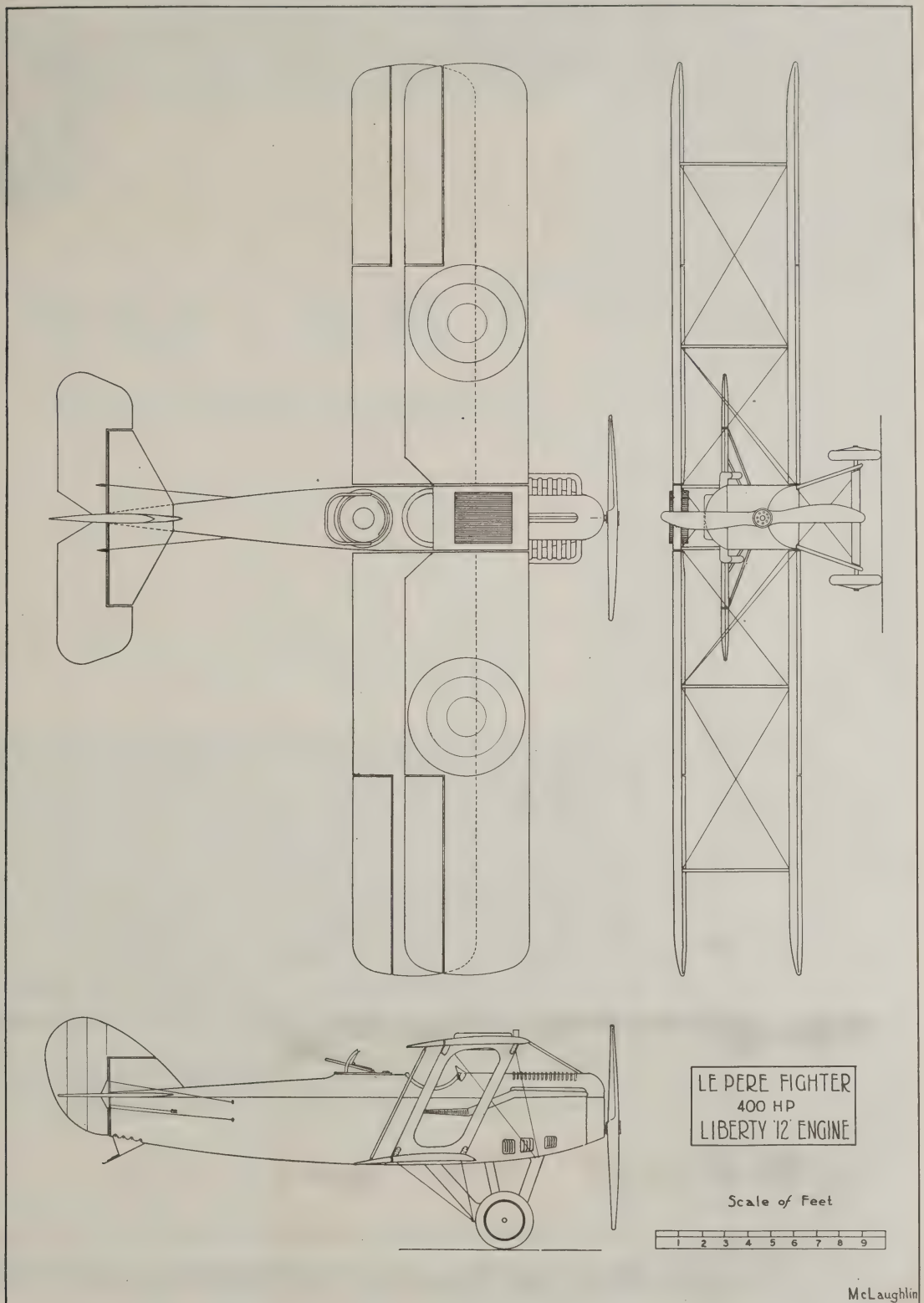
In a report on the work, Colonel Edgar, Chief of the Supply Section, D. M. A., says in part: "Particular commendation is deserved by the commanding officer, supply officers, officer in charge of construction, and the officers and enlisted men of the service and construction squadrons at Gerstner Field for their exceptionally good work in the rapid reconstruction of the wrecked post."

Teneyck Cited

Second Lieutenant Walton B. Teneyck, Jr., Air Service, pilot, 96th Aero Squadron. For extraordinary heroism in action near Birquenay, France, October 27, 1918. While engaged on a voluntary bombing mission, Lieutenant Teneyck was attacked by seven enemy planes (Fokker type). Although seriously wounded, he maneuvered his plane so skilfully that his observer was able to drive off the enemy planes. In the combat his plane was struck by 25 enemy bullets, some of which exploded the magazines of the observer's guns. In spite of his wounds and the damage to his machine he succeeded in landing safely on a strange field. Home address, Walton B. Teneyck, father, 91 Rodney Street, Brooklyn, N. Y.



Side view of the American-built Le Pere Fighter, with a 400 H.P. Liberty Engine


LE PERE FIGHTER
400 HP
LIBERTY 12 ENGINE
Scale of Feet
1 2 3 4 5 6 7 8 9
McLaughlin

Cu

"THE OPE

Curtiss Achievements"

1—The design and construction of the fastest fighting airplane ever flown. Official Government records credit this triplane, which was built for the U. S. Navy, known as model 18-T, with 160 miles per hour, carrying full military load, pilot and passenger. This is 15 miles per hour faster than any speed ever claimed for an airplane, a truly epoch-making achievement, made possible by the development of our new model K motor.

2—The design and construction for the Navy of the largest flying boats in the world, colossal crafts capable of carrying five tons useful load. It was one of these boats that recently carried fifty passengers.

3—The design and construction for the U. S. Navy of the fastest and most efficient Seaplane in service anywhere. This craft which is known as the Curtiss model H-A, with Liberty motor, made an official speed of 126 miles per hour with full military load, armament, ammunition, pilot and passenger.



The Curtiss Engineering Corporation is today the center of aeronautical d
Glenn H. Curtiss and his engineers have been busy in drafting rooms, research
of suitable commercial types. Aircraft especially designed for sportsman's use,
workmanship and performance as Curtiss military planes have proved themselves

CURTISS ENGINEERING C

Member of Man

iss

BOOK"

The Great War

:velopment and construction of a 12 cylinder, 400 H.P. motor of an entirely
d much lighter type, known as the Curtiss model K-12. These motors have
one exhaustive tests and are already in production.

:velopment and construction of the Curtiss model K-6, a new and much
6 cylinder motor. These engines develop 160 H.P. and possess greatest en-
e and reliability.

:velopment and construction on a large scale of the Curtiss OXX motors,
e J-N-4. training planes, which were used almost exclusively by the United
and Canada and largely in England for the training of American and
aviators. The training of over seven-tenths of the original land and
flying pilots, most of whom entered the service and formed the nucleus
United States Training Forces.



ies instead of being decreased will be increased by the coming of peace.
nels and shops in perfecting designs and carrying forward the production
peace-time purposes are already available and are as superior in design,

ION, Garden City, L. I.

THE HUGHES AIRCRAFT REPORT

(*Continued from last issue*)

African Mahogany

Attention should be called to the fact that the contracts with the mahogany manufacturers called for considerable quantities of African mahogany. It appears that prior to the War large importations of mahogany had been made from Africa. Thus, in 1914, out of total importations of mahogany logs of 70,914,000 feet there were 31,177,000 feet of African mahogany. At the first conference with the Government representatives on January 21, 1918, as the minutes kept by these representatives show, Mr. Mengel had suggested the increased supply which could be obtained from Africa, and Mr. Leary (of Ichabod T. Williams & Sons) "described his efforts to induce the Signal Corps to use African mahogany." Offers of African mahogany were made in proposals by several of the mahogany manufacturers under date of March 6th. Thus, in the proposal then sent to the Signal Corps by C. C. Mengel and Brother Company, it was stated that his company had at Axim, Africa (on the Gold Coast), "awaiting steamers 3,000,000 feet of sound, fresh logs"; and also at Axim "now in streams tributary to it, and available for the June rains, 4,000,000 feet, and these logs, located as they are, and from the best information we have, pretty nearly sure to be delivered at Axim on the June rains, as they were put in pretty good, safe streams by our own men in our own employ and paid by us, and put in streams selected so that they would come out on light water."

The advisability of using African mahogany as propeller material, however, was far from clear. It was not regarded as within the original specifications, but the modified specifications adopted on February 14, 1918 (No. 15,028-A) stated that African mahogany (*Khaya senegalensis mahogani*) was approved by the Signal Corps. Despite this statement, the question was not regarded as settled. On February 13, 1918, H. S. Betts, Acting Assistant Forester, in reply to a letter of Captain Oakleaf of the Signal Corps, stated that it was "undoubtedly true that the term 'African mahogany,' without further specifying as to kind of wood, would include several species which are inferior in quality for propellers," but after referring to various tests quoted a report from the Forest Products Laboratory that the African mahogany was "practically the equal of the Central American species and could be substituted satisfactorily for the latter."

On February 26th, H. K. S. Williams wrote to Major Gray of the Production Engineering Department, that he was "anxiously awaiting information as to whether African mahogany has been approved for use for the manufacture of propellers for battle and bombing aeroplanes." He said that he had reported the matter a number of times to his superiors and had been told to communicate with Major Gray, and after referring to communications he had received on the subject, he asked for a reply by telegraph. On March 1st the Production Engineering Department telegraphed its answer to H. K. S. Williams as follows:

"This Department is not favorably disposed towards African mahogany for combat propellers and does not see why it should be shipped here and then back to Europe. Can not arrangements be made to have walnut for English diverted to our propeller manufacturers and to ship African mahogany to England? There is much poor African mahogany on American market. In any event for safe use African mahogany would have to be inspected at the source to make sure that we obtained the proper varieties and proper wood. We feel further that with provision for splicing which has been adopted there should be enough of other woods available to meet the propeller requirements."

Before this was received, a telegram was sent on the same day to Major Gray, with the signature of the Materials Department, to the effect that they were "anxiously awaiting telegraphic reply to letter February 26th." And on March 2d, the Production Engineering Department, notwithstanding the statements in its telegram of March 1st, telegraphed to the Materials Department as follows:

"Regarding use of African mahogany for combat and bombing aeroplane propellers advise that such wood is acceptable for use in these propellers."

And on March 16th, the Airplane Engineering Department (by Mr. Caldwell, on behalf of Major Marmon) wrote to Major Gray, of the Production Engineering Department, referring to tests of propellers made of African mahogany at Langley Field and McCook Field, and stated the following order of preference for propeller woods: (1) walnut; (2) Honduras mahogany; (3) cherry; (4) African mahogany; (5) quarter-sawed poplar; (6) quarter-sawed white oak. Mr. Caldwell stated further that the following species of African mahogany were acceptable: (1) Grand Bassan; (2) Lagos; (3) Benin; also that there was an African wood similar to mahogany known as "Iroko" which had been found acceptable in the English propeller construction. On March 21st Mr. Caldwell wrote to Lt.-Col. Horner of the Equipment Division, stating that they had definitely ascertained that the wood they had tested came from Axim, and that "this wood would be acceptable at least to the extent of three or four million feet." Mr. Wickliffe, on behalf of Mr. Lockhart of the Materials Department, sent the following memorandum to the Contract Section on the same day (March 21st):

"It is only recently that the use of African mahogany has been authorized in the construction of propellers, and therefore the entrance of purchase request to cover the quantities of African mahogany shown in the attached proposals" (of the mahogany manufacturers) "has been withheld pending such authorization. Permission has now been received for the use of this wood and purchase requests are being sent to the Priority Section today covering the quantity of African mahogany shown in the proposals of Astoria Veneer Mills and Dock Company, Palmer & Parker Company, Ichabod T. Williams & Sons, and C. C. Mengel & Bro. Company."

In view of the heavy demand for shipping facilities, a serious question arose with the Shipping Board as to the necessity of getting in the African mahogany. In a conference between Mr. Karl deLaittre, representing the Shipping Board, and Mr. Sibley and Mr. Wickliffe of the Signal Corps, on May 4th, Mr. Wickliffe's attention was called to the lack of shipping space, and he replied (according to the stenographer's minutes produced by Mr. deLaittre):

"Yes, but this is a matter of contract. We make our contracts in good faith on both sides. It is not permissible for the Government to break these contracts; it would break the people making them. . . . We can not let these people down on the African product."

At another point in the conference, Mr. Wickliffe said:

"If the timber from Africa is not brought forward, coming in June, and is allowed to deteriorate, the first part that will be hit will be the outside of the log, out of which the aircraft material comes. If we do not get this African lumber, we have exhausted every resource in walnut and cherry and in Central American mahogany. We do not yet know as to the use of quarter-sawed oak. Then if we do not get this timber we can not get any African logs before June of the following year."

Meanwhile the subject had been taken up for investigation by representatives of the War Trade Board and of the Forestry Service. Its importance lay in the fact that there was an abundance of white oak available in this country, and it developed that there was opinion of considerable weight in favor of the use of oak on combat propellers.

On June 2d a conference was held between representatives of the Production Engineering Department, the Airplane Engineering Department, the Propeller Inspection Department, the Propeller Purchase Section and the Wood Inspection Section of the Signal Corps. Mr. Caldwell, who had written the letter of March 21st, represented the Airplane Engineering Department. Lieutenant Ryerson's memorandum of this conference contains the following:

"The question of the advisability of, and necessity for importing, African mahogany was carefully considered and it was the unanimous opinion that it would be possible to meet our present and future propeller lumber requirements from domestic or South American supplies and that because of the difficulty of inspecting African mahogany, its further use in propellers should be discouraged."

On August 3, 1918, Lieutenant Ryerson of the Propeller Section, having been asked for a statement of the requirements of woods for propeller stock, requested the Production Engineering Department for "an-up-date formal statement" as to the kinds of lumber to be specified for combat propellers, in the order of preference. This brought a reply under date of August 7th from the Production Engineering Department, through Professor J. S. MacGregor (Head of the Physical Testing Department, School of Mines, Columbia University) as follows:

"Answering your memorandum of August 3d requesting information on kinds of wood for propellers we advise you herewith that this Department has authorized the use of the following woods for combat propellers. The list is given in the order of their preference:

"Black walnut.
"True mahogany (Honduras).
"Cherry.
"Quarter-sawed white oak.
"African mahogany."

The objection to African mahogany (aside from the shipping problem) was that it varied considerably in quality, and that inspection of it so far from its source would make it difficult to be sure that the right species was received. Throughout the controversy Mr. Wickliffe has expressed his views with considerable emphasis and has thrown the weight of his influence in favor of contracts for African mahogany and of the provision of shipping facilities to bring it in. In support of his position, he has produced a memorandum, under date of August 23d, signed by Charles Day, as special assistant to the Secretary of War, to the effect that "while oak propellers are being used with satisfactory results in connection with our training planes, they have not been adopted for planes for active service overseas on account of unsatisfactory results obtained abroad when their use has been attempted for any considerable period." Mr. Wickliffe has also presented a letter under date of July 19th from Lieutenant Hollande, in charge of wood purchasing for the French Government, in which it is said that "we are buying a very great quantity of African mahogany in France direct from our colonies"; also a letter received from the office of the British War Mission giving information to the effect that "the home authorities propose during 1919 to use British Honduras and West African mahogany exclusively for propeller construction, cutting out walnut completely," and that demands from factories in England for propeller lumber are met "indiscriminately by the supply of either British Honduras or West African mahogany, the latter being considered as equivalent to the former for all purposes."

On the other hand, a very recent cablegram (September 28) from the Scientific Attaché to the American Embassy in London in answer to an inquiry of the Research Information Service here, states that "authorities British opinion and practice placing walnut and Kanduranian, Nicaraguan, Cuban mahogany ahead of African. British would not use African if sufficient quantities of above were available. African used only in combination with other woods." The statement to the contrary as to British practice is said to be incorrect, and it is added "British have not tested oak, cherry, poplar sufficiently to make comparison. American army wood experts now here state A. E. F. satisfied with oak and have advised Washington, D. C., accordingly. Poplar has also showed up well on tests. British unable to see any justification for U. S. using African mahogany in view of other furnishings available."

It is understood that ships for African mahogany were finally provided. Upon the evidence, it is apparent that the matter was the subject of discussion and presented grounds for differences of opinion. The interest, however, of some of the leading mahogany manufacturers in obtaining contracts for the delivery of African mahogany is apparent, and while the efforts to induce its purchase and transportation may have been based upon the belief that the wood was better than that available here and that the supply was needed by the Government, the matter is one which should receive consideration in connection with the survey of the industry which has been suggested for the purpose of determining the fairness of the mahogany contracts and of the action taken under them.

3—Sabotage Act—Grand Jury Proceedings

There have been occurrences in various plants indicating efforts to injure war material, or to make it defective, or to conceal defects, but on investigation it has generally been very difficult to find sufficient basis for criminal prosecution, either for lack of evidence as to the particular individual who had committed the act, or because on close examination it appeared that the condition of the material could be fairly attributed to carelessness, and evidence of criminal intent was wanting.

Hammondsport Plant of the Curtiss Company

In the course of this inquiry information was received that frequent attempts had been made to conceal defects in motors and their different parts which were in course of manufacture at the plant of the Curtiss Aeroplane and Motor Corporation, at Hammondsport, New York. Evidence having been obtained as to specific instances of this practice, there was an investigation in July last before a Grand Jury in the Western District of New York, John W. Ryan, Esq., of Buffalo, being appointed special counsel for the purpose, which resulted in the return of indictments against Lewis Longwell and Hector Bordeau, sub-formen in the assembly room of the Hammondsport plant, under section 3 of the Sabotage Act of April 20, 1918. Demurrers to these indictments have been overruled and the cases are awaiting trial.

North Elmwood Plant

In view of the conditions found at the North Elmwood plant of the Curtiss Aeroplane and Motor Corporation, there was a special investigation through special agents of the Department of Justice for the purpose of discovering violations of the Sabotage Act, with the result that evidence was brought before the Grand Jury in the Western District of New York, John W. Ryan, Esq., acting as special counsel, and indictments were obtained in September against Richard Eastman, foreman of the propeller department, Frank Truell, an assistant foreman, and David Rogovan, a workman, under the Sabotage Act. On October 9th, these defendants pleaded guilty and were fined $500 each.

Liberty Iron Works

Testimony given in this inquiry in relation to alleged irregularities at the Liberty Iron Works at Sacramento, California, led to a special investigation in charge of John W. Preston, Esq., Special Assistant to the Attorney-General, before the Grand Jury at Sacramento in September last. Considerable testimony has been taken, but no indictments have been returned.

4—Cross License Agreement as to Rights Under Aeroplane Patents

In view of claims under alleged patent rights, and with the object of facilitating aircraft production by providing for manufacture on a definite basis, a corporation was formed under the laws of the State of New York known as the Manufacturers Aircraft Association, Inc. This corporation entered into an agreement with its "subscribers", that is, its stockholders, called the cross-license agreement. The Government is not a party to the agreement, but it was recommended by the National Advisory Committee for Aeronautics, was endorsed by the Aircraft Board and received the approval of the Secretary of War and the Secretary of the Navy.

By the cross-license agreement, the subscribers grant to each other licenses under all aeroplane patents now or hereafter owned or controlled by them in the United States, its territories and dependencies (except foreign patents and certain specified patents); the corporation is designated as the agent of the subscribers to execute licenses accordingly; each subscriber agrees that it will not enter into any agreement or arrangement whereby its privileges under United States aeroplane patents or inventions will be diminished or surrendered so as to exclude or restrict the operation of the agreement, and that it will not grant licenses under any such patents for use in aeroplanes with reference to which it is receiving royalties under the agreement, to any other person, firm or corporation on more favorable or lower terms of royalty than those provided in the agreement, or which may become more favorable or lower during the term of the license. Under the agreement in its original form, in providing for the payments to be made by subscribers, it is stipulated that each subscriber shall pay to the corporation $200 for each aeroplane sold and delivered by the subscriber until the Wright-Martin Aircraft Corporation and the Curtiss Aeroplane and Motor Corporation (these corporations claiming to hold basic patents) had each been paid the sum of $2,000,000. A supplemental agreement has since been made modifying the provision for payments by subscribers and providing that the aggregate payments to both the Wright-Martin Corporation and the Curtiss Company should be $2,000,000 instead of $4,000,000.

The agreement has been criticized upon the ground that its provisions constitute a hindrance to the progress of invention in the important aeroplane field and as being in restraint of trade. Whatever ground for criticism exists in this respect is to be found in the terms of the agreement itself, as these are quite definite and determine its operation and effect. I shall not deal with the question of the legality of the agreement, as the question was specifically submitted by the Secretary of War to the Attorney General whether the association and the agreement were in contravention of the anti-trust statutes of the United States and the opinion was expressed by the Attorney General that they were not. That disposed of the question, in the absence of a contrary decision by the courts, so far as the action of the Executive departments is concerned.

To the question whether the patents of the Wright-Martin Company and of the Curtiss Company are basic patents, and whether the payments for which the agreement provides constitute a proper compensation for the rights conferred, it would require an exhaustive examination of the patent situation to give a satisfactory answer, and this inquiry has furnished no opportunity for such examination. For this reason no opinion is expressed upon the point further than to say that, if the validity of the agreement be assumed, the amount of the payments was a matter of sound administrative discretion, and there is no ground for the conclusion that the amount as fixed in the supplemental agreement could not fairly be allowed. It is also asserted that the Government is left liable to other claimants, but this also requires an opinion upon the validity of certain patent claims which could not be dealt with in this inquiry.

(*To be continued*)

HONOR ROLL OF AMERICAN AIRMEN

Washington.—The War Department, December 28, made public a list of 150 American commissioned officers of the Air Service who were killed in action at the front in 1918.

The complete list of the 150 American commissioned officers of the Air Service killed in action in 1918, with the date of their death, the detail to which they were attached at the time, and their emergency addresses follows:

Aldrich, Perry Henry, Oct. 29, First Lieutenant, 135th Aero Squadron, Essex Junction, Vt.

Angel, Cyril M., May 14, Second Lieutenant, 120th Aero Squadron, Attleboro, Mass.

Armstrong, Henry Guion, Oct. 4, First Lieutenant, 13th Aero Squadron, Memphis, Tenn.

Bahl, James La Verne, Oct. 27, First Lieutenant, Italian front, Cleveland, Ohio.

Baker, H. T., Aug. 15, First Lieutenant (C.A.C), 91st; no record.

Barber, Newell C., Aug. 12, Second Lieutenant, French Escadrille, Medford, Ore.

Beauchamp, Oliver T., Aug. 11, First Lieutenant, 27th, Princess Anne, Md.

Bellows, Franklin B., Sept. 13, Second Lieutenant, 50th, Williamette, Ill.

Bittenger, Howard P., Aug. 26, Second Lieutenant, Royal Air Force, 17th Squadron, 1 West 64th St., New York.

Bleckley, Erwin R., Oct. 15, Second Lieutenant, 50th, no address.

Blodgett, Richard Ashley, May 17, First Lieutenant, 95th, 174 Temple St., W. Newton Mass.

Boldt, H. St. John, July 20, 1st Lt., 1st Aero Squadron; no address.

Bowen, Joseph B., Sept. 7, 2d Lt., 32d Royal Air Forces; Pawtucket, R. I.

Bowyer, James E., Sept. 12, 2d Lt., 135th Aero Squadron; Yankton, S. D.

Brodie, Clarence A., Oct. 1, 1st Lt., 13th; 1039 N. Lawrence Ave., Wichita, Kan.

Broomfield, Hugh D. G., Oct. 21, 1st Lt., 93d; Gladstone, Ore.

Brotherton, William E., Oct. 10, 2d Lt., 147th; Chicago.

Bruce, Alexander Bern, Aug. 17, 1st Lt., 94th; Lawrence, Mass.

Burns, James S. D., Aug. 11, 2d Lt., 165th Inf., 88th; 880 West 180th St., New York.

Campbell, Burton L., Aug. 23, 1st Lt., 17th Royal Air Force; Wakeman, Ohio.

Carpenter, J. I., June 11, 1st. Lt., 73d Royal Air Force; Rochelle, Ill.

Case, Lyman E., Aug. 11, 1st Lt., 17th Royal Air Force; 210 S. Cherry St., Lamond, Iowa.

Cassard, Daniel W., July 16, 1st Lt., 147th; Grand Rapids, Mich.

Chapman, Charles Wesley, May 3, 2d Lt., 94th; Jackson, Mich.

Cochran, Robert James, Oct. 10, 1st Lt., 8th; Camilla, Ga.

Cochrane, Stanley L., Oct. 31, 2d Lt., 166th; Christ Field, Mr.

Coleman, De Witt, Jr., Oct. 29, 1st Lt., Italian front, Tenafly, N. J.

Collins, Phelps, March 15, Capt., 103 rd; no address.

Coolidge, Hamilton, Oct. 27, Capt., 94th; Boston, or Harvard Univ.

Craig, Harry Worthington, Aug. 20, 1st Lt., French Escadrille 12; Cleveland, Ohio.

Cronin, Edward M., Sept. 27, 1st Lt., 96th; Bayonne, N. J.

Crumb, Harris E., Sept. 30, 2d Lt., 9th; St. Louis.

Curry, Irby R., Aug. 10, 1st Lt., 95th; Marlin Texas

Carter, Edward Vivian, Oct. 21, 1st Lt., 90th; Spokane, Wash.

Davidson, Gilford Council, Aug. 2, 1st Lt.; no address; no organization given.

Davis, Philip W., June 2, 2d Lt., 94th; Newton, Mass.

Dietz, Philip, July 30, 1st Lt., 99th, R. A. F.; Roselle, N. J.

Dowd, Meredith, Oct. 23, 2d Lt., 177th; 76 Berkeley Ave., Orange, N. J.

Forbes, Earl, Sept. 27, 2d Lt., 20th; Fairmont, Neb.

Emerson, William K. B., Jr., May 14, 2d Lt., (F. A.,) 12th; Rye, N. Y.

Hyman, Karl Henry, June 5, 2d Lt., Inf.; no record in D. M. A.

Fisher, John Jacob, Oct. 14, 1st Lt. ; Punxsutawney, Penn.; no organization given.

Fox, Raymond F., Oct. 7, 1st. Lt., 1st; 491 Ashland Ave., Buffalo, N. Y.

Frebisher, J. E., Capt., Sept. 8, no rank given, 148th, R. A. F.; Arlington, N. J.

Fuller, Roswell Hayes, Sept. 20, 1st Lt., 93rd; Chicago.

Gardiner, E. H., Sept. 14, 2d Lt., 50th; no record.

Garnsey, Edward Grant, Oct. 29, 1st Lt., 94th; Chicago.

Garrett, Claude S., Oct. 10, 1st Lt., 8th; Laurens, S. C.

Giroux, Ernest A., May 22, 1st Lt., 103rd; Boston, Mass.

Goettler, Harold E., Oct. 6, 2d Lt., 50th; Chicago.

Gracis, Ralph D., Aug. 12, 1st Lt., 17th; Bemidre, Minn.

Grider, John McG., June 18, 1st Lt., 85th Chicago.

Gundelach, Andre A. H., Sept. 14, 1st Lt., R. A. F., and 96 A. S.; Chicago.

Hamilton, Lloyd A., Aug. 26, 1st Lt., 17th, R. A. F.; Burlington, Va.

Hammer, Earl M., June 12, 1st Lt., no organization given; San Francisco, Cal.

Hanscom, Austin F., Sept. 20, 2d Lt., C. A. C., 1st; no record.

Harris, David B., Sept. 27, 2d Lt., 20th; Chicago.

Hill, R. C., Sept. 14, 1st Lt., F. A., 99th; no record.

Hirth, F. K., July 16, 2d Lt., C. A. C., 91st; no record.

Hitchcock, R. W., Sept. 4, 1st Lt., 88th, Los Angeles, Cal.

Hobbs, Warren T., June 26, 1st Lt., 103d; Worcester, Mass.

Hunt, Jason Solon, Aug. 1, 1st Lt., 27th; Johnson, Vt.

Jenkinson, Harry, Jr., Sept. 20, no rank given, 148th, R. A. F.; Elizabeth, N. J.

Jerome, Gilbert M., July 12, 1st Lt., no organization given; New Haven, Conn.

Johnson, Arthur Theo., Sept. 13, 1st Lt., 135th; Chestertown, Ind.

Johnson, Conrad, Oct. 23, 1st Lt., no organization given. Duluth, Minn.

Johnson, Harry F. W., May 21, no rank given, no organization given; South Bethlehem, Penn.

Johnson, Donald, Sept. 12, 1st Lt., 104th; Harrisburg, Penn.

Kahle, Clarence C., Oct. 3, 1st Lt., 99th; Pittsburgh, Penn.

Kearney, Thos. E., Aug. 14, 1st Lt., no organization given; Memphis, Tenn.

Kessler, Samuel R., Jr., Oct. 9, 2d Lt., Inf., 24th; no record.

Kelty, Acher E., Sept. 26, 1st Lt., 91st; Rice Lake, Wis.

Kennedy, Chester H., Oct. 23, 2d Lt., F. A., 1st; McMinnville, Tenn.

Ker, David, Sept. 12, 1st Lt., 1st; 430 West 119th St., New York City.

Kimber, Arthur C., Sept. 26, 1st Lt., 22d; no record of address.

Kinney, Clair A., Oct. 4, 1st Lt., 49th; Endicott, Wash.

Kull, Geo. P., Sept. 14, 1st Lt.; Chicago.

Layton, Lawrence, July 28, 1st Lt., F. R., Escadrille No. 77; Georgetown, Del.

Lehr, Manderson, July 15, 1st Lt., F. R., Escadrille No. 117; Albion, Neb.

Loud, Harold D., Oct. 1, 2d Lt., 88th; Oscada, Mich.

Lowry, F. B., Sept. 26, 2d Lt., 91st; Menphis, Tenn.

Loughran, L. B., July 28, 1st Lt., R. A. F.; 103 Park Ave., New York.

Lufbery, Victor Raoul, May 19, Maj., 94th; no record of address.

Luke, Frank, Jr., Sept. 30, 1st Lt., 27th; Phoenix, Ariz.

Lumsden, J. C., Aug. 13, 2d Lt., F. A., 12th; no record.

MacArthur, John, July 20, 2d Lt., 27th; Entiat, Wash.

Manier, Emmet Malone, Oct. 2, 1st Lt., 117th Engrs.; Chicago.

Matthews, Alexander F., Aug. 24, 1st Lt., 84th Sqdn., R. A. F.; Louisburg, W. Va.

Matthews, Richard A., Sept., 27, 1st Lt., 23d; 461 Fourth Ave., New York City.

M'Clendon, Joel H., Aug. 11, 1st Lt., 88th; Farmers Branch, Texas.

M'Cormick, John F., No. 7, 1st Lt., 1st; Collins, Miss.

McCormick, Vaughn R., Sept. 12, 2d Lt., 139th; 766 Bedford Ave., Columbus, Ohio.

Miller, James E., March 9, Captain, 95th; 60 Broadway, New York.

Miller, John O., Aug. 28, 1st. Lt., 12th; Fairview, N. C.

Miller, Walter B., Aug. 16, 2d Lt., Washingtonville, N. Y.

Moody, Richard W., July 16, 2d Lt., F. R. Escadrille, No. 12; 1408 Park Ave., Minneapolis, Minn.

Moore, Frank N., Sept. 4, 2d Lt., 88th; no record address.

Morse, Guy E., Sept. 16, 2d Lt., 135th; 4238 Harrison St., Kansas City, Mo.

(*Continued on page* 916)

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.

Note 2—Report to Fergus Motors of America, 370 Jelliffe Avenue, Newark, N. J.

Note 3—Report to Speedway, Indianapolis, Indiana, to commanding officer.

Note 4—Report to district traffic representative, Pittsburgh, Pa., and wire DAP.

Note 5—Report to supply depot, Little Rock, Ark.

Note 6—Report to Radio Mechanics, Carnegie Institute, Pittsburgh, Pa.

Special Orders Nos. 301 to 305, Inclusive

A

Anderson, Ralph E.....KST
Anglin, Charles H.....DMA
Abbott, Walter S., Jr.....KST

B

Bailey, James Ruskin.....EOT
Barber, Frank H.....KST
Bassing, Francis Joseph.....SLA; EOT
Bowne, Francis D.....AGC
Bacon, Leonard.....REV
Blockinger, Carl H.....DMA
Brown, George H.....DMA
Brinsdale, J. B.....DMA
Boynton, Willard H.....BST
Burr, Alexander T.....FLA
Burchenal, Selden D.....CPA
Box, Thomas A.....CPA
Baker, Hobart A. H.....CPA
Babcock, Charles W.....CPA
Blakely, James A.....FLA
Barnes, Edwin A.....CPA
Brierley, George Cecil.....SLA; MAC
Bonnett, Edward Mortimer.....SLA; MAC
Brown, Elon Loraine.....SLA; MAC
Boonstra, Henry G.....Note 3

C

Crawford, Norman F.....KST
Carmody, John D.....CJW
Callahan, Ray James.....SLA; EOT
Cubberly, Walter Elsworth.....SLA; EOT
Carey, James.....AGC
Cheney, Clair E.....KST
Crandall, Carl.....SLA; BFT
Cashman, James A.....Note 5
Conant, William M., Jr.....CPA
Campbell, Shiras.....CPA
Caldwell, Frederick W.....HHN
Christine, Frederick F.....CPA
Cox, John D., Jr.....FLA
Campbell, Don M.....PFO
Clark, Birge M.....CPA
Connell, Robert D.....FLA
Claiborne, Herbert A.....FLA
Coolidge, Hamilton.....CPA
Carlisle, Louis G.....BST
Culp, Alexander B.....MDO
Carroll, Mitchell B.....Note 2

D

Daugherty, John E.....KST
Duncan, Thomas.....ELA; WDM; Note 1
Disher, Harry P.....DMA
Dinel, Leon Price.....SLA; EOT
Durfee, Francis M.....KST
Dahl, George L.....DMA
Devers, John M.....DMA
Dana, Duncan.....CPA
Davis, Thomas C.....FLA
Dise, Joseph Ivan.....FLA
Douglas, Albert Noel.....SLA; SBI

E

Emmons, Delos C.....MDO
Evans, Sumner Clark.....SLA; BFT
Ervin, Henry E.....FLA
Everett, Edward A.....LDT
Easters, Edmund.....DMA
Easter, Philip Ewing.....ELA
Elsey, George W.....MDO

F

Frank, Charles H. E.....MDO
Fellows, Gordon Rae.....SLA; EOT
Foley, Frank J.....PMT

Finford, Morton C.....KST
Fellows, Horace Weston.....SLA; EOT
Fagley, Wilber M.....BST
Follmer, Harold W.....RSD
Filgate, John T.....DMA
Frank, George S.....CPA
Frank, Harold P.....CPA
Full, Henry P.....FLA
Fauntleroy, Cedric E.....CPA
Forman, Horace B.....CPA
Fargo, Stanley .....CPA
Flynn, Edward J.....DMA
Fry, Kenneth .....MDO

G

Goggins, Hugh William.....SLA; EOT
Gramer, Paul Joseph.....SLA; EOT
Galentine, Norman E.....ABC
Grant, Alfred A.....CPA
Granger, Bruce E.....CPA
Griffen, Carl Wilbur.....SLA; MAC

H

Harding, Rowland R.....AGC
Hopkinson, Frederick James.....SLA; EOT
Hughes, Edward E.....KST
Hadden, Frank E.....MAC
Hammond, John M.....DMA
Hollahan, R. E.....DMA
Heisen, Horace N.....CPA
Hollaman, Frederic T.....FLA
Heater, Charles L.....CPA
Hinman, Russell.....CPA
Hill, Maury.....CPA
Harris, Harold R.....MDO
Harrison, Landreth M.....FRF
Holland, Maurice.....MDO
Harmon, Ernest L.....MDO

I

Ives, Herbert E.....DMA

J

Johnson, Cortlandt S.....DMA
Jones, Byron Q.....WFO
Jones, Greene H.....CPA
Jones, Delbert E.....FLA
Johnson, Earl Shephard.....SLA; MAC
Jones, William F.....MDO
Jordan, Frank L.....KST

K

Kennedy, Gayen LeRoy.....SLA; BFT
Kline, Lawrence J.....DMA
Kinney, Dorsey Eugene.....SLA; EOT
Kingsbury, E. F.....DMA

L

Lipari, Attilio F.....DMA
Lyon, Alfred J.....LHV
Loughead, Joseph Earl.....SLA; BFT
Lyon, Thomas G.....KST
Low, Seth.....CPA
Luhr, Frederick J.....CPA
Lucas, Malcolm.....DMA

M

Moreton, Frederick A.....RSD
Meloy, Vincent J.....KST
Morgan, Henry Fagg.....SLA; EOT
Manaker, Fred Philip.....SLA; BFT
Mayott, Charles.....KST
Miller, Ralph K.....KST
Mooney, John Patrick.....SLA; LHV
Murphey, William Hunt.....WFO
Mathews, George C.....TMA
Meissner, James A.....CPA
Montgomery, Harry G.....FLA
Mere, Morgan B.....CPA
Modish, Gus P.....MDO

Mc

MacClain, Albert L.....KST
McGee, Earl G.....MDO
McNabb, David W.....KST

N

Norris, Howard D.....RSD
Nutt, Clifford C.....EOT
Nicholson, George M.....RSD
Nunn, Richard E.....RSD
Neitz, A. H.....DMA
Nelson, Luther.....HHN

O

Orbison, William F.....RSD
Osborn, Harold G.....GLC
Oliver, William B.....KST

P

Porter, Horace H.....FLA
Puckett, Johnnie R.....BST
Peterson, Lloyd J.....WFO
Pierce, Roscoe E.....CPA
Parker, Leslie M.....CAF
Powelson, Karl B.....KST
Price, Albert C.....MDO
Patterson, George B.....MDO
Parker, Leslie M.....CAF

Q

Quirt, Harold W.....DMA

R

Rimer, William Collner.....SLA; EOT
Redman, Mark H.....GLC
Randolph, John H.....DAF
Rogers, Robert Stow.....SLA; EOT
Rogers, George Washington.....DMA
Roberts, Irving Thornburg.....FLA
Richmond, Jacob Joseph.....SLA; EOT
Ringold, Murray.....FLA
Rankin, Carlo A.....KST
Rady, William J.....DMA
Reed, Charles W.....Note 4

S

Stephens, Orville L.....RSD
Stone, Samuel W.....CPA
Schaffner, Herbert A.....CPA
Still, Elmer K.....BST
Shaffer, William L.....DMA
Stack, Joseph Francis.....SLA; EOT
Sullivan, Edward J., Jr.....DMA
Sedgwick, Malcolm A.....FLA
Schauffler, William G., Jr.....CPA
Saunders, Bradley J., Jr.....CPA
Stewart, Frank L.....FLA
Schilling, Frederick E.....CPA
Stone, Harry D.....RSD
Shea, Edward H.....FLA
Strange, Thomas Wright.....SLA; BFT
Singletary, Harry H.....DMA
Smith, Edwin Crookes.....DMA
Smith, Harold V.....AGC
Shepherd, Herbert R.....DMA
Stell, George William.....SLA; BFT

T

Taylor, John A.....FLA
Tilleson, Selmar J.....FLA
Thomas, William Harvey.....SLA; BFT

W

Wade, Robert M.....DAP
Wrenn, Theodore W.....DMA
Wilkinson, John A.....DMA
Williams, Isaac J.....DMA
Woodard, Henry G.....DMA
Washburn, Lawrence G.....DMA
Westmoreland, Horace E.....CPA
Wise, Andrew B.....KST
Wing, Howard W.....KST
Wallen, Henry L.....FLA
Wolfe, Charles E.....CPA
Wheeler, William L.....KST
Wright, Vernon H.....DMA

Z

Zogbaum, Harry S. C.....CFT
Zipf, Oscar R.....DMA

484 Aero Construction Squadron Cited

The following citations from the Army Air Service of the First and Second Armies have been received by the 484th Aero Construction Squadron:

"The Army Air Service Commander, Second Army, American Expeditionary Forces, desires to record in General Orders, his appreciation of the excellent conduct and efficient co-operation always displayed by the officers and men of the 484th Aero Construction Squadron (Captain John Sloan, Commanding).

"This squadron constructed the advanced air-dromes of Noviant-aux-Pross, Saizerais and Maconville, with exceptional speed and thoroughness, thereby contributing in a large measure to the successful operation of the other air service units." (Signed) F. L. Larm, Colonel, A. S., U. S. A.

"The Army Air Service Commander, First Army, desires to make of record in General Orders of the First Army Air Service, his extreme satisfaction with the conduct of the officers and men of the following units:

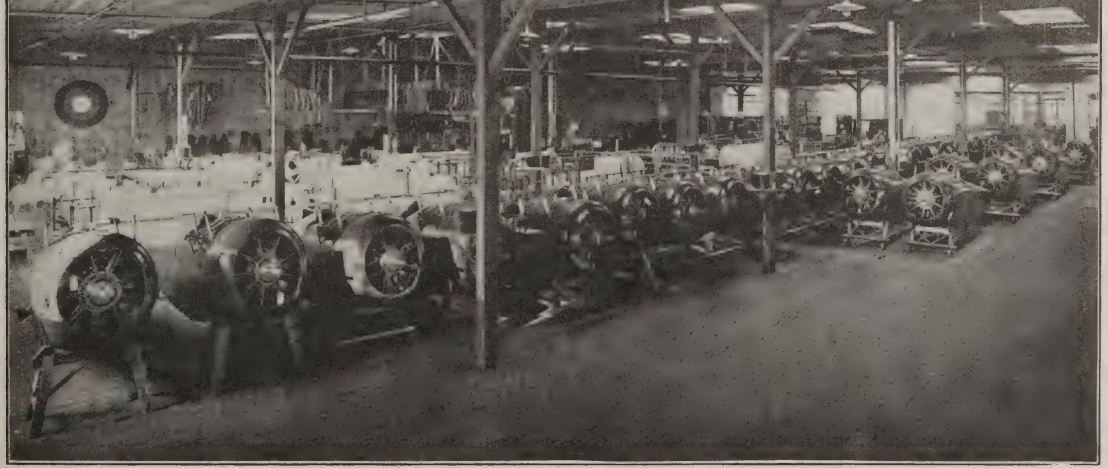
"1. 484th Aero Construction Squadron. For efficient and meritorious work in building aerodromes for the service. The work of both officers and men was remarkable for its speed and excellence, despite the many hardships confronted." (Signed) W. C. Sherman, Lieut. Colonel, G. S., U. S. A., Chief of Staff.

Cited for Distinguished Service

The commander in chief, in the name of the President, has awarded the distinguished-service cross to the following named officers for acts of extraordinary heroism:

First Lieut. Rodney M. Armstrong, Air Service, pilot, 168th Aero Squadron. As pilot of a D. H. 4 plane, Lieut. Armstrong flew an infantry contact machine over the lines of the 7th Division November 4, 1918. Owing to low clouds and rain, he crossed the line at 1,000 feet in order to enable his observer to locate the position more accurately. While on the enemy's side, he was wounded by an explosive bullet. In spite of his wound and weakness, he continued his mission, coming down to within 500 feet of the enemy's machine guns and troops, until his observer had signaled him that the mission was completed. Home address, 1012 East Eleventh Street, Winfield, Kans.

First Lieut. James F. Manning, Jr., Air Service, pilot, 49th Aero Squadron. In action near Doulcon, France, October 4, 1918, while leading a patrol of seven planes, Lieut. Manning accepted combat with 17 German machines (type Fokker) at an altitude of 1,200 meters. Through his courageous leadership and skillful maneuver of his patrol, seven of the enemy planes were shot down. Home address, Leesburg, Va.



Interior of the "Standard" Factory, showing over thirty fuselages for the ME-1 Scout Training planes equipped with Gnome and le Rhone engines

FOREIGN NEWS

Says 'Plane Surrender Cripples Germany

London.—For the Allies to take 2,000 aeroplanes from Germany in accordance with the terms of the armistice means militarily crippling Germany in the air beyond hope of early recovery, while immensely adding to the aerial strength of the Allies, says an aviation expert. This is emphasized, he says, by the fact that in five months of the heaviest air fighting of the war, Germany lost in aerial combat with the British alone something like 2,700 machines. To this total must be added the destruction of the French and American air services.

The expert asserts that for several months before the armistice, Germany's capacity for producing aeroplanes was unequal to the task of replacing her immense losses. This, he adds, was strikingly illustrated by the almost complete failure of her air arm during the final and most critical phase of the war.

British Polar Expedition

London.—Plans have been quietly laid for a British aeroplane expedition to start for the North Pole in April. The British party will travel via Spitzbergen, where, under the direction of Captain Wild, who was second in command of Sir Ernest Shackleton's South Polar venture, a landing place is in the course of construction at Lawe Sound, and where a camp with abundant supplies has been established.

Captain Frank Wild is a veteran in Antarctic exploration. He was second in command of the Scott expedition in 1901-4 and was a member of the Dr. Douglas Mawson exploring party some years later. He was with Sir Ernest Shackleton first in 1907-9.

Captain Wild commanded the twenty-two men who were left on Elephant Island April 16, 1916, by Shackleton when he made his famous journey of 750 miles in an open boat with six comrades to South Georgia Island for relief. Wild and his men lived until August 20 on one meal a day, consisting mainly of penguin fried in blubber, unaware that Shackleton had been successful and that help was on the way. They endured incredible hardships.

Robinson, Air Hero, Dies

London, Dec. 31.—William Leefe Robinson, one of the best known members of the Royal Flying Corps, died tonight at Harrow, following an attack of influenza.

Robinson, to whom was awarded the Victoria Cross in 1916 for bringing down a Zeppelin which was raiding London, was captured by the Germans last April and returned to England on December 14.

During his imprisonment, Robinson attempted several times to escape, but was recaptured. The Germans placed him in solitary confinments in a small cell, it is said. Since returning he is reported to have suffered severely from the hardships he endured while a captive.

Coblenz Watches U. S. Take Over 200 German Aeroplanes

Nancy, Jan. 2.—The proud Fortress of Coblenz in its long military history never saw a scene such as yesterday, when in a huge aerodrome created by American hustle on the plateau behind Fort Alexander, towering high above the Rhine, a commission of German aviators began the humiliating task of turning over 6,000,000 marks ($1,380,000) worth of aeroplanes, comprising 200 of the newest model Fokkers, to their American victors.

Under the terms of the armistice the Germans are forced to give a fifteen-minute trial flight in one aeroplane out of every twenty. In the presence of a large crowd of American flyers, Red Cross nurses, Y. M. C. A. entertainers and staff officers, Pilot Sergt. Donhauser, who boasts that he brought down Quentin Roosevelt, was forced to make a test flight despite a gale and German protests.

After an exhibition of trick flying, looping the loop included, he was chagrined to learn upon landing that he had flown only thirteen minutes and was compelled to do it all over again.

The ranking American flyer intimated to the German commissioners that this was not a sporting but strictly a business proposition, and that all the formalities under the terms of the armistic mus be lived up to.

Foe Gives Up Sixty More Aeroplanes to American Forces

Coblenz, January 4.—Sixty more German aeroplanes were accepted to-day by the Americans. One hundred more, which will be turned over, have arrived here and are being given trial flights by German aviators preparatory to their acceptance. So far all the machines offered have been accepted. All are new.

Britain Had Fleet of Air Torpedoes

London, December 24.—According to a dispatch to the New York *Sun* the lifting of the censorship now permits the disclosure that England had in operation several months before the armistice was signed a "flying torpedo boat," one of the navy's deadliest weapons, which is credited with having had a lot to do with causing Germany's abject surrender.

The enemy had devised means of successful protection of his naval bases against torpedo boats and submarines, but the latest invention of British air and naval science baffled the Germans. Had not the armistice terms been accepted the destruction of Kiel would have been assured. When the idea was broached of having an aeroplane discharge torpedoes, technical difficulties seemed insuperable. The torpedo weighs one ton.

The effect of discharging the torpedo, thus lightening the machine was disastrous in the initial experiments. Once the wings collapsed and the pilot was hurled to death. On another occasion the discharged torpedo hit the water at an awkward angle and riccocheting from the surface rose and demolished the aeroplane. The difficulties, however, were overcome with such success that one British aeroplane dischaged torpedoes which sank a Turkish transport carrying 3,000 troops.

The efficiency of the weapon may be realized from the following brief details of its operation. Espying an enemy craft, the flying torpedo boat makes a sudden dive from the clouds at a speed of 150 miles an hour till it is within fifty feet of the surface, when it discharges the torpedo direct at the enemy ship, then rapidly rises and disappears in the clouds. The operation is so swift that the enemy is unable to train his guns. The machines can be launched from land or sea or from the deck of a ship.

When the German fleet surrendered, an aeroplane mothership, carrying twenty of the new type machines, met the enemy at sea, in readiness to sink the German ships if any treachery should be attempted.

"Flying Tank" Captured

London.—Many aeroplanes were destroyed in part by the Germans when they evacuated Cologne, according to reports from correspondents in the British area of occupation.

Among the dismantled machines is the skeleton of a huge Gotha, built to carry fourteen men. On its broad wings are walks, while iron ladders lead to the upper plane, where machine gunners were posted.

Another machine (the "Junker") is an armored aeroplane for use in attacking trenches with machine guns. The wings are of corrugated steel, and steel plates, a quarter of an inch thick, protect vital points as well as the seats for two men. Two machine guns point through the bottom of the fuselage.

Truce Halted a Big Air Raid on Berlin

London.—The report of Major-General Trenchard, commander of the independent Royal Air Force, reveals that all preparations for attacking Berlin by air were completed three days before the armistice was signed.

"The seventh group was established in England under the command of Colonel Mullock, for the purpose of bombing Berlin and other centres," the report says. "The group received machines capable of carrying on the work only at the end of October and though all ranks worked day and night in order to get the machines ready for the attack on Berlin, preparations were completed only three days before the signing of the armistice."

The independent force, formed with the object of striking Germany's most vital point and her sources of supply, consisted of sixty machines. Instead of a continuous series of attacks on one industrial centre until it was destroyed General Trenchard decided to attack as many centres as it was possible to reach with the machines at his disposal, because the moral effect would be greater, with no town feeling safe. The moral effect is twenty times greater than the material.

"I considered it probable," says General Trenchard, "that by the spring of 1919 half the force would be attacking enemy aerodromes, while the other half would be attacking long distance targets. Railways were of first importance, with blast furnaces second. The radius of activity of the squadron increased from 272 miles daily in June to 320 in October.

"In September and October a day bombing squadron had to fight practically from the front line to the objective and home. In several cases it had to fight the whole way out and the whole way back. The most accurate calculations of fuel were necessary.

"In one case there was a formation with fuel for five and a half hours. It was out all that time and barely managed to get home. A miscalculation of five minutes would have lost the whole formation."

Canada Takes U. S. Air Station

Halifax, N. S., Dec. 23.—The United States Naval Air Service Station at Eastern Passage, in Halifax Harbor, is to be taken over by the Canadian Naval Service by the first of the year, according to an announcement made here. Sixty of the 250 members of the American units have left the station for New York.

American Aircraft at War's End

Coblenz, Dec. 23.—On the last day of fighting the American Expeditionary Air Force could have put into the air a total of 450 to 460 aeroplanes of all kinds—chase, observation, and bombing. Of this number 102 were American-made machines—De Haviland Fours. There were other American-made machines in France and a large number of Liberty motors, but the figures given represent what was at the front at 11 o'clock on the morning of Nov. 11.

In cases where the American forces had several thousand machines massed for special operations that result was obtained by the assistance of French and English airmen.

Describes Battle Fatal to Quentin Roosevelt

With the American Army of Occupation, Saturday, December 28.—Christian Donhauser, the young German aviator who claims to have shot down Quentin Roosevelt near Chambray, France, on July 14, told of the battle which ended fatally for the son of the former President of the United States. He said:

"I was one of a party of six German aviators, and on July 14 sighted six American machines east of Fere-en-Tardenois. One American, who, I learned later, was Quentin Roosevelt, was ahead of the rest of his squadron and off to one side. He came straight at me, and I swooped down under his machine. We seesawed back and forth, peppering away, and each trying to gain the advantage of climbing above each other.

"Roosevelt made several loops and I admired his gameness. Once I thought his machine gun was jammed, but a second later he began again to shoot and I felt the bullets striking my plane. Then I mounted above him and swooped down to within twenty meters of him, firing all the time. Then I saw my opponent collapse and his machine began to fall."

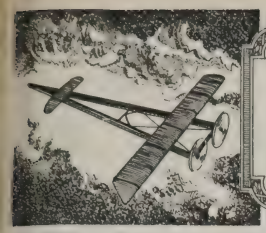
Donhauser, who is a non-commissioned officer and speaks English, has relatives living in Michigan. He was credited with thirty aerial victories in the fighting after July 1, when he entered the German air service.

The battle with Lieutenant Roosevelt, the German aviator said, was fought at an altitude of between 2,000 and 3,000 meters. In the fight bullets from Lieutenant Roosevelt's machine gun pierced the German aviator's machine in twenty places.

Donhauser said he realized soon after the fight began that his opponent was not as experienced as some Americans he had encountered, but Lieutenant Roosevelt put up a plucky fight to the end. Three or four times during the fight Donhauser declared, Roosevelt had the upper hand for a few seconds.

Captain René Fonck Highest Aerial Score

The highest official score for bringing down Hun fliers during the Great War was made by Captain Rene Fonck, the famous French Ace. Before the Armistice was signed he was officially credited with 75 Boche planes, but virtually he brought down over 100. On two different occasions he brought down six machines within a few minutes. Fonck was a wonderful flier and was among the first to perform the "barrel" maneuver during an aerial battle. The French Government has conferred on him nearly every decoration in its power to give.



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

I HAVE not given drawings of the motor changes as yet but later on I will present a cut showing the full changes of the motor. This has been held up owing to the fact that companies manufacturing the different parts have failed to give me the information which I need for the drawing. The information I gave in the last article should be sufficient to change the motor for anybody acquainted with the Ford car.

The wings will be considered next. These are made in four pieces; that is, two lower halves, two upper halves, and of course, the center section.

The section of wing we will use is the R.A.F.6 and, of course, working to the nearest 1/64 of an inch. The layout of the wing section is given at the lower lefthand corner and the dimensions are also given. The chord of the wing is 4 feet and the dimensions are given in inches. The builder should lay out the wing section full size according to the dimensions given. The figures along the top show the distance from the chord line that these points are located. The bottom figures show the distance that the bottom curve is drawn.

When laid out, a template should be made of 3/16" thick wood of each part of the web. The web is the part of the rib that keeps the two battens which are located top and bottom. The web is made in three pieces, one from the entering edge to the spar, the other between the spars, and the other from the rear spar to the trailing edge. These webs are lightened out as shown and are 3/16".

The battens are fastened with hot glue and small brads about ½ to ⅝" long and about 1/32" thick. The glue is applied first and while the glue is still hot the brads are hammered into place. This forms a rib, and if the webs are made correctly all will be the shape and size. When finished they will have two oblong openings, one six inches and the other thirty inches from the entering edge. (This means from entering edge to the centers of the spar openings.)

By consulting the cut you will see that all the ribs do not run all the way back, but are cut off at the cross batttens. These are termed half ribs and are inserted between each full rib in order to maintain the correct shape of the wing. These half ribs are made of 3/16" thick clear spruce, poplar or fir. (These woods all range about 27 lbs. per cubic foot and have about the same bending strength.) The outline of the rib does not conform to the web for the full ribs as they have no battens and owing to these being omitted the web must be the height of web and battens added together. You will note that the spar hole is the same size and distance as given for the long ribs.

The spars should be made of Fir, as it is a bad job getting spruce these days, and Fir has very few defects. The spars are about 3" deep through the center and 1" thick. The spars taper from the last rib to the ends where the edge is fastened.

When the ribs and spars are finished, the ribs are pushed along the spar. The rib next to the body has a solid rib that is instead of lightening the web it is left solid. A half rib is next pushed along the spar then a full rib, etc., making sure to keep the correct distances. Remember that all wings are the same except two sections are made for the right and two for the left. Wire bracing is inserted to strengthen the wing and the terminals for the wires are placed at a point where the struts are situated. The entering and rake edges are made of ⅜ by ¾" ash. The ribs are then fastened to this edge with thread and glue. The trailing edge simply consists of a steel wire No. 20, a hole being drilled about ⅛" from the end and a strap of aluminium placed over it to strengthen.

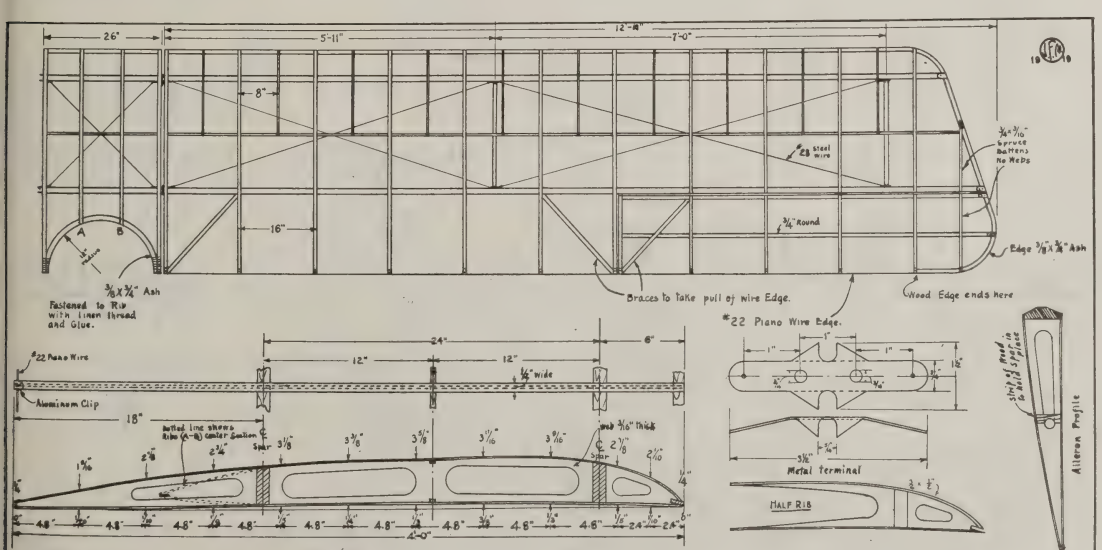
Where the ailerons come, the ribs are cut off at the spar, the aileron being made separate. A cross section of the aileron is given in the illustration.

You will see that the spar is beveled to allow free movement of the aileron and a ¾" round spar is placed midway between the trailing edge and the spar.

The center section over the body is made of two solid and two lightened ribs, the light ribs being cut off at the rear along the dotted line in the wing profile. An ash edge bent to the radius of 12" is then fastened to the ends of these ribs; to the solid ribs with linen thread and glue and to the shorter ribs by glue and brads.

The fittting for brace wires is shown in the cut and provision is made for attaching the compression struts in place. The compression struts are ¾" square.

(To be continued.)



Details of main planes and ailerons for the Ford motored aeroplane



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Standing in Line

I stood in line to join,
I stand in line for mess;
I stand in line for everything
I get, almost, I guess.

And when I soon go back again,
Now that Bill's dream has burst,
I'll stand in line to kiss my girl,
Perhaps, and that is worst.

Things That Worry My Morale

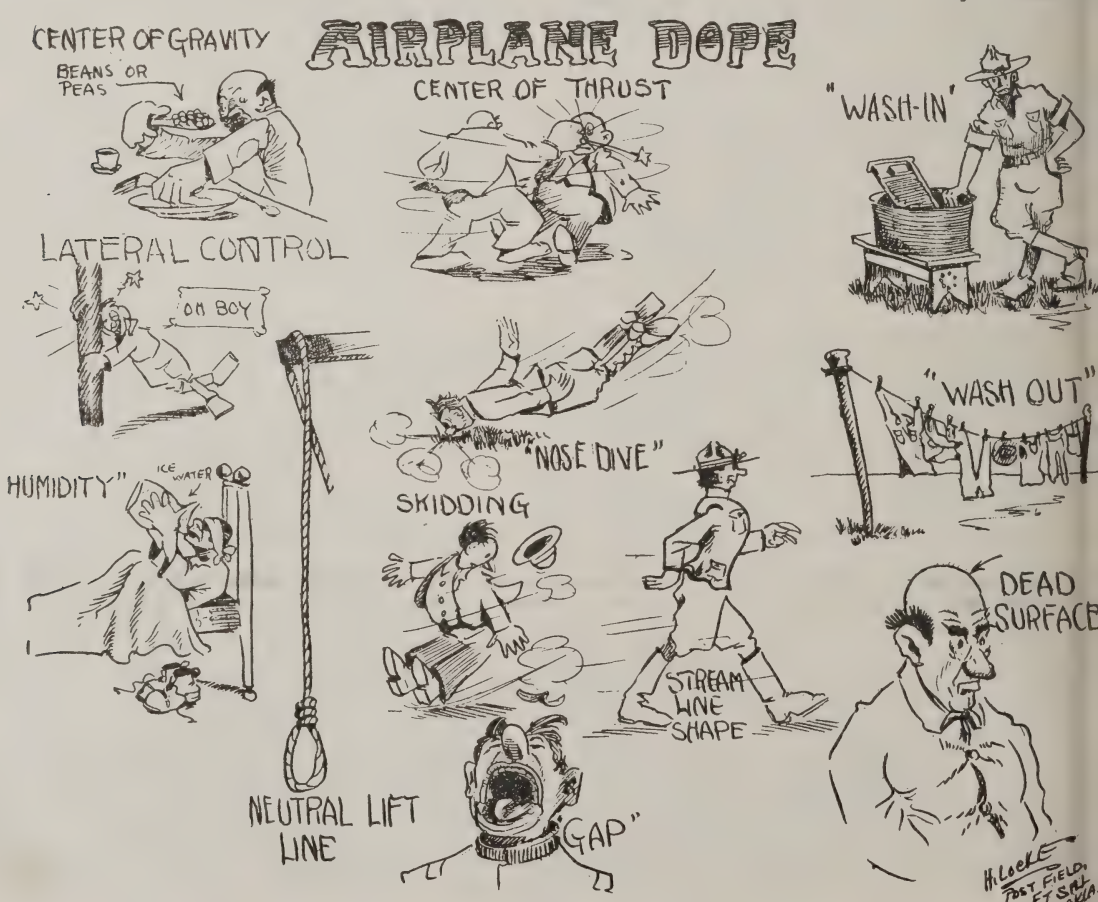
Work
Prunes
Prudes
Homely Girls
Cramps
Near Beer
Craps
Reveille
M. P's.
Bread Pudding
Service Cars
Evening News "Extras"
Physical Inspection
Influenza.

The Value of German

If you would make love,
Speak Spanish.
If you would be an orator,
Speak French.
If you would be poetic,
Speak Italian.
If you would be humorous,
Speak English.
If you would say a prayer,
Speak Latin.
If you would get a dog out of the house,
Speak German.

B. A. S.

Life Is Just One Big Aerodrome, After All — **By R. Kendrick**



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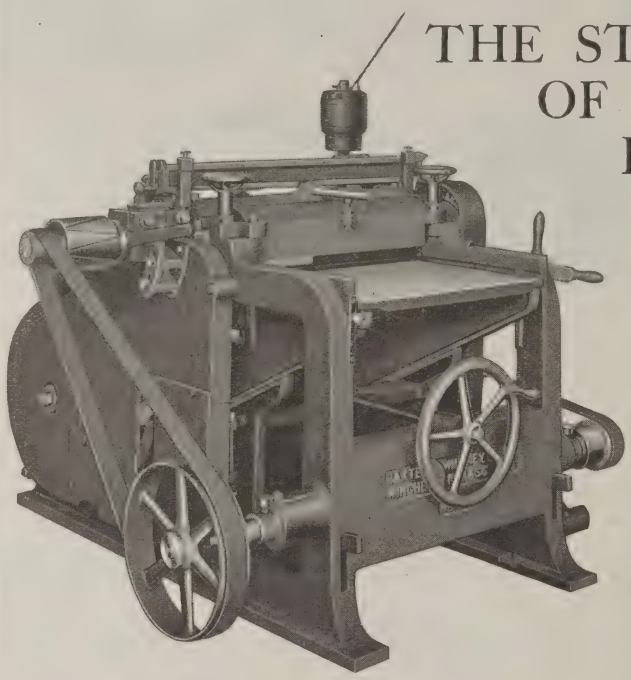
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THE PACIFIC AIRWAY: extending from San Diego to Puget Sound, following the coast line, touching every city on the Pacific seaboard.

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(*Continued from page* 909)

Mortimer, Richard, Jr., May 22; Tuxedo Park, N. Y.

Noble, Ralph M., May 14, 2d Lt.; no address.

Norton, Frederick W., July 23, 1st Lt., 27th; 172 West 1st Ave., Columbus, Ohio.

Nutt, Alan, Sept. 26, 1st Lt., 94th; Cliffside, N. J.

O'Donnell, Paul J., Sept. 26, 2d Lt.; 96th; 1907 Market St., Wilmington, Del.

Offutt, Jarvis J., Aug. 13, 1st Lt., 56th R. A. F.; 140 North 39th St., Omaha, Neb.

Ovington, Carter L., May 29, 1st Lt., Escadrille No. 98; 25 Rue des Brodes, Paris, France.

Palmer, Keene M., Oct. 3, 1st Lt., 104th; South Dayton, N. Y.

Parker, Raymond W., May 4, 2d Lt., with French; no address.

Parrott, Edmund A., Sept. 26, 1st Lt., 20th; San Mateo, Cal.

Patterson, Alfred D., Oct. 29, 1st Lt., 93rd; 438 Franklin Ave., Wilkinsburg, Penn.

Petree, Harris E., Sept. 26, 1st Lt., 22d; 1,236 Euclid St., N. W., Washington, D. C.

Phillips, Walter A., Oct. 7, 1st Lt., 1st.; no address.

Plummer, Charles W., Aug. 11, 2d Lt., 88th; no address.

Potter, W. M. C., Oct 10, 1st Lt., 20th; care H. G. Campbell, 11 Wall St., New York, N. Y.

Prentice, Lee S., Aug. 1, 2d Lt., 104th R. A. F.; 301 Park Ave., Albert Lea, Minn.

Putnam, David E., Sept. 14, 1st Lt., 139th; 1374 Commonwealth Ave., Awlston, Mass.

Reilly, Lloyd G. E., Oct. 31, 1st Lt., 99th; 228 North Claybrooke St., Memphis, Tenn.

Rhinelander, Philip N., Sept. 27, 1st Lt., 20th; Maddrisan, France.

Richards, John F., Sept. 26, 1st Lt., 1st; 4526 Warwick Blvd., Kansas City, Mo.

Roosevelt, Quentin, July 14, 1st Lt., 95th; Oyster Bay, L. I., N. Y.

Ross, Cleo J., Sept. 26, 1st Lt., 8th; 302 North Franklin St., Titusville, Penn.

Roth, Irving, Sept. 26, 1st Lt., 49th; 36 E. 7th St., New York City.

Russell, William M., Aug. 11, 1st Lt., 95th; 917 Jefferson Ave., Detroit, Mich.

Rust, Charles E., Oct. 11, 2d Lt., 104th; 81 State St., Gallipolis, Ohio.

Sands, Charles B., Aug. 1, 1st Lt., 27th; 1625 Hanover Ave., Richmond, Va.

Shilling, Franze F., July 2, 1st Lt., 91st; not in office's files.

Schone, Harold J., Oct. 30, 1st Lt., 139th; 5001 College Ave., Indianapolis, Ind.

Sebring, Raymond R., Sept. 7, 2d Lt., 91st; 139 La Grange St., Morena, Mich.

Siebold, George V., Aug. 26, 1st. Lt., 148th; 756 Rockcreek Church Road, Washington, D. C.

Shaw, Irwin D., July 9, 1st Lt., 48th R. A. F.; 27 Broad St., Sumter, S. C.

Shoemaker, Harold G., Oct. 5, 1st Lt., 17th R. A. F.; 225 East Commerce St., Bridgetown, N. J.

Simon, Herbert K., Oct. 14, 1st Lt., 13th; 3007 Jackson St., San Francisco, Cal.

Simpkins, James C., Sept. 18, 2d Lt.; 125 Brooks St., Missoula, Mont.

Smith, Walter W., Aug. 17, 1st Lt., 94th; 472 Lexington Ave., New York City.

Stephenson, Wayne B., Sept. 13, 1st Lt., 28th; 2601 Durant Ave., Berkeley, Cal.

Stevens, Henry L., Sept. 14, 1st Lt., 50th; Chachan Plantation, Marcks Corner, S. C.

Stiles, Robert H., Sept. 16, 1st Lt., 13th; 22 Prospect St., Fitchburg, Mass.

Suiter, Wilbur C., Sept. 13, 1st Lt., 135th; 927 Orange St., Shamokin, Penn.

Sunford, Charles R., April 12, 1st Lt.; Skowhegan, Me.

Sykes, Don. J., Aug. 1, 1st Lt., 2d; Peedee, N. C.

Taylor, Everett A., Sept. 27, 2d Lt., 20th; Cleveland, Okla.

Thomas, Gerald P., Sept. 22, 2d Lt., 17th R. A. F.; 259 Broadway, Flushing, L. I., N. Y.

Upton, Charles H., Aug. 28, 1st Lt., 50th; 27 Harvard St., Arlington Heights, Mass.

Way, Howard P., Sept. 14, 2d Lt., 96th; St. David's, Penn.

White, Sidney W., Oct. 31, 1st Lt., 27th; Elizabeth City, N. C.

Whitney, R. H., March 13, 2d. Lt.; Rock Hill, S. C.

Wicks, Glenn D., Oct. 5, 1st Lt., 17th R. A. F.;

Zellers, George H., July 30, 1st Lieut. 20th R. A. F.; 143 E. James St., Lancaster, Penn. Sauquoit, N. Y.

Wold, Ernest G., Aug. 1, 1st Lt., 1st; 1779 Emerson St., Minneapolis, Minn.

Wood, Francis A., Sept. 13, 2d Lieut. 99th R. A. F.; 20 E. 83d St., N. Y. City.

Wooten, James C., Aug. 1, 2d Lieut. 1st; no address.

(*Continued from page* 897)

he knew that the enemy was constantly patrolling the air. On October 27, near Chatelchesery, while regulating artillery fire, he was attacked by several enemy planes and his balloon was perforated by incendiary bullets. He remained in the air and carried out his observation. His extreme courage and devotion to duty furnished a splendid example to the officers and men of his command. Home address, G. M. Bowers, father, 1140 South Thirteenth Street, Birmingham, Ala.

First Lieutenant W. J. R. Taylor, Air Service, United States Army. For repeated acts of extraordinary heroism in action near Malancourt and Montfaucon, France, September 26-October 10, 1918. On September 26, while conducting an important observation, Lieutenant Taylor was twice attacked by enemy planes. He would not jump from his balloon because of the valuable work he was doing for the infantry, although he was at all times in danger of losing his life from incendiary bullets. On October 3, near Montfaucon, Lieutenant Taylor was attacked, but refused to leave until his balloon caught fire. Again, on October 6, he was attacked and forced down in his parachute. On October 10, while he was conducting an important observation, an enemy patrol hovered over his balloon; he refused to jump until attacked at close quarters. His heroic devotion to duty was an inspiration to the officers and men of his company. Home address, W. R. Taylor, father, 13 Prince Street, Rochester, N. Y.

First Lieutenant Paul N. A. Rooney, Air Service, United States Army. For repeated acts of extraordinary heroism, in action near Anstauville and Germonville, France, July 22, and September 26, 1918. On July 22, near Anstauville, Lieutenant Rooney, with Lieutenant Ferrenbach, was conducting an important observation. At an altitude of 800 meters he was several times attacked by enemy planes but refused to leave his post until his balloon was set afire, and only then after he had seen that his companion had safely jumped. While descending, his parachute was almost hit by the falling balloon. He insisted upon returning to his post, and was in the air again as soon as another balloon could be inflated. On September 26, while adjusting artillery fire, his balloon was attacked by three enemy planes (Fokker type). At imminent peril to his life he stuck to his post until one plane dived directly at him. Lieutenant Rooney would not leave the basket until his companion, Lieutenant Montgomery, had jumped to safety. Home address, Mrs. W. J. Rooney, mother, 14 Paris Street, East Boston, Mass.

AERIAL AGE WEEKLY

Vol. 8, No. 19 JANUARY 20, 1919 10 CENTS A COPY



A formation flight at one of the American flying fields

Bartlett Arctic Expedition to be Roosevelt Memorial

A Difficult Problem Which May Interfere With International Aerial Transportation

ISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
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VOL. VIII JANUARY 20, 1919 No. 19

TABLE OF CONTENTS

PAGE

Bartlett Arctic Expedition to be Roosevelt Memorial Expedition. 935

A Difficult Problem which May Interfere with International Aerial Transportation 936

The Atlantic Air Route 936

The News of the Week 937

The American Aces 938

The Aircraft Trade Review..... 939

U. S. Aerial Mail 940

Manufacturers' Aircraft Association Banquet 941

Plywood in Aeroplane Construction 945

The Christmas Strutters Biplane ... 948

The Hughes Aircraft Report..... 952

Naval and Military Aeronautics... 954

Foreign News 956

Elementary Aeronautics and Model Notes 957

Aeronitis 958

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Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879



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THE NATIONAL TECHNICAL, ENGINEERING ND TRADE AUTHORITY
PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
WASHINGTON OFFICE: 619 *Union Trust Bldg.*
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, *at the Post Office at New York, N. Y., under the Act of March* 3, 1879
Copyright, THE AERIAL AGE CO., Jan. 20, 1919
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, JANUARY 20, 1919 NO. 19

BARTLETT ARCTIC EXPEDITION TO BE ROOSEVELT MEMORIAL EXPEDITION

THE Executive Committee of the Aero Club of America have decided to make Captain Bartlett's Arctic Expedition the "Roosevelt Memorial Expedition."

It was Roosevelt, while he was President of the United States, who gave Admiral Peary leave of absence to organize and take charge of the expedition which led to the discovery of the North Pole. It will be recalled that Peary's ship was named "The Roosevelt" in appreciation of President Roosevelt's interest in the expedition. Captain Bartlett was Captain of the Roosevelt in two Peary expeditions.

Colonel Roosevelt was a veteran supporter of aeronautics. As early as 1897, when he was Assistant Secretary of the Navy, he used his influence to secure the appropriations needed by Professor Langley to continue his work.

Colonel Roosevelt was also responsible for giving the U. S. Army an aeroplane before any other nation had one. In 1907 he approved the ordering of a Wright biplane and a dirigible.

The Roosevelt Memorial Expedition will have four important missions, as follows:

(1) To explore as much as possible of the 1,000,000 miles of unexplored Polar Arctic regions.

(2) To fly across the top of the world from Cape Columbia on the American side to Cape Chelyuskin on the Siberian side.

(3) To conduct extensive soundings in the Polar Basin and collect flora and fauna from the ocean bottom.

(4) To send up sounding balloons and explore the upper air of the Polar regions, gathering meteorological data.

It is also fitting that the first land, if any land is discovered in this first use of aeroplanes for arctic exploration, shall be named "Roosevelt Land."

The expedition is to start from the United States next June. There are six weeks of fair weather in July and August when, even in the Polar regions, it is seldom lower than sixty degrees above zero. The plans are to have a ship go to Etah, about 600 miles from the North Pole, in June, when the ice is sufficiently broken to permit the ship to cross Melville Bay.

The ship would carry a large seaplane or land aeroplane for the final flight across the top of the earth, and for long distance exploration of the unexplored Polar regions, as well as smaller planes for the scouting flights for short distance survey.

Immediately upon arrival at Etah a base will be established and while waiting for the ice to break up further north to permit the ship, to go as far as Cape Columbia, the small seaplanes will fly to Cape Columbia and establish a base there for the large plane which is to be used for the flight across the top of the world, from Cape Columbia on the American side, over the Pole, to Cape Chelyuskin on the Siberian side and for exploration over longer distances.

For the six weeks after the middle of July, when the weather conditions are best for flying in the Polar regions, the large plane as well as the small planes will be put into service and the important work of the expedition will be done, including sending up sounding balloons in the upper air to gather meteorologic data.

Results of inestimable value to the United States and to science will surely be obtained from this expedition. There is no doubt whatever that this expedition can explore, survey and photograph the unexplored parts of the arctic regions and establish the existence or non-existence of land or lands in that region.

The Committee of the Aero Club of America assisting Captain Bartlett consists of Rear Admiral Robert E. Peary, discoverer of the North Pole; Alan R. Hawley, Henry A. Wise Wood, Henry Woodhouse, Rear Admiral Bradley A. Fiske, John Hays Hammond, Jr., Rear Admiral William E. Little, U.S.N.; Professor Charles L. Poor, Colonel E. Lester Jones, U.S.A.; Charles Jerome Edwards, Major Cushman A. Rice, U.S.A.; Augustus Post, Major J. C. McCoy.

A DIFFICULT PROBLEM WHICH MAY INTERFERE WITH INTERNATIONAL AERIAL TRANSPORTATION

THE report of the British Civil Aerial Transport Committee brings up once more the problem of insuring national safety without interfering with the development of international aerial transportation. The committee's report reads in part as follows:

To the Air Council:

1. By our terms of reference we were invited *inter alia* to consider the development and regulation of civil aerial transport from an international standpoint. We have been informed by the Foreign Office that in the opinion of that Department, if it is desired to set on foot negotiations for the conclusion of an International Aeronautical Convention, no time should be lost in approaching certain Allied and friendly Governments. We therefore think it desirable to submit an interim report on this branch of our subject at once.

2. At the outset of our enquiry we found it necessary to divide the subjects covered by our terms of reference under various heads, and to refer these different heads to special committees for detailed investigation. One of the branches of enquiry so referred comprised international and legal problems, and Special Committee No. 1, who have dealt with these problems, have presented a report which, as far as it concerns international questions, has generally been approved by us. We think it will be found convenient that we should enclose herewith this report in its entirety, and that we should draw attention to certain salient points which seem to us to call for emphasis or comment. We shall deal in a further report with the latter part of the report of Special Committee No. 1, which is concerned with questions of municipal legislation.

3. It will be observed that the Special Committee, in considering the first part of their subject, have taken as a basis the Draft International Convention drafted by the Conference held at Paris in 1910. This Conference was unable to com-

plete a draft convention for ratification by the Contracting Powers, mainly owing to a conflict of opinion between the British and German delegations as to the right of each State to the sovereignty (or to the exercise of control and jurisdiction, whichever term be preferred) in the air space over its territories. In our opinion this question of sovereignty is one upon which agreement between the Contracting Powers is vital in the future interests of civil aerial transport.

4. It is a question on which it is possible to hold different opinions: indeed, some divergence of view with regard to it has manifested itself on our Committee. It must, of course, be admitted that a State must assert some rights of sovereignty in the air space over its territories, since otherwise no legal control could be exercised over aircraft in flight at however low an altitude, but it is possible to take the view either (*a*) that State sovereignty should be asserted *usque ad coelum,* or (*b*) that State sovereignty should be asserted only up to some prescribed level of altitude, above which the flight of aircraft would still be practicable, and that above that altitude the air should be free to all, just as the high seas outside the limits of territorial waters are free to all.

5. From the purely business point of view of the prospects of civil aerial transport in times of peace, the latter view has much to recommend it. The commercial advantages of air traffic are to be expected mainly from rapid uninterrupted flights over long distances, and these advantages would be clearly best secured if aircraft above a certain altitude were allowed to fly freely in any direction without let or hindrance imposed upon them by the municipal legislation of the States over whose territories they might pass.

* * * * * * * *

6. The argument, however, for the doctrine of State sovereignty in the air space *usque ad coelum* is in the main a military one. Military considerations dictated the opposition of the British delegates to the proposals pressed by the German representatives at the Conference in Paris in 1910, and we understand that the views of the Foreign Office and of the naval and military advisers of the Crown are unchanged. To give to foreign aircraft, as a matter of acknowledged international law, the right to fly at will over the territory of the State would be to give them undesirable opportunities for espionage, and generally to limit "the elementary right of a State to take each and every measure which it considers necessary for self-preservation." In time of war, moreover, the doctrine of the "freedom of the air" above a certain altitude would give rise to most embarrassing questions for neutral States. They would actually be exposed to the risk of having aerial battles fought over their territory without being able to claim that their neutrality had been infringed. The case of the upper air presents no true analogy to the case of the high seas outside the limits of territorial waters.

7. The experience of the present war has merely served to increase the force of these considerations, and we agree with the Special Committee that the doctrine of State sovereignty in the air space *usque ad coelum,* on which this country acted before the war, and on which, along with neutral countries, it still acts, is sound, and should be adopted as the basis alike of international agreement and of municipal legislation.

8. As far as the doctrine of sovereignty may be applicable to territorial waters, we agree with the conclusion of the Special Committee that the air space over such waters must be considered from the same point of view as the air space over the land of the State. We desire, however, to point out that the questions of sovereignty over and of any extension of the limits of territorial waters are primarily the concern of the Admiralty, and that military rather than civil considerations must be regarded as of major importance in this connection.

* * * * * * * *

10. We approve the detailed conclusions of the Special Committee set out in Appendix A to their report. The technical regulations contained in Annex C of the Draft International Convention were referred to Special Committee No. 2 of our Committee, and we further approve their detailed recommendations. Recent developments in the science and practice of aeronautics have rendered necessary some amendments of regulations agreed to in 1910, more particularly since such regulations were at that date considered from the aspect of the use of airships rather than of aeroplanes.

11. In paragraph 10 (i) of Part I. of their report the Special Committee have touched upon an important question which was not considered by the Conference held in Paris in 1910. We think that the possibility of damage done by foreign aircraft visiting this country is a matter for careful consideration when it is remembered that, unless an aircraft is itself damaged, the owner of it is in a peculiarly advantageous position as regards escape from the legal consequences of his act. We agree with the Special Committee that, if some system of insurance could be mutually arranged between the Contracting Powers, or at least between H.M.G. and the States whose aircraft are most likely to visit this country and over whose territories our own aircraft are most likely to fly, such an arrangement would be of distinct advantage to civil aerial transport.

12. Having regard to paragraph 10 (ii) of the report of Special Committee No. 1, we hold a strong view that some international agreement which will permit of the utilization of aerial routes immediately after the war is of urgent importance for the purpose of encouraging civil aerial transport, and that therefore early steps should be taken to enter into the necessary negotiations.

* * * * * * * * *

For the Civil Aerial Transport Committee,
(Signed) JOHN BAIRD,
(Acting Chairman).
February 7, 1918.

(Signed) D. O. Malcolm,
(Secretary).

Aircraft are with the world to stay. Larger and faster aircraft are coming. Aerial transportation is to be a strong factor in the reconstruction. Therefore the problem is one that deserves the serious consideration of the world's leading jurists.

Why not solve it by agreeing to freedom of the air above the 20,000-foot level?

THE ATLANTIC AIR ROUTE

THE Chief of the Bureau of Aeronautics, Major Gen. William L. Kenly, traveled with a pilot at the rate of 160 miles an hour in a specially designed Haviland plane from Washington to Mineola. Greater speed was made by Pilot Eric Springer and a mechanician, who, in a Glenn L. Martin bombing plane driven by two Liberty motors, flew from Dayton to Cleveland, 215 miles, in an hour and a quarter, at a rate of about 175 miles an hour. General Kenly was not trying for a record, and he expects to make a faster trip from Washington the next time. The Ohio aviator believes that he has beaten all creation, but tomorrow some one in this country, or in England, or in France may report a swifter flight. Aviation records tumble almost every day. Given a machine with motors powerful enough to keep it in the air for nine hours and a half at a speed of 175 miles an hour, and the Atlantic could be crossed in a continuous flight from the most easterly point in Newfoundland to the most westerly point in Ireland, a distance of 1,640 miles.

At the dinner of the Manufacturers' Aircraft Association

(*Continued on page* 962)



THE NEWS OF THE WEEK



"Welcome Home" Plan of Aero Club Working Well

The difficult problem of welcoming the returning aero squadrons at the different ports throughout the United States has been solved by the Aero Club of America by the employment of wireless.

Upon learning from the War Department of departure of transports from Europe carrying Aero Squadrons the Club sends a wireless reading as follows, which was the wireless sent to the thirteen aviators returning on board of the transport *"Accomac,"* which is due to arrive at New York on January 17th:

"To Captain of Transport 'Accomac.'

"Kindly transmit the following message to the members of aero units on board of the 'Accomac':

"The Aero Club of America and forty affiliated aero clubs greet and welcome you back to the United States. As hearty a reception awaits you at the New York Club House as you had at the Paris Club House."

"The method is working to perfection," said Mr. Alan R. Hawley, the President of the Club, today. "It reaches all the members of the aero units, and as they cannot come immediately upon landing, because they must go to camp, they come later."

The Aero Club also has a permanent reception committee consisting of Messrs. Alan R. Hawley, Rear Admiral Bradley A. Fiske, Major Cushman A. Rice, Henry A. Wise Wood, Hon. Murray Hulbert, Henry Woodhouse, Professor Charles Lane Poor, Augustus Post, Charles Jerome Edwards, K. M. Turner, Lieutenant Godfrey L. Cabot, U. S. N., Captain Robert A. Bartlett, and Leroy B. Gulotta. Every ship is met by some of these members.

Lieut. Rodman Awarded $1000 Curtiss Prize

The Contest Committee of the Aero Club of America at a meeting held on January 8, awarded the $1,000.00 cash prize which accompanies the Curtiss Marine Flying Trophy, to Lieut. Thomas Clifford Rodman, of the U. S. Navy, who flew in this contest as a representative of the Aero Club of America.

Under the rules the cash prize goes to the winning pilot and the Aero Club of America becomes the permanent owner of the trophy, as it has been won for three consecutive years by one of its members.

There were seven entrants in this contest which ended December 31st, 1918, and the flight of Lieut. Rodman in a H-16 flying boat with two Liberty motors at Pensacola, Florida, carrying 11 passengers and covering 669 statute miles in nine hours and 12 minutes with one stop was the longest distance made, and with his allowance of 5 per cent for each passenger carried, and deducting 5 per cent for one stop and 5 per cent for flying over a broken course, the final record allowed amounted to 970.1 miles. This flight was officially observed by Ensign R. A. Tallott, Ensign M. S. Martin and Lieut. (j.g.) E. M. Mitchell of the U. S. Navy.

Another very creditable flight was made by Lieut. Commander P. N. L. Bellinger, U. S. N., in an F-5 flying boat at Norfolk, Virginia, who made a record of 834.9 miles in nine hours and one minute without stop, carrying five passengers and 542½ lbs. of ballast, a total of 1464 lbs.



Major John C. P. Bartholf, J.M.A., the popular commanding officer of March Field, Riverside, Cal.

Capt. T. R. Shearer, M. C. R., in an H.S. flying boat, flew 574.2 between Miami and Palm Beach, and Lieut. Douglas Manning, M. C. R., in an H.S.1 Curtiss flying boat, flew over the same course, making 552.9 miles in 8 hours and 23 minutes with two stops. Other flights were made by Lieut. G. B. Newman, M. C. R., in a JN4H, flying over the same course, 504 miles in 7 hours and 40 minutes with one stop.

On October 25th, Stewart W. Cogswell in an Aeromarine hydroaeroplane, flew 459 miles in 7 hours and 53½ minutes, with two stops for fuel between Keyport, N. J., and Coney Island, L. I., New York.

Dirigible Record Homologated

The Contest Committee of the Aero Club of America has homologated the dirigible flight record made December 24th to 26th, by Ensign T. E. Maythem and Chief Carpenter's Mate J. H. Collier in dirigible "A" 236, who flew 691 linear miles in 40 hours and 48 minutes, and the distance was further augmented by 13 hours of flying at Palm Beach, Miama and Key West, which would amount to at least 200 miles additional. The course was from Key West to Tampa, Tampa to Cape Sable, Cape Sable to Palm Beach and Palm Beach back to Key West. Two hundred pounds of water ballast were taken aboard by means of a line and specially constructed bucket. Messages were dropped over Palm Beach, and exhibitions were given at various places en route. Food and drinking water was included in the complete equipment which was carried, which totaled 832 pounds and included extra oil, gasoline, clothing, sea-anchor, life belts, camera, radio apparatus light and batteries. The motor was stopped only twice for three minutes each time to put in extra oil, and 24 gallons of gasoline remained at the end of the flight. This flight establishes a new record in this country for this type of a dirigible and it is believed to be a world record, for time spent in continuous flight.

A previous flight was made by Ensign T. E. Maythem in the same dirigible on November 23rd to 25th, when he covered 372 miles carrying two passengers and full equipment from the same Naval Air Station at Key West.

The Aeronautic Exposition

Hearty co-operation on the part of the War and Navy departments is assured for the annual aeronautical show which the Manufacturers' Aircraft Association is to hold at Madison Square Garden, from February 27 to March 6th. This assurance from Washington means that the exposition will take on the permanent character of a combined effort, uniting National Defense, scientific achievements, and industrial development.

A statement given out by the Manufacturers' Aircraft Association, indicates that the exposition is to have the benefit of Naval and Military co-operation and, while no definite announcement may yet be made with regard to trophy displays, it is believed certain that this exposition which will take rank as the first of a national character, will afford opportunity for the public to inspect for the first time, not only some of the material taken from the enemy abroad, but much of the remarkable equipment which is owned by both the Naval and War Departments.

Co-operation and co-ordination will be fundamentals of the exposition. In the early days of the war, the industry was called upon to aid wherever aid was needed and this show will illustrate to what a remarkable degree this assistance was carried out. The War and Navy Departments still maintain close relationships with the industry and many of the notable exhibits, therefore, will come through the courtesy and co-operation of the various officials in Washington.

Army Aviators Honor Roosevelt

Army aviators from Hazelhurst Field, Mineola, L. I., paid a last tribute to the late Colonel Roosevelt from the air on January 6. Soon after the death of the Colonel was reported, the commanding officer at Hazelhurst Field ordered ten army pilots to fly to Oyster Bay and keep up an aerial patrol over the home of the ex-President for twenty-four hours. At intervals floral wreaths were dropped upon the grounds at Sagamore Hill as a token of the high esteem with which the Army, and particularly the Air Service, held Colonel Theodore Roosevelt.



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A new tandem biplane recently tested at Mineola. The results of the tests have not yet been made public

Rickenbacher to Fly for Loan

Washington.—Eddie Rickenbacher, American ace in the Flying Service in Europe, may make a series of flights through the United States this spring under the auspices of the Treasury Department at the time of the next Liberty Loan. The Treasury Department is now negotiating with the War Department on this matter.

Enlistment of Discharged Temporary Officers

Under the provisions of the act of Congress approved March 30, 1918 (Sec. V, Bul. No. 22, W. D., 1918), all commanding officers are authorized to enlist former enlisted men of the Army of the United States who were discharged to accept a commission in any component part of the Army of the United States, and who, having been discharged from such commissions, tender themselves for enlistment within three months after the termination of their commissioned service. Upon acceptance each enlisted man shall be appointed to the grade held by him before he was discharged to accept such commission.

No applicant for reenlistment under this authority will be rejected until his case has been reported to the Adjutant General of the Army with a statement as to the disqualifications or other reasons for rejection and instructions to that effect having been received.

Until the emergency is terminated by proclamation the term of enlistment will be for the "period of the emergency" as at present prescribed by law.

The names and army of service of soldiers reenlisted under this authority will be reported to the Adjutant General of the Army by wire, with a view to instructions for their assignment.

By order of the Secretary of War:

PEYTON C. MARCH,
General, Chief of Staff.

Officers Discharged from Air Service

Among the officers who have recently been discharged from the Air Service in the D. M. A. are the following: 2nd Lieut. Frank H. Carter, Capt. Adelbert Ames, Jr., 1st Lieut. Edwin E. Weise, 2nd Lieut. Norman Dunning, 1st Lieut. James N. Bobbitt, 2nd Lieut. William T. Nelson, 2nd Lieut. Joseph P. Annin, 1st Lieut. Wm. E. Dean, 2nd Lieut. Percival Gilbert, 2nd Lieut. Hermon L. Underhill, 2nd Lieut. Eppa H. Willis, 2nd Lieut. Herbert R. Shepard, 2nd Lieut. Alanson W. Aird, 2nd Lieut. Aubrey Drury, 1st Lieut. Henry L. Taylor, 2nd Lieut. George F. French, 2nd Lieut. Charles King, 1st Lieutenant Paul D. Weathers, 2nd Lieut. John C. Rowland, 2nd Lieutenant William E. Lewis, Major Roger Amory, 1st Lieut. George D. Taylor, Capt. Hamilton H. Salmon, 2nd Lieut. Willis F. Geib, 2nd Lieut. William H. Spurgin, 1st Lieut. William L. Shaffer, 1st Lieut. Jefferson W. Davis, Capt. Hayward H. Kendall, 2nd Lieut. Walter G. Eagle.

New R. M. A.s

The following officers of the Air Service have recently been rated as Reserve Military Aviators: Capt. Jacob S. Schlussel, 2nd Lieut. Stanton T. Smith, 1st Lieut. James C. Fair, 2nd Lieut. Ferris F. Hamilton, 2nd Lieut. Russell F. Swift, 2nd Lieut. Henry C. Fisk, Jr., 2nd Lieut. C. J. Fuller, 1st Lieut. Sydney H. MacBey, 2nd Lieut. Wm. L. Fancher, 2nd Lieut. Hugh F. Porter.

THE AMERICAN ACES

Washington.—Captain Edward V. Rickenbacker of Columbus, Ohio, famous an an automobile driver, was the premier "Ace" of the American air force in France, having twenty-six enemy planes to his credit. An official report received at the War Department showed that there were sixty-three "Aces"—men who had downed five or more enemy machines—in the American Army when hostilities ceased.

First Lieutenant Frank Luke, Jr., of Phoenix, Ariz., who was killed in action, was second on the list of "Aces," with eighteen victories to his credit, and Major Victor Raoul Lufbery of Wallingford, Conn., also killed in action, was third with seventeen victories. Before joining the American Army Major Lufbery was a member of the Lafayette Escadrille.

Captain Reed G. Landis of Chicago and First Lieutenant David E. Putnam of Brookline, Mass., who was killed in action, had twelve victories each. The other "Aces," with the number of victories credited to each, follow:

First Lieutenant Fields Kinley, Gravette, Ark., 10.
First Lieutenant G. A. Vaughn, Jr., 441 Washington Ave., Brooklyn, 10.
First Lieutenant J. M. Swaab, Philadelphia, 10.
First Lieutenant T. G. Cassady, 9.
First Lieutenant C. E. Wright, Cambridge, Mass., 9.
First Lieutenant W. P. Erwin, Chicago, 9.
Captain E. W. Springs, Lancaster, Penn., 9.
First Lieutenant H. R. Clay, Jr., Fort Worth, Texas, 8.
Major J. A. Meissner, 45 Lenox Road, Brooklyn, N. Y., 8.
Captain Hamilton Coolidge (deceased), Boston, Mass., 8.
Captain G. De F. Larner, Washington, D. C., 8.
First Lieutenant P. F. Baer, Fort Wayne, Ind., 8.
First Lieutenant F. O. D. Hunter, Savannah, Ga., 8.
First Lieutenant W. W. White, 541 Lexington Av., New York City., 8.
Second Lieutenant Clinton Jones, San Francisco, Cal., 8.
Captain R. M. Chambers, Memphis, Tenn., 7.
First Lieutenant Harvey Cook, Toledo, Ohio, 7.
First Lieutenant L. C. Holden, 103 Park Av., New York, 7.
First Lieutenant K. H. Schoen (deceased), Indianapolis, Ind., 7.
First Lieutenant W. A. Robertson, Fort Smith, Ark., 7.
First Lieutenant L. J. Rummell, 798 South 11th St., Newark, N. J., 7.
First Lieutenant L. A. Hamilton (deceased), Burlington, Vt., or Pittsfield, Mass., 7.
First Lieutenant J. O. Creech, Washington, D. C., 6.
Second Lieutenant Howard Burdick, 175 Remsen St., Brooklyn, N. Y., 6.
First Lieutenant C. L. Bissell, Kane, Penn., 6.
Major H. E. Hartney, Saskatoon, Canada, 6.
Captain Douglas Campbell, Mount Hamilton, Cal., 6.
Captain J. C. Vasconcelles, Denver, Col., 6.
Captain E. G. Tobin, San Antonio, Texas, 6.
First Lieutenant E. P. Curtis, Rochester, N. Y., 6.
First Lieutenant Sumner Sewell, no address, 6.
First Lieutenant R. A. O'Neill, Nogales, Ariz., 6.
First Lieutenant Donald Hudson, Kansas City, Mo., 6.
First Lieutenant M. K. Guthrie, Mobile, Ala., 6.
First Lieutenant W. H. Stovall, Stovall, Miss., 6.
First Lieutenant J. D. Beane (missing in action), 6.
First Lieutenant A. R. Brooks, Framingham, Mass., 6.
First Lieutenant R. O. Lindsay, Madison, N. C., 6.
First Lieutenant Martinus Stenseth, Twin City, Minn., 6.
Second Lieutenant F. K. Hays, Chicago, Ill., 6.
First Lieutenant H. C. Klotts, no address, 5.
Lieutenant Colonel William Thaw, Pittsburgh, Penn., 5.
Major D. McK. Peterson, Honesdale, Penn., 5.
Captain H. R. Buckley, Agawam, Mass., 5.
Major C. J. Biddle, Philadelphia, Penn., 5.
First Lieutenant James Knowles, Cambridge, Mass., 5.
First Lieutenant J. A. Healey, Jersey City, N. J., 5.
First Lieutenant Innis Potter, no address, 5.
First Lieutenant F. M. Symonds, 20 West 8th St., New York City, 5.
First Lieutenant J. F. Wehner (deceased), 124 East 28th St., New York, 5.
First Lieutenant J. J. Seerley, Chicago, 5.
First Lieutenant E. M. Haight, Astoria, N. Y., 5.
First Lieutenant H. H. George, Niagara Falls, N. Y., 5.
First Lieutenant G. W. Furlow, Rochester, Minn., 5.
First Lieutenant A. E. Easterbrook, Fort Flagler, Wash., 5.
First Lieutenant B. V. Baucom, Milford, Texas, 5.
Second Lieutenant Harold McArthur, no address, 5.
Second Lieutenant J. S. Owens, Baltimore, 5.

S. A. E. Program Taking Shape

New York.—The program for the winter meeting of the Society of Automotive Engineers to be held in the Engineering Societies Building, New York, February 4-6, is rapidly rounding into shape.

A discussion of the fuel situation will be led by President C. F. Kettering, who will summarize the situation to date with particular reference to the need for improving the thermal efficiency of engines. In addition, there will be an analysis of the supply of petroleum in the United States by a representative of the United States Geological Survey and a discussion of modern refinery practice. Dr. Joseph E. Pogue, of the Bureau of Oil Conservation of the Bureau of Mines, will present an interpretation of the fuel situation.

It is expected that that portion of the sessions devoted to aircraft matters will be of prime importance. J. G. Vincent, formerly lieutenant-colonel and chief of the aeroplane engineering division of the Bureau of Aircraft Production, will deliver a paper on engines of the fixed type with radially arranged cylinders. A paper on proportioning planes to their engines is in course of preparation.



A group of the enthusiasts at McCook Field, Dayton. Bottom row, standing—Ralph De Palma, Otto Summers, George Hecker, Guy Muntz, Pete Henderson, Sergt. Brigham, R. C. Sprague, Ben Spreng, Russell McDermott, Kern Aylward, Corp. Wiedenhoeft, J. H. Stukey, Frank Peck, A. F. Heywood, Corp. Markley, Wm. Moore, Del Golder, Ernest Longchamps, H. K. Reeve, Earl F. Dilgard, Sam Prince, E. A. Johnson, Sergt. F. F. Phlough, H. M. Shafer, Priv. Brinton, Bill Selleck, D. L. Long, Sergt. Tribbett, Capt. R. H. Depew, Harvey Ford; second row, kneeling—A. J. Barry, Bob Jandreau, Priv. Cassell, Corp. Kane, Wm. Beatty, Ralph Arment, Axel Christensen, Eddie Stace, Russell Shade, Carlo Capra, R. H. Werts, Priv. Leversey, George Bowman, W. Riedinger, Jr., O. H. Snyder, Corp. Burroughs, L. L. Gibson, H. F. Lawson, D. A. Lowry, John Isham, Steve Goodrich, Frank Hambly, Fred Golder, Jack Sutcliff; bottom row, sitting—Sergt. Robson, K. A. Craig, Bill Bailey, Sergt. McCollum, Wm. M. Hyde, Frank Gollery, Sergt. Beyers, A. J. Sanderson, Jack Tuyle, B. D. Maggia, J. J. Harriman, Sergt. Chauvin, Weldon Yates, Frank Muto, Dewey Bollinger, Corp. Sutton, Joe Welbon, Jimmie Johnson, Fred A. Hoover, Walter Lees, Lieut. McCoy, Carl Kuhl, Harry McQuitty

The AIRCRAFT TRADE REVIEW

A. E. J.

Performance of the Gallaudet D-4 Seaplane

In the December 30th issue of AERIAL AGE a description was given of the Gallaudet D-4 Light Bomber Seaplane, and mention was made of its speed. An illustration shown last week was from a photograph taken of the machine while it was traveling 126.7 miles an hour, piloted by Lieutenant E. F. Stone, U.S.N.

The list of performances given before (that is, maximum speed, 126 m.p.h.; slowest landing, 42.6 m.p.h.; slowest getaway, 46 m.p.h.; and climb in 2 minutes 2,100 feet) were officially observed results from actual flying tests, and not mere estimated calculations.

Moto-Meter Opens Detroit Branch

Detroit.—Following its policy of expansion, the Moto-Meter Co., Inc., Long Island City, New York, has opened a direct factory branch at 1432 Dime Bank Building, Detroit. The office will be in charge of J. J. Tobias.

New Livingston Radiator Corporation

New York.—The rights to manufacture radiators for automobiles, trucks and aeroplanes under the Livingston patents formerly owned by the Livingston Radiator & Mfg. Co. of this city have been purchased by the Livingston Radiator Corp. The new corporation also takes over all the mechanical equipment and processes of manufacture of its predecessor, and will place the production of this type of radiator on a quantity basis. A new management will have charge of the affairs of the new organization. The inventor, Dr. McRa. Livingston, again becomes associated with the manufacture of radiators under his patents, and will be vice-president and consulting engineer. E. G. Hines is president and general manager.

Doolittle with Sunderman

A. H. Doolittle has been elected secretary and general manager of the Sunderman Corp., Newburgh, N. Y. He was formerly sales manager of the Zenith Carburetor Co.

Brogan Leaves Duesenberg

Graham W. Brogan on Jan. 15th assumed the duties of advertising manager for the Black & Decker Mfg. Co., Baltimore. He was formerly advertising manager for the Duesenberg Motor Corporation.

Expect Keen Bidding for Army Planes

Houston.—There promises to be keen competition in bidding for the purchase of the 1200 aeroplanes and 2000 aeroplane engines, now stored at Houston, which the Government has announced it will sell on Feb. 1. Many of the men who will put in bids for aeroplanes are former army flyers, who want the machines for their private and business use. All bids will be opened at the office of the salvage branch, supply section, office of the director of military aeronautics, Washington, D. C.

The bids will be accepted on the plan of cash down before delivery, f.o.b. cars in Houston, and delivery promised within ninety days from the day the bid is accepted. Each bid must be accompanied by a check for 20 per cent of the proposal, and the Government reserves the right to reject any or all bids and also reserves the right to accept the bid on the unit basis. Bids will be accepted for one or more of the aeroplanes and the same applies to the aeroplane engines.

Returning Air Service Units

The battleship *Rhode Island* sailed from Brest January 2 and is due January 12 at Newport News, with the following troops: 477th Aero Construction Squadron, 4 officers and 150 men, Fort Slocum 48 per cent, Fort Logan 10 per cent, Fort McDowell, California, 10 per cent, miscellaneous 32 per cent; 6 casual officers classified as follows: Air Service 1, Field Artillery 1, Engineers 1, Infantry 2, Quartermaster 1.

The battleship *Virginia* sailed from Brest and is due January 12 at Newport News with the following troops: 484th Aero Construction Squadron, 5 officers and 145 men; Regular Army 98 per cent, miscellaneous 2 per cent and casual officer Air Service.

THE JUNKER ARMORED BIPLANE

FOR some time past there have been rumors current of a German all-metal aeroplane in which, it was said, even the wing covering was of metal. It is not, however, until quite recently that we have been able to obtain reliable information concerning this machine. What is left of the Junker biplane, as the machine in question is called, is now included among the many interesting exhibits at the Enemy Aircraft View Rooms at the Agricultural Hall, Islington, England, where representatives of the British publication *Flight* have been permitted to examine this machine in detail.

Owing to the damaged condition of the specimen on view it has not been possible to give, at present, more than a brief outline of the main characteristics of the machine. Later we hope to be able to describe it in more detail.

The Junker armored biplane is designed for use as a trench fighter, and in contradistinction to the A.E.G. armored biplane it was evidently designed with this object in view from the start, the armor not being attached, as a supplement, to an ordinary girder structure, as was the case with the A.E.G., but forming the main fuselage structure at the same time as providing the armoring.

The shape of the front portion of the fuselage may be seen in one of the accompanying photographs. It has flat sides of armor plating, and a slightly curved top of aluminum. The bottom of the body is formed of three flat surfaces, the middle one of which is horizontal, the other two sloping so as to connect the edges of the horizontal bottom with those of the vertical sides. The engine, a 230 h.p. Benz, is also protected by armor plating, which is detachable so as to allow access to the engine. This is accomplished by hinging the armor at this point, the port and starboard engine armor being separately detachable. In the accompanying photograph the engine armor of one side will be seen lying on the floor in front of the fuselage. The armoring is finished off just behind the gunner's cockpit, where it is continued across the fuselage by a curved armor plate shaped to form the gunner's back rest.

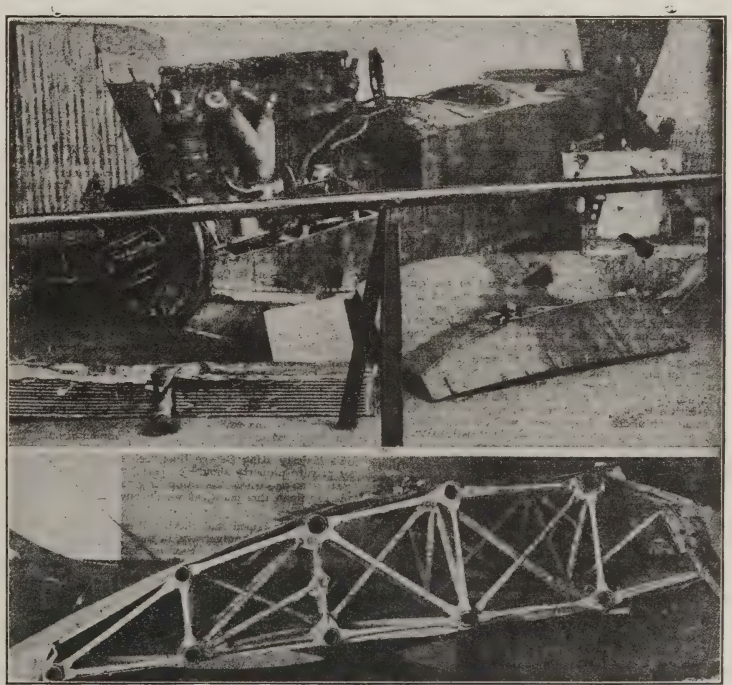
Of the rear portion of the fuselage nothing remains on the machine examined, and nothing can therefore be said regarding the details of its construction. Judging from such evidence as fittings for large diameter tubes at the four corners it would appear that the rear part of the fuselage has been built up of a tubular framework of Duralumin.

The wings of the Junker are of great interest as being a construction very dissimilar to any so far seen. The internal construction of the wings is in the form of Duralumin tubes crossing diagonally and connecting the tubular spars, which latter are far greater in number than is ordinarily found in an aeroplane wing. It has evidently been the aim of the designer to distribute the spars over the wing section rather than to provide two spars located in the usual manner. In the Junker there may be said to be six spars, if one counts the top and bottom tubes lying vertically above one another as one spar. The lower photograph will give some idea of the general distribution of the various wing members.

In section the planes of the Junker are enormously deep, the maximum thickness of the top plane being about 16 in. The chord of this wing is a little over 8 ft., while the chord of the bottom plane is approximately 5 ft.

From the fact that no trace was found of inter-plane strut fittings, it would appear that these members have been dispensed with in the Junker. It appears that the top plane centre-section was carried on a structure of tubes from the body, while the bottom plane appears to have been attached to the bottom of the fuselage by a series of diagonal struts. This arrangement, which would be made possible by employing such a deep wing section, would have the advantage that the gunner could fire forward at a considerable angle without danger of hitting a vital member of the wings.

The undercarriage is in the form of two Vees, attached to the lower plane some distance out. From this point the bracing tubes of the bottom plane run to the body, thus transmitting the shock to the fuselage without, presumably, causing excessive bending stresses in the lower wing spars.



Two views of a wrecked machine, showing the construction of the Junkers Biplane

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service.



PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

Aerial Mail Service

In the course of his Annual Report, Postmaster Burleson discusses the aerial mail service:

The report discloses a program for the very wide extension of the aeroplane mail service, which has been successfully operated between Washington, Philadelphia, and New York since May 15, 1918. Though the subject of air service had previously been given considerable study and a number of spasmodic flights with mail had been undertaken for purposes of exhibition, it was only with the establishment of this route that transportation of mail by aeroplane became a permanent and practical feature of the Postal Service.

The Aerial Mail Service was inaugurated with the cooperation of the War Department, which furnished the machines and aviators and conducted the flying and maintenance operations. This cooperation, which was of inestimable value, was maintained until August 12, when the entire operation was taken over by the Post Office Department and the work performed by this department with its own equipment and personnel.

This program directs, first, the establishment of an aerial-mail service connecting the principal commercial centers of the country by a system of trunk lines and feeders, and, secondly, connecting this country with the West Indies and Central and South America. The trunk lines and feeders decided upon under this program are:

1. New York to San Francisco, with feeders from—
   (*a*) Chicago to St. Louis and Kansas City.
   (*b*) Chicago to St. Paul and Minneapolis.
   (*c*) Cleveland to Pittsburgh.
2. Boston to Key West, with feeders from—
   (*a*) Philadelphia to Pittsburgh.
   (*b*) Washington to Concinnati.
   (*c*) Atlanta to New Orleans.
3. Key West, via Habana, to Panama.
4. Key West, via the West Indies, to South America.

On this program I have to report progress as follows:

1. *Boston to Key West.*—Of this route the Washington-New York division has been operated since May 15 and is functioning perfectly.

The Boston-New York division has been tentatively laid out and will be established whenever, in the opinion of the War Department, its operation will not conflict with the war needs of the country.

The Washington-Atlanta and Atlanta-Key West routes are now being worked out with a view to their immediate establishment at the close of the war.

2. *New York to San Francisco.*—Of this route the division from New York to Chicago has been carefully worked out. The War Department, under act of Congress of July 2, 1918, has released to the Post Office Department, for the use of this division, aeroplanes of 650 pounds mail-carrying capacity which are no longer suitable for war needs. The hangars have been ordered, landing fields obtained, and the route has been ordered established before the close of the present year. In a series of aeroplane flights by the Post Office Department early in September, the route was carefully charted for emergency and regular landing fields. In this work one aeroplane made a record flight from Chicago to New York in less than 14 hours, including all stops en route. The flights were made through storm and heavy rains over parts of the route. The reconnaissance developed that it will be feasible to maintain a daily 9-hour schedule between New York and Chicago, as compared with the 21-hour schedule of the Twentieth Century Limited. The New York-Chicago schedule for the present will call for departing from New York at 6 a. m. and arriving at Chicago about 3 p. m., thus connecting with all city deliveries. The principal mail stop will be Cleveland. The time between Chicago and Cleveland will be cut to 3 hours 45 minutes, and between New York and Cleveland to 5 hours 15 minutes. Mail from the Atlantic seaboard will be advanced from 12 to 24 hours to the West and Southwest by this new service. The feeder routes from Chicago to St. Louis, Kansas City, St. Paul, Minneapolis, and the remainder of the trunk line from Chicago to San Francisco will be worked out during the ensuing year with a view to their immediate inauguration at the close of the war.

3. *Key West to Panama,* and

4. *Key West to the West Indies and South America.*—Negotiations looking to the conclusion of special aerial mail conventions between the United States and the foreign countries involved for the establishment of these routes to the West Indies and Central and South America are now in progress. It is realized that these oversea routes will require the most powerful aeroplanes with wireless installation and special construction to make them safe over the seas, but the enormous commercial advantage that will result by materially reducing the time between this country and Central and South America will justify the expenditure that such a service will entail.

In the conduct of the service now in operation and the preliminary work on the routes to be established immediately upon the termination of the war, the Post Office Department is receiving whole-hearted support from the War Department, Navy Department, National Aeronautical Advisory Board, Bureau of Standards, Weather Bureau, and Geodetic Survey, besides much local assistance from committees, individuals, and aero clubs in this country.

New Special Six-Cent Stamp for the Aeroplane Service

The official record from the Office of Third Assistant Postmaster General describes the new special six cent stamp issued for the aerial mail service.

1. Postmasters and other officers and employees of the Postal Service are notified that the department is issuing a new postage stamp of 6-cent denomination. It is intended, primarily for the aeroplane mail service, under the new rate effective December 15, 1918 (Postmaster General's Order No 2415, of November 30, 1918), but will be valid for all purposes for which postage stamps of the regular issue are used.

2. A description follows:

The stamp is rectangular in shape, about seven-eights inch long and three-fourths inch high; color orange. The central design is a mail aeroplane in flight. Above, in a curved line of Roman capital letters, are the words "U. S. Postage." Triangular ornaments appear in the two upper corners. Below the aeroplane, in a straight line of Roman capital letters, is the word "Cents," with the numeral "6" within circles in two lower corners.

3. To obtain the new stamps, central-accounting and direct-accounting postmasters will draw requisition upon the department on Form 3201, writing the word "Aeroplane" on the line opposite the 6-cent denomination and complying carefully with sections 50 to 52, 57 and 60, pages 37 and 38, 1918 Postal Guide. Requisitions which disregard these instructions will be returned to postmasters for completion. Requisitions will not be made special, but will be filled in the order of receipt at the department.

4. The 16-cent aeroplane stamp will be available for special delivery fee and a single rate of letter postage (6 cents) on aeroplane mail. The 24-cents stamp will be available for aeroplane letters weighing in excess of 3 and not more than 4 ounces.

A. M. Dockery.
Third Assistant Postmaster General.

Cited for Distinguished Service

The commander in chief, in the name of the President, has awarded the distinguished service cross to the following named officers and soldiers for the acts of extraordinary heroism described after their names:

First Lieutenant James A. Healy, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Grandpre, France, October 30, 1918. Becoming separated from his patrol, Lieutenant Healy, flying at an altitude of 600 meters, discovered an enemy plane (type Halberstadt) hiding in the sun 200 meters above him, which he attacked and sent to the ground in a spiral dive. He then engaged two other machines (type Fokkers), which had been attempting to attack him. He succeeded in outmaneuvering them, and finally shot down one of the Fokkers. He returned without a drop of gasoline in his tank. Home address, Mrs. Mary A. Healy, mother, 361 Union Street, Jersey City, N. J.

First Lieutenant Murray K. Guthrie, Air Service, 13th Aero Squadron. For extraordinary heroism in action near Andsvanne, France, October 1, 1918. Lieutenant Guthrie was a member of an offensive patrol of four planes, which was attacked far behind the enemy's lines by six German machines. One of our pilots was forced to withdraw by the failure of his machine guns, and two others were surrounded and overpowered. Lieutenant Guthrie fought the six enemy planes alone for 10 minutes and destroyed one of them. For the following act of extraordinary heroism in action near Montefaucon, France, October 4, 1918, Lieutenant Guthrie is awarded one bar: When the leader of his patrol was blown to pieces by a shell, Lieutenant Guthrie took command and attacked the formation of six enemy planes. Although he became separated from his companions, he succeeded in destroying one of his opponents.

For the following act of extraordinary heroism in action near Fontaine, France, November 4, 1918. Lieutenant Guthrie is awarded one bar; as flight commander Lieutenant Guthrie led his formation of six planes to the attack of seven enemy planes (type Fokker), six of the enemy were destroyed, one of which was sent down by this officer. Immediately following this combat he attacked and drove off four hostile machines (type, Fokker), which were about to attack one of our balloons. Home address, K. R. Guthrie, father, care of A. T. & N. Railway, Mobile, Fla.

First Lieutenant Lloyd A. Hamilton (deceased), 17th Aero Squadron. For extraordinary heroism in action at Varssenuere, Belgium, August 13, 1918. Leading a low bombing attack on a German aerodrome 30 miles behind the line, Lieutenant Hamilton destroyed the hangars on the north side of the aerodrome and then attacked a row of enemy machines, flying as low as 20 feet from the ground despite intense machine-gun fire, and setting fire to three of the German planes. He then turned and fired bursts through the windows of the chateau in which the German pilots were quartered, 26 of whom were afterwards reported killed. Next of kin, Rev. John A. Hamilton, father, 25 Buell Street, Burlington, Vt.

MANUFACTURERS' AIRCRAFT ASSOCIATION BANQUET

THE banquet of the Manufacturers' Aircraft Association at the Waldorf-Astoria on January 7 was a great success, with a thousand guests in attendance, as was related in last week's issue of AERIAL AGE. The speeches were enthusiastic and prophetic, and we have pleasure in presenting them this week in substantial part.

Toastmaster Frank H. Russell struck the keynote of the meeting in his introductory speech. He said in part:

"About two years ago my friend, Harry B. Mingle, had a brain throb; he thought that the half dozen aircraft manufacturers, if they would once get together, would find that each was not such a bad sort of a fellow, and that he was worth knowing better. The result was that the aircraft manufacturers' association was formed. It was a little body, within two months from the time it was formed; the Advisory Board for Aeronautics invited us to Washington to consider the question of preparation for the war, which at that time seemed inevitable. We went. The discussion there was, how many aeroplanes were going to be needed? Somebody thought we would have an army of a million men, and there ought to be at least an aeroplane for every thousand men; so that meant a thousand aeroplanes, and then possible two in reserve, so if half a dozen companies could make 3,000 aeroplanes, we would have done our duty and done it well. We had about 5,500 men at that time building aeroplanes in various parts of the country.

"But, with the arrival of the British Mission and a thorough realization of what the problem of fighting in the air meant, the demand grew from 3,000 aeroplanes to 25,000 aeroplanes, and our work began. At first we were a bit lonely, but automobile manufacturers throughout the country came to our aid, and as they came, if they were building aeroplanes, they were welcomed into our association and for well nigh two years we worked together, not as separate companies, not as individual organizations working for profit, but as one concerted unit, to produce the aeroplanes that our country needed.

"Our forces grew from a paltry fifty-five hundred men to the time of the armistice, one hundred and seventy-five thousand men and women.

"Were those men and women working industriously? The fall of 1918 found the country supplied with more motors and more aeroplanes than could be conveyed.

"The armistice came and everybody took a long breath, and we had a little meeting and said, 'Now let us have a victory dinner, a celebration for the little that we have done.' As we talked about it more, as we went back to our factories and heard of the possible cancellation of contracts, as we realized the number of people who had devoted themselves so faithfully to the service of building planes, we realized that the problem which we had before us had really only just begun. And so we changed the idea of our dinner from a little liberty, victory dinner to a dinner in which we could invite our friends, the army, the navy, our friends wherever they may be, who are interested in aeroplanes and in aeronautics and in the progress of this new art, to come together tonight to confer with us as a council of peace for progress.

"With that idea in view, our committee has selected tonight a number of speakers whom we believe to have the various points or lines of development most clearly in mind.

"To start our evening, I should have said in the beginning that we have a number of regrets —there are quite a number. Among them are those from the Secretary of War, from the Secretary of the Navy, from Dr. Charles Wolcott of the Smithsonian Institute, from General George D. Squier, from Colonel Sidney Waldron, from Orville Wright, and last from Pat O'Brien. He is on the way raising money for a trans-Atlantic flight, and we wish him luck.

"We have a very pleasant surprise, Colonel Bishop, a man who is already very well known throughout this country. In 1915 Colonel Bishop was a boy in Toronto, Ontario. He joined the Artillery, went into service, went from there to become an observation officer in the Air Service, was brought down, went back and nobody heard of him for five or six weeks; but when he reported for duty he was a full fledged aviator. In a matter of three months he had captured the military medal and the military cross. With a record of 72 machines brought down officially and 23 more reported."

Col. Bishop's Speech

Colonel Bishop was most cordially received. After dwelling on his war experiences and marvelous victories, he discussed the future of aviation. He said in part:



"Speaking of the future of aviation, one can only say that aviation has been made by this great war. At the beginning of the war it was a dream of the pioneer of flyers that flying machines should help to scout and do other work, and they did at the beginning of the war; but no dreams that those pioneer flyers could possibly have had could possibly picture the wonderful development which aviation has had during the past four years.

"Each month of the whole course of those four years new improvements and new machines have steadily come to the different fronts, and with those improvements and those new machines new work has developed for the aeroplane, and instead of, as was at first thought, an aeroplane would simply do scouting work and the odd bit of looking around here and there, it now takes part in every action in any kind of warfare, and no action is complete without its perfect cooperation.



"I feel convinced—and really I have seen aeroplanes do some extraordinary things—I feel absolutely convinced that the future of aviation is not in warfare; it is in commerce, and I think that the wonderful record the science of flying has had will be equalled and unsurpassed in the next few years by the development of commercial aviation. The first startling thing will be the trans-Atlantic flight, and as every man here knows, that is not far off, not for one machine, but for many machines. At the end of another year, I feel quite confident that scores of machines will have crossed the Atlantic.

"And a great number of men here tonight will doubtlessly take that trip. This trip will without doubt be done not only in the big machines, but in the small machines. Both of these types have their advantages for commerce. The general idea among the outside public seemed sometimes to be that the only machine fit for a commercial purpose is the big, many-engined machine. This machine undoubtedly has tremendous advantages in carrying weight, in going long distances, and by reason of its two, three or four motor engines, it may be more reliable; but the engines which have been turned out of late in your country, in England and France and Italy have shown us that single engine machines may now be reckoned upon to be absolutely reliable, and that a person flying a machine with one engine, one of the good ones, may rely on that engine not to let him down.

"This is undoubtedly the biggest step that flying has taken, because in the past the people were very frightened of flying over bad country, continually worrying (I have done it myself) of landing in corn-fields and like fields, woods and all sorts of things. Now with engines that one can rely on, we feel absolutely confident that it will carry you through. The little machine will be cheaper in every way, will, of course, not bring the same results with the one exception of speed, and it will always be the fast machine.

"The United States went into this war with a jump in every way, but with an extra jump as regards aviation. It headed with a bang; it seemed to feel that aviation was built for the United States, made for it. The first machine it flew flew in the United States of America. America is very, very proud of that, and she came after when she entered this war in the proper spirit."

Dr. Boynton's Speech

The Rev. Nehemiah Boynton delivered a rousing address and offered a splendid tribute to the late Colonel Theodore Roosevelt. Speaking directly to the boys who had been overseas, he said:

"You come home again, my comrades—for I am so proud that I can call you such—you come home again at a most significant and a most pathetic moment in our American life, a moment when two names are upon the lips of the entire world, and both of them Americans. One of them is being spoken of in the tender words of respect and of memory, a man with whom many may have disagreed in political fields, but concerning whom there isn't an honest American, of whatever party or whatever creed, but who will confess that a more genuine, a more sincere, a more patriotic spirit never graced the office of highest responsibility in our country, whose loss we mourn, and the influence of whose magnificent character and achievement will abide throughout the centuries, side by side with those of Washington and of Lincoln. He speaks an earnest word to every lover of his country, a word which is particularly significant at this time, and that word is: The necessity on the one hand of genuineness of personal character, and on the other of everlasting watchfulness, with relation to the rights and the interests of our country and of our Allies, lest in the genial and relaxing attitude and temptation of these conquering days we after all lose that crown of victory which we have won upon the arena of war.

"He reminds me in his character of a line from Richard Watson Gilder, which may well be quoted at this time:

> When to earth I must,
> Where the fathers sleep,
> When fulfill the trust,
> And the mourners weep,
> When, though free from rust,
> The sword has lost its worth,
> May I bring to earth
> No dishonored dust.

"And the other man lives in the thought of the entire world today because of the majesty of the undertaking which is his. Saturday was a wonderful day, if you think of it, it was the day when the *Mauretania*, the sistership to the *Lusitania*, whose sinking revealed the character of the Hun—to which you referred, Colonel, a moment or two ago—and among the list of the cabin passengers was a little company to which I call your attention. There, together with his wife, is one of the wealthiest citizens of New York, over there is one of the most outstanding bankers of



The banquet of the Manufacturers' Aircraft Association, held at the Waldorf-Astoria on January 7, 1919, at which a thousand aeronautic enthusiasts, army, navy, civilian and industrial, were present. (Photo by Drucker)

the city of New York. There is a man whose name is known throughout the entire country, not for his wealth, but for the philanthropy of his spirit, and they are but samples of a little company of a dozen people who are sailing away from our shores tonight in order that they may go to the near East, where the outrages have been so dreadful, and where the needs so absolutely pathetic today, in order that by personal examination of the situation, they may come back and say to us Americans, what we must further do in order to show that spirit of friendship to a depressed race, which it is our boast to have set up in these splendid ideals which we have declared have been those for which we and our brave Allies have been struggling in this last tremendous encounter.

"And that ship the *Mauretania* could almost have crossed the cable which was bringing a word under the sea from the President of the United States to the Congress assembled in Washington, asking them immediately, because of the stress of the situation which obtains in many neutral nations who are our friends to send at once a hundred million dollars, in order that by clothing the naked and feeding the worthy poor we may give another practical demonstration of our abiding faith in that principle of friendship which we are setting up in the world."

Mr. Marshall's Speech

Mr. H. Snowden Marshall, who investigated the aircraft situation in the spring, was the next speaker. He said in part:

"On the eleventh day of last November the production of aircraft in this country had gotten under full swing. The whole force of the country had gotten back of it, it was approaching —although it had not yet reached the very top of the speed that it was approximating.

"I am told that on that day there were aircraft in this country that could not be shipped abroad for lack of ships. On that day, in the foot race that was going on between Mr. Ryan and Mr. Schwab, Mr. Ryan had forged ahead almost a lap, and I understand had turned around towards Mr. Schwab and placed his thumb upon the end of his nose and extended his fingers to Mr. Schwab, making a sign, gentlemen, that was classical many years ago.

"Now, because that success had been reached, because everything had gone so well, and because this country was taking a great pride in its manufacturers of aircraft, I think perhaps you will be glad to have me dig up the dry bones of the past and tell you how bad it was, or was thought to be, not quite one year ago.

"It will be a pleasure, perhaps, to hear about it, because the contrast is so keen and clear, and the success has been so great that the memory of what people used to say about you, about the manufacturers of American aircraft, the memory of the bricks that were slung at you, is a pleasure now to think of it.

"Last March, I would say, was the time when the blackguarding of aircraft manufacturers got its zenith. Every editor who had anything to spatter, spattered you. Every fellow who wanted cheap notoriety abused you. The most remarkable men, from the most remarkable sources, appeared in public places posing as experts in aircraft manufacture and chucked bricks at you.

"Now, the torrent of abuse got so great that this committee was appointed, of which I happen to be a member, and it was thus that I theretofore entirely innocent of any knowledge of aircraft manufacture became introduced in some degree to what was going on at that time.

"Well, the first thing I walked into was a fight. There was the most tremendous lot of vituperation going on, the most blasphemous charges of fraud, of treason, of profiteering; there was a sort of a general impression on the part of some newspaper men at least that every factory for aircraft was infested with German spies which tore down the work as fast as it was put up. It is so happily forgotten, but that was the state of the public mind at that time.

"Now, the uproar that was going on made it difficult to find the truth, the investigation which we made was necessarily as hurried as we could make it, the time pressed, it was necessary to dispose of a lot of foolish charges, it was necessary to find out what the country could do and what the country could not do, and the report which we made had necessarily to be confidential, because the efforts that we had made to find the truth disclosed what we though was the absolute truth, and of course that was the thing which of all other things would be best appreciated in Berlin.

"But I think I will be violating no confidence at all if I say that every member of our Committee, after going up and down and all over the country and looking at all of the people and discussing things with the manufacturers, and with the Signal Corps, and with everybody concerned, unanimously formed the opinion that there was no truth whatever in the false and libelous charges that had been made against the body of the people who were working on this, but that we had been in contact with an able, a patriotic, and an honest body of men, who were striving under the great handicaps, to accomplish a great good for their country.

"Now, I have been asked here of course to talk of the past, but I can't help thinking of the future. The problem we have here now is a pretty big one—it isn't as big as the one we had before, and as we solved the last one I am sure we will be able to solve this one; but here we have aircraft turned out in quantity, talented, skillful manufacturers able to turn aircraft out. It is a certainty, as sure as people can be of anything that they don't know, that the time is near when the production of aircraft will be a most important thing, commercially and in every other way in this country, and we have come to a stop. Are these manufacturers, are their plants to be dismantled? Are we to let this great industry that was born in America leave here again? The only customer, the only present customer, is Uncle Sam. The commercial or other uses of aircraft have not yet developed, but it seems to me it would be an awful pity if we slumped back into the state in which we were before, and left to other countries, left to countries across the water, the development of that industry that belongs to the United States by right of discovery."

Mr. John D. Ryan, former Director of Aircraft Production, delivered a brief address. He said:

Mr. Ryan's Speech

"I was called in the aircraft production at a time, as Mr. Marshall says, when there was a great deal of discussion, a great deal of criticism, and a great deal of blame; and I say to you tonight in all earnestness most of it was totally and entirely undeserved.

"Aircraft production had to start at the beginning. It had to find a way from nothing, to meet the demands of the American people, and brought to a point that was beyond all reason. People talked of clouds of aeroplanes, of tens of thousands of sparrows, and it was just as impossible to realize that dream as it was to realize any kind of a dream. Aircraft had to be built slowly, carefully, it had to be built to conserve, first, the lives of those gallant boys who took these ships in the air. They had to be made sure, every wrinkle, every crinkle, everything that could be a menace to the life of these boys had to be taken out of them, if it was possible, before they were sent to fight across the line, and they had to fight across the line. The work that was done before me made it comparatively easy for me to win a good deal of praise, as I say, that I was not entitled to.

"The work of my predecessors, the work of the aircart manufacturers of the United States, was a thing that, when I got into it and studied it, was amazing to me in its competency, and all it lacked was just time enough and just some organization to center it, to drive it in the direction, and to finish it.

"The manufacturers of this country, with singular devotion to the country, with great patriotism, and with the greatest earnestness that I have ever seen in any body of men, had built an organization for the manufacture of aircraft that certainly has never been equalled in the world, in the time in which it has been done.

"The brains that were in the aircraft organization at the time that I took charge of it had been well-directed, there were some things that might have been better done. There are things always that might have been better done, but in the main, in the mass, the work was well laid down, it was under way, and the manufacturers of this country who were making aircraft were doing a wonderful job, as far back as last May.

"I want to say that no association of my life has given me such great pride and such great pleasure as the association with aircraft manufacturers, with the Department of Military Aeronautics, with these boys who took our planes and proved them and flew them and fought them.

"When I went to France in September, our planes had only just begun to reach the front lines there were a good many of them there.

"In the first day of the fight at St. Mihiel, I went from one pursuit group to another and one observation group to another and talked with the boys and asked them how they liked the American-made planes. And I think these boys sitting here tonight will tell you even then, after they had had them only a comparatively short time, there wasn't a single man of them who did not say that they would not take any other plane of a similar type into the air, if they could get an American-built plane.

"The greatest effort necessary to build aircraft, as you gentlemen know, to start the building of aircraft, was in the building of the engines and is there anybody here tonight who doubts that the accomplishment of the American manufacturers of engines was one of the greatest accomplishments in the war, one of the greatest things done in the war? When the war ended, there wasn't a nation on our side of the war—and I am sure there wasn't one on the other—who would not take every engine we could build for them of the types we were building, there was not a single nation in the war that did not want more of what we were making than we could build for them.

"And we did not do so badly. From the time we began, we built more engines, and we built more planes, month for month, from the time we began, than any nation in the war built from the time it began. We had more engines ready, and we had more planes ready, month by month, from the time we commenced, than any nation in the war had month by month from the time it commenced.

"As Mr. Marshall said to you, it is no glory to me. I did not build it, as Dr. Boynton said to you, it struck a chord with me as he was concluding, he said he did not know anything about aeronautics, and neither do I.

"But the American manufacturers of aircraft, the American engineers, with their ingenuity, their brains, their patriotic devotion, the tremendous work they put into it, were building so well and even so fast that the day the armistice was declared there were six hundred and eighty-six American planes at the port of embarkation that could not be loaded. That was not the fault of the shipbuilders. Mr. Marshall gave us more credit than we were entitled to. But the reason for it was that while we were building a good many planes, a great many other people were building other things that General Pershing and the people on the other side wanted very badly, and they were taking trucks and ordnance and other things that they needed very badly, and leaving aeroplanes for the last few days, but the fact remains and we have it to our credit that we had more planes ready for them than they were ready to take.

"It was a great adventure, and we are all proud of it. I hope that what has been accomplished in aircraft, in war times, will be duplicated to a great extent in peace times. I haven't any doubt that there is a great peace future for aircraft. I haven't any doubt that the men whose brains, whose money, have been put into aircraft will go on developing it, perfecting it, making it so necessary to the life of the world, that the peace requirements in time will exceed the post-war requirements.

"I thing the peace requirements—and I don't believe I am over optimistic—will in time startle the world. I don't think it is coming today, and I should regret very much if it were pushed too much. I think with care and caution and development and trial that the aeroplane can be made as necessary in peace almost as it is in war, and I believe it is in good hands. I believe the manufacturers of this country, who are in the aircraft business today, will see it to their own interests to proceed cautiously, carefully, and make as few false starts as possible, develop it on broad lines and bring it to the fruition it deserves.

"I am out of the aircraft, as you all know. I am back a plain citizen, but I have great interest in it and its future. I should hate above all to see aircraft, particularly for the defense of the country, go by the board.

"I should think that it would be plain to almost anybody that in the necessity for the defense of a great country like ours, with a great coastline like ours, a very extensive aircraft program is a very desirable thing.

"I think the science of aviation should be encouraged in every possible way. I would have an academy of aviation, just as we have a military academy at West Point and a Naval Academy at Annapolis. I would educate the boys of this country from the time they are boys in aviation, strictly and almost exclusively, and I think that with the proper expenditure and the proper direction, that within five years from now an enemy fleet that attempted to reach the shores of the United States would be detected and located so far out at sea that it would be put out of business three or four hundred miles beyond the reach of the shore.

"I don't think there is anything in the nature of a dream about that. I don't think that anyone who studies what has been accomplished in aviation, and who thinks what might be accomplished, can consider that at all a dream.

"We now have planes that have a long range, we will have planes with a longer range, not necessarily the fastest planes, but planes with a long range that could absolutely detect the presence of a hostile fleet on its way to these shores, at least five or six hundred miles before they could reach us. Not deprecating in any way the great naval defense that we want in this country, and that we must have, I would say the planes could locate the fleet and the navy could destroy it, it could be told where it was and destroyed before it could reach us.

"I think it is a great pity that the brains in the aircraft organization, naval, as well as in the army, should be scattered. I think that the civilians who have come into this work, able engineers who have gone so far in this work, should be used, should be kept, should teach the younger generation all they know, pass it along, and that these great organizations that have been gotten together under the stress of war should not be dissipated and go back to their civilian employments without leaving with the country the benefit of all they have learned.

"I think that the great manufacturing organizations should not be destroyed, or allowed to fall into disuse. I don't advocate the building of great numbers of aircraft for military purposes. I don't think it is necessary. But I think that sufficient encouragement and employment can be given to the well-developed aircraft factories of this country, to keep them in the aircraft business, to induce them to make every discovery, to do everything they can to promote the science of aircraft. The organization should be kept intact, the men who are able and who have done this thing, should be kept together as far as possible. It would be a small expense, and God knows, it might be a great measure of economy some day.

"It has been a great thing to be identified with the development of aircraft during this war. As little as some of us have had to do

with it, it is a thing that we will be proud of to our dying day. To be associated with you men who have done this wonderful work in the building of aircraft, to have served these boys who have carried our craft across the enemies' lines, and they had to go across the enemies' lines because he couldn't come across ours—who have destroyed him, has been a thing that one can hand down to his children with great pride."

Lieut. Emmons' Speech

Lieutenant H. H. Emmons, U. S. N., who is in charge of the Aircraft Engine Division of the Bureau of Aircraft Production, and who performed his duties so excellently in that capacity, said:

"The first thing is that this war is the first war in history that has called for a large amount of industrially made material different from any preceding war. Other wars have depended upon men and wagons and some artillery and the things that go with them. This war developed into a scientific fight, which called for an enormous amount of new industrial material, of many different kinds and types, such as aeroplanes and engines and tanks and gas and flame projectors and chemical work, and electrically heated clothing, and instruments by the score, and things that never before had been used in any fight since the history of the world began.

"Therefore, industry and manufacturers were called upon to produce this material as something new. Now, the first thing I would like to ask you to remember is, just consider and look over this list of things and find out how much of it got to the front in time for the final fight, and you will find that there were more aircraft, more engines, and more brains there than there were of any other kind of new industrial material made for this war.

"Now, that was made by the members of this Association and others who are not closely connected with it, and who are not here to-night.

"Now, having that in mind, I want to give you a few figures, ordinarily they are very dry, but I think these will interest you, as to what was actually produced by this aircraft crowd, and when I speak of manufactures, gentlemen, I include not only you who were working in the factories but I include the unfortunate members of your fraternity who were chosen to go to Washington and represent the Government. You want to thank your lucky stars that you were permitted to stay in your own plants and work, you might have been one of those victims that was chosen to go there and represent the Government.

"There were a number of them chosen to go and do that work, and you all know, it isn't necessary for me to say to you, that there never was a higher-minded, better-principled, harder-working group of men put on any job than those men in that aircraft work.

"They were not super-men, they were men like you and as I say, you might unfortunately have been one of them, but luckily you were not. As soon as they got there, they were oppressed with all kinds of assistance from every person on this side of the water and on the other, who thought he knew anything about this subject. Each man said, 'Make my machine, or my engine, don't make this one'; the other fellow said 'Make an American engine,' the other man said 'Don't do this, make a foreign engine'; everyone had a different idea, and he wasn't slow about expressing it.

"The situation soon became like it was in the section gang that found a great big rock on the railroad track. There were three Irishmen in the crew; one fellow said 'Let's take our pick and get it off'; the other fellow said, 'No, the way to get it off is with the shovel'; the third fellow said, 'Take my crowbar and knock it out.' The foreman then said, "All of yez, throw down your tools and come around on the side with me and lift, and we will get it off." And the leader in the Aircraft Production Board at that time said the same thing to everyone, 'Come around and lift with me, we may not get the very finest way to do it, but we will get it done in some way.' And it was done.

"Now, gentlemen, this is what you did. The requirements of the aircraft were of two classes, first for training; second for combat. For training we had already in America two engines that could do the work, the Curtiss and the Hall-Scott. There were others that could have helped, but time didn't suffice to enable us to use them. There were planes to go with them, and we adopted these two and pushed the production of them, with the result that the training planes were put in our fields, with something over 16,000 engines to fly them before the war was stopped.

"Now, to understand what that means, you should know what the situation was when this was started. For the eight years prior to 1916, the Army had ordered fifty-nine airplanes and had received fifty-four. During the year 1916, the Army had ordered three hundred and sixty-six planes and had received sixty-four. In other words, for the nine years prior to 1917, the Signal Corps of the Army had received the enormous sum of one hundred and eighteen aeroplanes. That was the equipment that they had had up to the date that we started this business, and that was all that they knew about them. Now, from that we had to start with a program laid down by the joint army and navy technical board, calling for over 9,000 training planes and over 20,000 combating planes, and you gentlemen who have made any of this material know what it meant to tackle a job of that kind.

"Now you made nine thousand of the training planes, you made the sixteen thousand training engines, and every one of them had been delivered and put into service, gentlemen, before the armistice was declared.

"On the combat engine side we were oppressed with the same multiplicity of advice. As a result of which it was determined to put our main effort upon the Liberty engine. I am not going into the arguments for or against it, I am simply going to call your attention to this fact, that on the nineteenth day of May the first stroke of the pen was made to design the Liberty engine, the first engine was built complete and delivered in Washington on the fourth day of July, less than six weeks, it was extended into a twelve-cylinder engine and the first one was built and passed the fifty-hour test by the twenty-fifth day of August of that same year and was pronounced a success and ready for production. We started to produce that engine which was rated at a horsepower of three hundred and thirty. When we had tooled and jigged up for it and gotten the factory ready and had produced several hundred of them we were told to increase the horsepower. It was boosted to three hundred and seventy-five, with the resulting changes in the tools and equipment. When we had made some four or five hundred of them we received our final instructions from abroad and I might say to you that most of the things you have felt disposed to criticize, you will find they were done by us because we were told by the authorities under whom we were working that that was what was wanted, and that we should do it. We received our instructions from the other side that if we could produce an engine of four hundred horsepower or upward, we would have the engine that would do wonders in 1917 and 1918. Many changes were required to get that large engine, and on the 29th day of May, 1918, one year after this engine was started to be designed, we had passed all those difficulties, had engineered and developed it, put it into a manufacturing proposition and delivered into service over eleven hundred of them.

"Now that is an accomplishment that never has been equalled in industry anywhere. Those of you who are familiar with the automobile business know that no automobile motor of any size or strength has ever been put into service without at least a year of experimentation and development on it. This Liberty engine had no such year of development before it was put into production and it did not need it for the reason that the design was proper when it was made. You have heard about changes on that engine. From the date it has been made until now there have been no fundamental changes on that engine. We have changed the oiling system, but there aren't any fundamental changes.

"The changes that you have heard about are of two classes: We know those were required by the two increases in horsepower that I have told you of, and the other the manufacturing changes that always are discovered in the process of production. And those are all the changes that have been made on this engine during the time that it has been in production.

"Now from the 29th day of May until the armistice was declared the production of these engines jumped by leaps and bounds, until during the month of October the production of Liberty engines was 3876, or over 150 for every working day in that month.

"The total engine production of all types for the month of October was 5603, or over two hundred for every working day in the month, and as my friend Gen. Cormack told me, 5603 is more engines than were produced in any one month during the war by England and France combined. (Applause.)

"Now, we had, gentlemen, under contract for production, 95,995 aviation engines, at a total cost of engines and spare parts of over $450,000,000. We had them in production in the finest plants that are in the world for the production of machinery and particularly motors.

"On the 29th day of November, exactly 18 months after the first scratch was put on the paper to design the Liberty Engine, we had produced and delivered into service 15,000,000 Liberty, 12-cylinder engines. We had produced and put into service of all kinds of engines, training and combat over 32,000, that is over a third of the total that we had ordered built. Now, one may ask where those engines went, and it is quite interesting to know where they went because there has been some question asked about that.

"Of the Liberty combat engines, 5,000,327 of them went to aeroplane plants to be installed in planes, or to accompany those planes as spare engines, and over 3,000 of the D. H.4 planes with the extra engines had been produced and started for the front when the armistice was declared. Of these Liberty 4,511 had been delivered to the American Expeditionary Forces in France as engines only, not accompanied by planes. 3,742 engines had been delivered to the Navy and we had delivered to the English, French and Italians, 1,089 engines for their use, and we had put on our fields for the training of our aviators 907 of these Liberty engines. That will give you some idea of the extent to which this production had gone. By January of this year we would have been producing over 6,000 aviation engines of the Liberty type per month, and by April of this year we would have been producing 10,000 engines per month of every type. That is what the manufacturing interests of this country have done.

"Now, that is only one item of production in the Bureau of Aircraft Production work. I might tell you about balloons. The balloons are wonderfully interesting things. We had delivered over 700 of them by the time the armistice was declared. Our balloon companies went from the ships direct to the front, thoroughly equipped and prepared both as to men and material and took their place on the line at once. So that the country and the manufacturers of them in aircraft work have a right and ought to understand that the work that they have done has been absolutely marvelous, and that this criticism and talk and blackguarding that we have been subjected to is entirely uncalled for and it doesn't make any difference what source it comes from.

"Now, the manufacturers of the country have not had their due from this. We have heard about the millions and the billions of profits that these profiteers are going to make. We all know that this is incorrect, that the manufacturer who comes out of this work even is doing a very handsome thing by himself, under these circumstances. But we all know, and we should all hold it in our own remembrance, for our own satisfaction, if no one else will believe it, that whenever the necessity arises for the manufacturing interests of this country to come forward again, if the time ever comes when anybody else arises and says that by sheer brute force and bestiality he is going to try to override the right and justice of the world, the manufacturing institutions of this country stand ready to come forward and sacrifice themeslves again and do their part as they have done this time!"

Second Assistant Postmaster Otto Praeger discussed the aerial mail service. He discussed the various types of machines which he anticipated the industry would be required to build for his special work.

Planes Visit Aborigines

Army pilots at France Field, Cristobal, Canal Zone, Panama, are required to do much of their flying over water and along the coast. A flight to the Gulf of San Blas, consuming three and one-half hours, was recently made by two R9 hydro-aeroplanes.

The Gulf of San Blas is situated on the Atlantic Coast about one hundred miles southwest of France Field. The mainland and numerous islands in and around the Gulf are inhabitated by Indians, who are suspicious and unfriendly and decline to trade with strangers. In view of this information it was not contemplated stopping here, but due to the overheating of one of the motors a landing was made and the machine beached on one of the most populous islands. None of these people had ever seen nor probably ever heard of a flying machine, and great consternation was manifested when the ships taxied up to the village, while from all the neighboring islands there were sent numbers of small dugouts.

It is doubtful who was the most fearful on this occasion, for when the begoggled pilots stepped from their machines the entire population of the island was lined up on the beach, armed to the teeth. The headman very reluctantly took his place in front of this aggregation and greeted the visitors with a scowl and a machette in his left hand. One of the pilots was a new arrival in Panama and unfamiliar with the current yarns about the unfriendliness of the Indians. As soon as he stepped on the beach, he rushed up and greeted the headman in a very effusive manner and fortunately his friendly smile was properly interpreted. Most of the men were half naked and the boys entirely so. The costume of the women was both picturesque and very uniform. Bare feet were in vogue, the ankles and calves wrapped with a reddish string fiber, while short red dresses of the same material and without sleeves reached to the knees. The majority of the women wore large gold rings in their ears and noses and in many instances necklaces and bracelets of attractive design made from sharks teeth. A camera was brought out, but this aroused such a feeling of hostility and suspicion that it was deemed advisable to return it to the ship. Some of the small boys mustering up courage came close enough to accept cigarettes, which they apparently enjoyed hugely, and finally the old chief himself grudgingly accepted one.

After this the pilots were permitted to go through the village proper, and by way of courtesy the chief was invited to come aboard one of the hydroaeroplanes, which invitation was not accepted. Radiators were filled with salt water and after a stay of about two hours the return flight was accomplished without serious trouble.

PLYWOOD IN AEROPLANE CONSTRUCTION

By HENRY HARRISON SUPLEE

IN view of the fact that the extensive use of laminated plywood is beginning to be considered seriously by the builders of aeroplanes in the United States, it may be advisable to review the extent to which this unsurpassed material has already been successfully employed elsewhere.

Notwithstanding the importance of other materials of construction which have been produced and used for all structural purposes, it still remains that, to use the words of one of the most eminent engineers and inventors of America, uttered with the results of an unequalled testing laboratory before him: "For all purposes in which its use is possible, there is nothing which can equal a good sound piece of wood."

For some purposes, however, wood, in its natural condition, is inapplicable. Large sheets, sawed or sliced from large logs, especially when thin, have little strength, save in one direction. Even if sound when cut, they can with difficulty be prevented from splitting and cracking; and this defect appears to a still greater degree when the sheet is rotary cut from smaller logs.

For some purposes, however, large continuous surfaces are required, and hence, for many years the makers of furniture, panels, and similar work have found it necessary, when such a surface is needed, to glue a thin sheet to a heavier backing. This method, having the further advantage of enabling a face of a fine wood to be placed upon a backing of inferior material, has led to a natural discrimination between such "veneered" surfaces and the so-called "solid" wood; a condition of affairs which may have had something to do with the prejudice which the uninformed man usually has against what is most incorrectly called "veneer."

Laminated plywood, called by the French *contreplaqué*, and by the Germans *furnier*, is apparently of Russian origin, and has nothing in common with "veneer" except that it is built up of plies of thin wood.

Ordinary glue, made from hide, bone, animal gelatine and the like, and soluble to a greater or less degree in water, or swelling and loosening on exposure to atmospheric humidity, is manifestly unsuitable for the production of a homogeneous and permanent structure of this sort, and hence it should never be used for any serious work. It is absolutely necessary that the idea of a number of sheets and fragments of thin wood, stuck together by any such adhesive, should be dismissed from the mind when the material "plywood" is under consideration.

True plywood is an *original product*, resulting from a *scientific process*, involving a correct and methodical sequence of operations, all depending upon each other, and all demanding immediate relations with each other. The elements of the original structure of the wood; the relations of the particular cementing material employed to the wood and to the atmospheric conditions of the moment; the temperature required to produce the chemical reactions between the wood and the cementing material, and within the cementing material itself; and the magnitude and duration of the pressure applied per unit area; all these form such a number of variables that no routine standardization is practicable, and only the exercise of individual skill, obtained under long experience, can produce a determinate result.

Any attempt to take somebody's glue, of unknown composition and reaction, and spread it over sheets of wood of unknown moisture content and indeterminate structure, regardless of weather conditions, whether hot or cold, moist or dry, and hold them together with an uncertain pressure for irregular periods of time, must obviously result in a nondescript material, wholly unfit, except by accident, for the severe requirements of aeroplane service.

When we consider the care with which the materials entering into the construction of the motor are specified, analyzed, and tested, we may gather some idea of the absurdity of neglecting like precautions for the material composing the structure which carries, not only that motor, but also the lives of men, the material of combat, and all the stresses of action in the air.



Plywood cowling above the pilot's and gunner's cockpits for the De Haviland "4," made by the Dodge Manufacturing Company, Mishawaka, Indiana

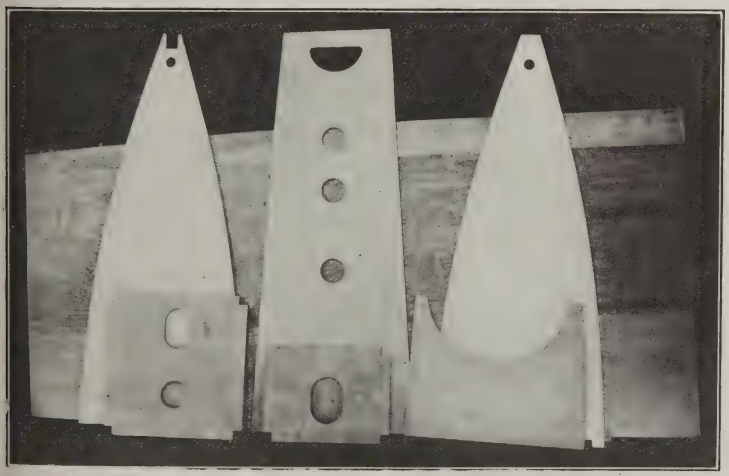
One of the highest authorities upon the subject of the union of materials by glues and similar cementing materials, Dr. Samuel Rideal, the eminent London chemist, states as an essential to satisfactory results, that:

"It is necessary to know the properties of the materials used, and the chemical and physical conditions at every stage of the process; these must be observed systematically."

It does not follow that there are any insuperable difficulties to be overcome in the manufacture of aeroplane parts of the highest character from laminated plywood; on the contrary, this material, during the recent years in which its production and applications have been perfected, has become a staple product in the establishments which have worked out the details and apparatus of the industry.

Laminated plywood, formed into shapes under heat and high pressure, with cementing materials which become insoluble in the course of the process, has been used in Russia for many years, notably in the works of the Russian-Baltice Wagon Company, Ltd., and its use extended thence into Germany in the products of the Deutsches Rohrplatton Gesellschaft; from which a knowledge of these special processes and equipment passed to the United States nearly twenty years ago. The process was used in Russia for the manufacture of wagon parts, tubes, containers, etc., and for similar parts in Germany, while in the United States it was developed especially in the manufacture of such containers as the well-known "Indestructo" trunks, as well as for special containers, flour bins, conveyor tubes, and the like.

Very early it was employed in Russia in airship construction, and more than thirty years ago Captain Kostovitch built a rigid airship, of the type later developed by Count Zeppelin in Germany. In-



Set of plywood sheathing for the fuselage stern, De Haviland "4," National Veneer Products Company, Mishawaka, Indiana

stead of using an aluminum alloy for the rigid framework of this dirigible, Captain Kostovitch employed formed shapes of laminated plywood, wholly waterproof, and extremely strong and light. This rigid structure enclosed seven balloons, filled with hydrogen, of an aggregate capacity of 9,000 cubic metres, and in construction and design anticipated the most recent rigid plywood dirigibles of the Zeppelin type built by the Schütte-Lanz Company in Germany.

It was in 1910 that Sikorsky began his experiments in aeroplane building, and he naturally turned to plywood as a material well-known in Russia and available for his purpose. The work upon the large quadruple-motored Sikorsky aeroplanes, built in 1913 and 1914, was done in the works of the Russian-Baltic Wagon Company, and the entire fuselage of the first Sikorsky machine, the "Russky Vitiaz," was made of plywood, thus anticipating the developments of the German Albatross and Gotha machines by several years. In Russia, also, the first complete plywood aeroplanes were made by Steglau, in 1912, these remarkable machines being constructed wholly of plywood, including the wing covering, no linen whatever being used. The extreme rigidity of these plywood wings showed the superiority of the material for this purpose, and since the weight of the whole wing surface was no greater than the linen-covered skeleton of spars and ribs otherwise employed, the radical value of the construction became apparent.

In France, as early as 1909, Levavasseur had built a box-girder fuselage covered with sheet plywood for the Antoinette monoplane, but defective design caused this machine to be of insufficient strength, and its use was abandoned. Probably this improper use of plywood had much to do with the tardiness of the otherwise brilliant French designers in a wider use of the material.

In 1912, Béchereau, the able designer of the Deperdussin Company, produced a special machine for entry in the Gordon Bennett race. Realizing the immense influence of low aerodynamic resistance upon speed, Béchereau designed the so-called "monocoque" fuselage, shaped, as closely as possible, to the streamline form, to minimize the production of eddy currents and resistances. This body, or fuselage, was constructed over a mould by gluing successive layers of narrow wooden strips, with interlayers of linen, the successive layers of wood being laid in diagonally crossing directions, and the exterior smoothly finished. This machine, a monoplane, showed by its victorious performance, the great advantage involved in this form.

The building up of a fuselage according to the method of Béchereau has been successfully applied repeatedly in France and elsewhere, and the correctness of this design fully demonstrated so far as performance is concerned, but the difficulties of adapting the detailed construction to quantity production have led to other methods for attaining similar fuselage forms. In any case, such a fuselage, even when bonded together with plies of linen, or similar fabric, is not an altogether scientifically arranged distribution of material to attain maximum strength with minimum weight, and it is impracticable to bring to this construction the desirable elements of heat and pressure.

The earlier German Albatross machines were built after the prevailing French models, the fuselage being made up of four longerons, or longitudinals, trussed with short wooden and wire struts and ties, and covered with linen.



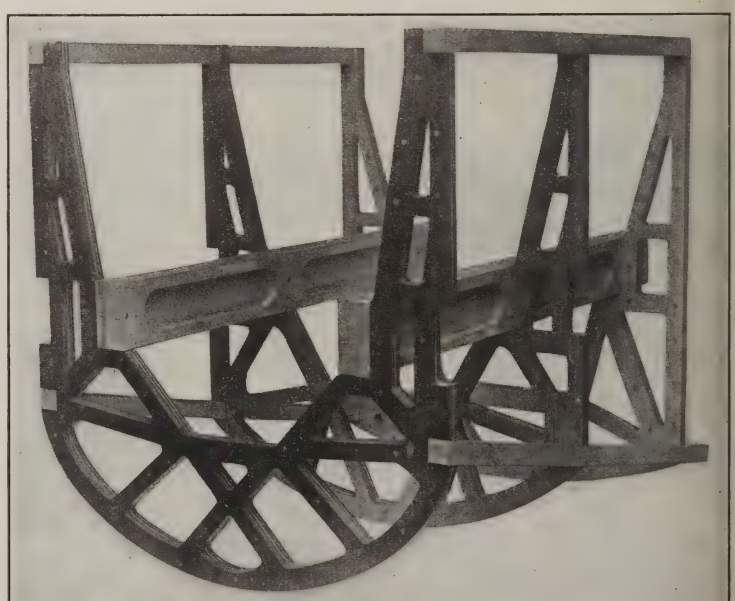
A plywood monocoque fuselage designed and constructed by the Dodge Manufacturing Company and submitted to the Signal Corps, U. S. A., in May, 1916. It is 17 feet in length and weighs only 86 pounds

In 1912, a German aviator, named Bier, visited Russia, ostensibly to give exhibition flights with one of these German Albatross biplanes, but it was afterwards proved that he was really an officer and investigator in the flying corps of the German army. Soon after the return of this officer to Germany the German Albatross Company began the use of plywood in fuselage construction, following, not the built-up system of Béchereau, but a method decidedly more correct, and doubtless derived from what had been learned about the plywood machines of Steglau and Sikorsky.

Instead of a unit monocoque, the streamline form of fuselage was produced by the use of four or six longerons, fitted over bulkheads or frames made of plywood, the whole being encased with sheets of plywood, formed to the tapering curves of the shape of minimum aerodynamic resistance, these plywood sheets being fastened to the longerons and frames by screws or nails. In this construction we see a distinct adaptation of the long-accepted method of boat design, modified to meet the requirements of form and the demand for lightness, and adapted to the most efficient utilization of plywood.

England and France continued to use the linen-covered truss construction, and the precedents thus created were followed in the United States, with little or no regard to what had been developed in Russia and Germany.

It is true that certain engineers in America, approaching the subject from a wholly independent viewpoint, produced and urged the use of fuselages built upon longerons and bulkheads, developing plywood fuselages of great strength and marked lightness and low aerodynamic resistance, while entirely unaware of the work which had been done in Germany. Plywood was even offered for wing-design, and full-size wing sections developed to demonstrate the applicability of the material and the weight possibilities. For more than two years such plywood construction was urged upon the authorities in the United States, with negative results, the experience of practical workers



The plywood construction of bulkheads and engine bearers for the De Haviland "4" battleplane



View showing the interior of a monocoque fuselage built by the Dodge Manufacturing Company. The frames, longerons, and skin are of plywood

in this line being ignored, while time and money were expended in uncertain and less-tried ways.

The extent to which the plywood fuselages of the later Albatross machines were able to resist punishment, and the good condition in which they landed, even when brought down under fire, was conclusive evidence of the superiority of design and construction of these aeroplanes. Owing to the manner in which the plies of the wood were laid up, with the grain of the sheets crossing and interlocking, the fuselages, even when riddled with holes, held well together, and even after apparently destructive falls were picked up whole and unceremoniously hauled away by their tails without coming to pieces; a marked contrast to the crumpled mass of kindling wood produced by a wrecked truss body.

The use of plywood on British and French machines is even yet unlike that of the better German aeroplanes, mainly because it is still endeavored to use the plywood in flat or slightly curved sheets, nailed on as a mere covering, and not formed and united in an integral part of the structure. Thus, in a certain British machine, a separate cowling is fitted on top of the longerons, while flat sheets, cut to form, are attached with screws to bulkheads and longerons. In like manner, an Italian pursuit machine, in many ways of admirable design and execution, does not realize the full value of the material. Even at the present time the prevailing tendency is to procure plywood in large flat sheets, and cut it up and try to bend it dry and cold into forms for which it is unsuited, this being clear evidence of the lack of grasp of the possibilities of a material so eminently adapted for original moulding and shaping.

A critical study of the use of plywood in the German machines becomes especially desirable in view of these facts. In the Albatross CIII or DI the manner in which the skin adds its strength and stiffness to the frame is worthy of close examination, while in the later Albatross Cv we see how the form of the fuselage is blended and curved off into the lower wings and into the vertical stabilizer in a way which reveals an intimate knowledge of the art of moulding and forming the plywood, giving at the same time strength, stiffness and minimum wind resistance.

It is interesting to note the extent to which the aerodynamic resistance has been reduced in these later Albatross machines, and increased speed obtained without material increase in powering. The 160-horse-power Mercedes or Benz engines have driven aeroplanes of this type at least 20 per cent. faster than was practicable with earlier forms and construction of fuselage. In some of these German machines the plywood skin is attached with cement-coated nails, instead of brass screws, a modification probably due to limitations of materials, but the general distribution of material and the efficient results attained reveal a wholly different appreciation of the real value of plywood from those who see in it merely one more material for covering.

It has been sought to secure a high grade of plywood for aeroplane construction by drawing up specifications indicating certain tests, such as soaking for hours in boiling water, or baking, etc., such requirements being apparently specified in ignorance of the fact that such prolonged temperatures add to, rather than detract from, the resistance of properly made plywood. No one wants to boil an aeroplane, and such a test is of no informative value as concerns the actual service to be rendered.

It is well known that one of the critical stages in the construction of a trussed fuselage is the process of "truing up," an operation of hours and men, a "tuning up" of wires and struts, of uncertain value and limited duration. A machine with a fuselage out of line is regarded as unfit for satisfactory service, and hence the care which is taken in the original alignment of the body, and the careful inspection and tuning given to machines with truss fuselages after flight.

A plywood fuselage, on the contrary, properly designed and

(*Continued on page* 961)

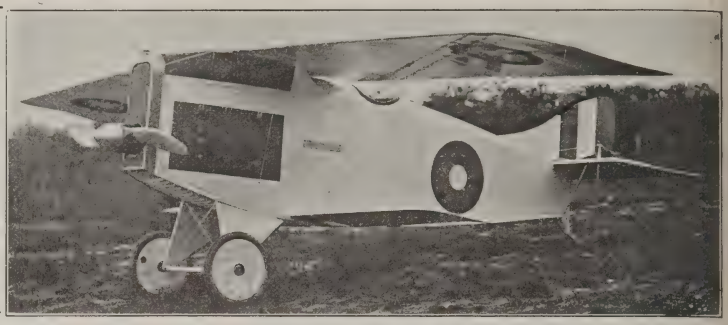


Making plywood wing ribs, National Veneer Products Company



Building up fuselage tops for the De Haviland "4" Aeroplane

THE CHRISTMAS STRUTLESS BIPLANE



SEVERAL attempts have been made for years by experimenters to perfect an aeroplane with flexible wings, or following closely the flexibility of the wings of a bird. The biplane designed by Dr. W. W. Christmas appears to have met with much success in the structure mentioned, and his theories of flexing wings have shown more practicability than most rigid-wing adherents were apt to believe possible.

The British and French Governments have manifested considerable interest in this machine, probably because of reports of the great speed accredited to it.

A most radical departure from what has heretofore been believed to be necessary practice is the entire elimination of struts, cables, and wires in the bracing of the wings, as well as the absence of wiring in the internal structure of the wings. The wing curve is one developed by Dr. Christmas, and is of fairly deep section between the main wing beams, but tapering off sharply aft of the rear beam, and merging into a flat thin, flexible trailing edge. The effect of the section is to maintain a high angle of incidence as the machine is travelling at low speed, and a high angle as the machine gathers speed, flattening out the wing and presenting very little resistance.

Upper and lower wings have the same aspect ratio. Upper wing has a thickness of 5 inches. Patents are pending on the wing construction, and full details cannot now be given of these features.

With the wing section used, Dr. Christmas has succeeded in obtaining a 72 per cent lift on the upper wing, a higher vacuum than found on any other section. Wings are set at an incidence of 3½ degrees.

As the wings are not braced transversely, flexibility is also obtained in that direction. Puffs of wind or sudden changes of direction, do not sharply affect the machine's progress, for the shock is transmitted only after being partially absorbed by the resiliency of the wings. It would seem that such construction would result in a low factor of safety, but the designer claims a safety factor of seven throughout.

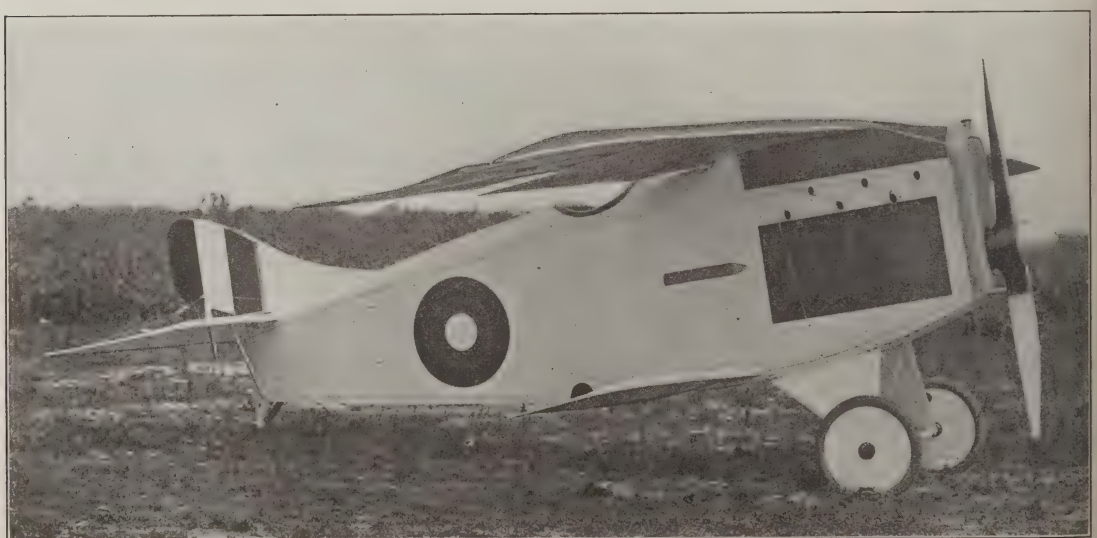
When at rest on the ground, the wing droops in a negative dihedral of —17 degrees. In flight the wing tips have a range of flexibility of 3 feet; that is, the wings can assume positive or negative dihedral measuring 18 inches from the horizontal in either direction.



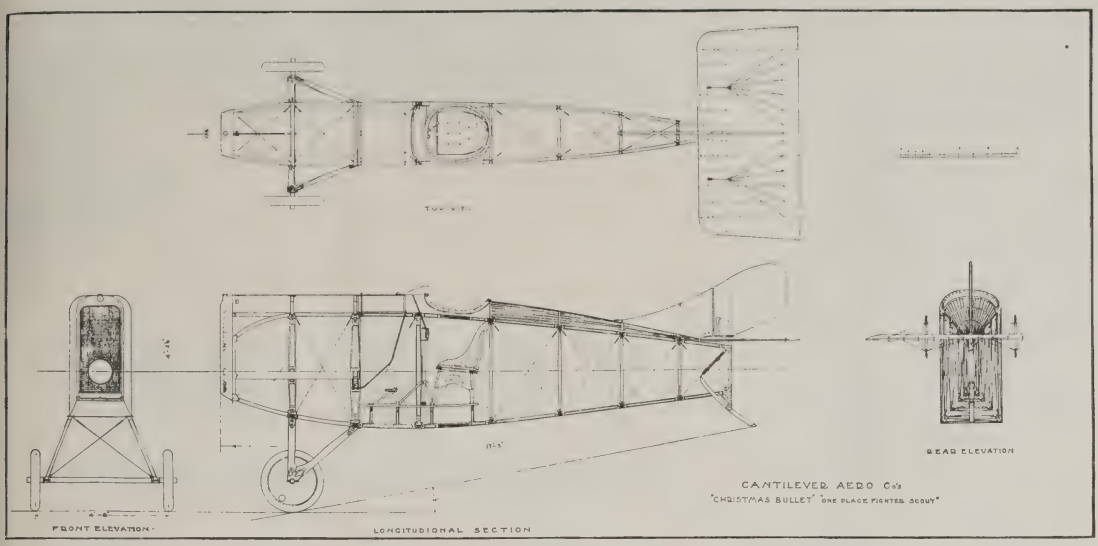
The Christmas "Bullet," in flight at Mineola, L. I.

It has been demonstrated that the wings carry a load no greater than necessary to sustain the machine in flight, and this load is carried regardless of wind puffs or extra strains due to increased wind pressure above or below the wing.

The principal specifications of the Christmas "Bullet" are as follows:



The Christmas "Bullet" strutless and wireless biplane which makes a speed of 170 miles an hour with a 6 cylinder Liberty Motor



Details of the fuselage and tail group of the Christmas "Bullet" strutless scout biplane

Span, upper plane	28 ft. 0 in.
Span, lower plane	12 ft. 0 in.
Chord, upper plane	5 ft. 0 in.
Chord, lower plane	2 ft. 6 in.
Area, upper plane	140 sq. ft.
Area, lower plane	30 sq. ft.
Length overall	21 ft. 0 in.
Weight, machine empty	1820 lbs.
Weight, fully loaded	2100 lbs.
Minimum speed	50-60 m.p.h.
Maximum speed	175 m.p.h.
Cruising radius	550 miles
Ceiling	14,700 ft.

A Liberty "6" is used, giving 185 H.P. at 1400 r.p.m.; the machine attains 170 miles at three-quarter throttle. The weight fully loaded is with 50 gallons of gasolene and 5 gallons of oil, sufficient for a sustained flight of three hours.

The "Bullet" was originally designed as a single seater fighter. The pilot has an unobstructed range of vision, as his eyes are at the level of the upper plane and the lower plane has such a narrow chord that it offers but very little obstruction to vision. Although military necessity does not now demand the adoption of the machine as a fighter, it lends itself admirably to the needs of civilian uses. The planes are readily detachable and are easily set up, as there are no wires to align. When the planes are removed, they can be strapped alongside of the fuselage and the machine then takes up only about one-fifth of the room ordinarily required for storage. The machine can be rigged up ready for flight in 15 minutes.

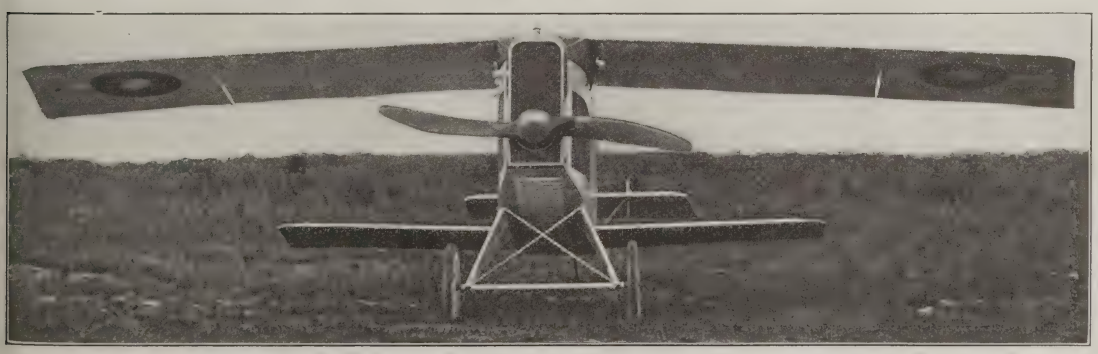
All the controls are exceptionally easy in their operation. The tail is flexible, and its efficiency is illustrated by the fact that a 1 inch deflection causes a controlling moment equal to that produced by a rigid flap movement of 4 inches.

The two main tail beams are 1½ inches by 1¾ inches laminated spruce. A horizontal V section spruce leading edge is used. The battens are air-seasoned white ash.

Ackerman spring wheels are used, which cut down resistance and do away with the usual rubber shock absorber cord.

The principle of radiation is original. Besides the nose radiator of the "Livingston" type, copper mesh screens cover in the sides and top of the fueslage, forward of the wings, and this surface has proven adequate for the Liberty "6." Much of the radiation is thereby effected by skin friction rather than by dead head resistance.

The propeller was designed by Mr. Caldwell at McCook Field, Dayton, Ohio. It has a 10′ 6″ pitch and is 7′ 0″ in diameter, designed for a speed of 195 miles an hour, which the machine is expected to make with full power.



Front view of the Christmas "Bullet", showing the absence of struts and bracing wires



"THE OP

Curtiss Achievements

1—The design and construction of the fastest fighting airplane ever flown. G Government records credit this triplane, which was built for the U. S. known as model 18-T, with 160 miles per hour, carrying full military load and passenger. This is 15 miles per hour faster than any speed ever claim an airplane, a truly epoch-making achievement, made possible by the develo of our new model K motor.

2—The design and construction for the Navy of the largest flying boats in the colossal crafts capable of carrying five tons useful load. It was one of these that recently carried fifty passengers.

3—The design and construction for the U. S. Navy of the fastest and most ef Seaplane in service anywhere. This craft which is known as the Curtiss model with Liberty motor, made an official speed of 126 miles per hour with full m load, armament, ammunition, pilot and passenger.



The Curtiss Engineering Corporation is today the center of aeronauti Glenn H. Curtiss and his engineers have been busy in drafting rooms, res of suitable commercial types. Aircraft especially designed for sportsman's workmanship and performance as Curtiss military planes have proved thems

CURTISS ENGINEERIN

iss

BOOK"

The Great War

evelopment and construction of a 12 cylinder, 400 H.P. motor of an entirely id much lighter type, known as the Curtiss model K-12. These motors have one exhaustive tests and are already in production.

evelopment and construction of the Curtiss model K-6, a new and much 6 cylinder motor. These engines develop 160 H.P. and possess greatest en- e and reliability.

evelopment and construction on a large scale of the Curtiss OXX motors, e J-N-4. training planes, which were used almost exclusively by the United and Canada and largely in England for the training of American and aviators. The training of over seven-tenths of the original land and flying pilots, most of whom entered the service and formed the nucleus United States Training Forces.



nes instead of being decreased will be increased by the coming of peace. nels and shops in perfecting designs and carrying forward the production peace-time purposes are already available and are as superior in design,

ION, Garden City, L. I.

THE HUGHES AIRCRAFT REPORT

(Concluded from last week)

General Conclusions and Recommendations

1. The controlling facts and the conclusions in relation to the matters reviewed have been stated under appropriate headings. It would be impossible to re-state them in a brief summary. The defective organization of the work of aircraft production and the serious lack of competent direction of that work by the responsible officers of the Signal Corps, by which the delays and waste were chiefly due, were matters for administrative correction through unification of effort under competent control. The provisions of the criminal statutes do not reach inefficiency.

It is not within the province of this report to make recommendations with respect to administrative policy, but it should be said that under the direction of Mr. Ryan and Mr. Potter there has been improvement in organization, and progress has been made in gratifying measure.

2. The evidence discloses conduct, which although of a reprehensible character can not be regarded as affording a sufficient basis for charges under existing statutes, but there are certain acts shown, not only highly improper in themselves but of especial significance, which should lead to disciplinary measures. The evidence with respect to Colonel Edward A. Deeds should be presented to the Secretary of War to the end that Colonel Deeds may be tried by court martial under articles 95 and 96 of the Articles of War for his conduct (1) in acting as confidential adviser of his former business associate, H. E. Talbott, of the Dayton Wright Aeroplane Company, and in conveying information to Mr. Talbott in an improper manner, with respect to the transaction of business between that company and the division of the Signal Corps of which Colonel Deeds was the head; and (2) in giving to the representatives of the Committee on Public Information a false and misleading statement with respect to the progress of aircraft production for the purpose of publication with the authority of the Secretary of War.

3. The absence of proper appreciation of the obvious impropriety of transactions by Government officers and agents with firms or corporations in which they are interested compels the conclusion that public policy demands that the statutory provisions bearing upon this conduct should be strictly enforced. It is therefore recommended that the officers found to have had transactions on behalf of the Government with corporations in the pecuniary profits of which they had an interest should be prosecuted under section 41 of the Criminal Code.

4. The Federal Trade Commission should be requested to report upon the proper cost of mahogany for aeroplane propellers, to the end that upon the coming in of its report the question of the propriety of further action with respect to the transactions of the Mahogany Manufacurers and Importers Association may be determined.

5. It is recommended that the representatives of the Department of Justice should keep in touch with the progress of the re-audit of accounts so that it may be advised of the complete enforcement of the rights of the Government in final settlement of accounts, and that the Government has been fully protected against unnecessary loss through waste and the absence of suitable factory supervision.

6. Permit me also to suggest that a special division, or subdivision of the present Bureau of Investigation, in the Department of Justice should be assigned to the consideration of suggested delinquencies in connection with aircraft production so that the work already done may be appropriately followed up. In particular, it is recommended that the activities in relation to Spruce Production, which being largely centered on the Pacific Coast it was impracticable to embrace in the present inquiry, should be carefully scrutinized.

I have the honor to remain,

Respectfully yours,
(Signed) CHARLES E. HUGHES.

Comment of the Attorney General

THE PRESIDENT, October 31, 1918.
The White House.

Dear Mr. President:

On May 6th last you directed me to investigate and pursue charges of dishonesty or malversation in regard to the production of aircraft and, on May 13th, you asked Judge Charles E. Hughes to act with me in making this investigation. By far the larger part of the last five months has been consumed in taking testimony. An opportunity has been given to every person claiming to have grievances, charges, or criticisms to appear and testify in person and produce other witnesses and data.

We spent many weeks in personally inspecting conditions and taking testimony at the larger plants having aircraft contracts with the Government at Dayton, Ohio; Detroit, Michigan; Elizabeth and New Brunswick, New Jersey; and Buffalo, New York. The papers, books, correspondence, accounts and other records in the files of the Signal Corps at Washington, as well as those of the principal contractors and of the Government at these plants, have been critically examined as far as there was reason to believe that they would throw light on the matters under investigation. We have examined nearly three hundred witnesses and taken about 17,000 pages of testimony.

In an effort to make the investigation thorough, we have attempted to go into every phase of aircraft production since our entry into the war in April, 1917, and had recourse to every source of information which appeared available. Every complaint or charge of wrongdoing has been heard and carefully considered. It is believed that the investigation has been exhaustive, except that full data as to contracts let abroad for planes has not been at hand, and the matter of spruce production on the Pacific Coast has been gone into only to the extent that this could be done by the examination of witnesses at Washington. From the investigation made, it has been concluded that the taking of the additional time necessary for obtaining complete data from Europe in regard to the contracts in question, or for a trip of investigation to the Pacific Coast where most of the spruce is produced, was not justified. During the period referred to Judge Hughes has given practically his entire time to this work and has been in direct charge of the investigation, which has been conducted by him with the cooperation of myself and other officials of the Department of Justice. The investigation has now been completed.

Some three weeks ago, at the conclusion of the taking of testimony, in order that you might have the independent judgment of both, Judge Hughes and I, each without conference with the other, considered the evidence, reached his own conclusion and prepared a report. On the afternoon of last Saturday, October 26th, Judge Hughes handed to me a copy of his report, together with a letter asking me to transmit it to you with whatever statement of views I wished to make. The report consists of 182 printed pages. By far the greater portion is devoted to a remarkably accurate statement of substantially all the transactions had since the beginning of the war in the course of the development of the aircraft program. After carefully examining this statement of the transactions had, I find myself in substantial accord therewith and do not consider it necessary to present to you a somewhat full report which has heretofore been prepared in the Department of Justice. As hereinafter shown, I also find myself in accord with the conclusions presented by Judge Hughes on questions of dishonesty and malversation.

I do not consider it germane to this investigation to enter into criticisms of the program or of mistakes in policy or in the exercise of judgment.

I send you herewith Judge Hughes' report and present herein my conclusions and briefly supplement Judge Hughes' findings of fact in a few instances.

General Character of Charges

When the investigation began, in May, it was sweepingly charged that $691,851,866.47, appropriated for the fiscal year beginning July 1, 1917, had been expended with practically no results; that members of the aircraft boards had been financially interested in aircraft contracts; that German and disloyal influences had retarded the progress of the work and that these influences, together with graft of various kinds, had entered into the transactions involved. It therefore seems desirable to state briefly what sums have been expended and what has been accomplished.

Amount Expended.

The $691,851,866.47 appropriated was for all aviation purposes, including many things besides the building of aircraft. Contracts for aeroplanes and motors let here and abroad, it was estimated, would require $474,910,706.55, but in May last this amount had by no means been expended. The actual disbursements for this purpose up to the close of the fiscal year ending June 30, 1918, were as follows:

For production in this country	$106,741,490.77
For production abroad	25,605,074.31
For experimental and development work	1,697,830.19
Total	$134,044,395.27

This amount includes not only the cost of planes and motors delivered, but also large payments for special tools and for labor and materials in planes and motors not then finished. The figures are not now available to show just how much more has been disbursed on this account since June 30th, though the total amount disbursed for all aviation purposes between that date and September 30th was $139,186,661.33.

Planes and Motors Acquired

To provide for the needs of the Army until production in this country could be expected, contracts were let, in the summer of 1917, in France for 875 training planes with engines and for 5,000 service planes and 8,500 service engines, deliveries to begin in November and be completed in June, 1918, and in Italy for 700 service planes with engines. These contracts were not carried out as contemplated, partly because of unavoidable delay by this Government in delivering materials, but largely because the unexpected increase in the needs of the French Government overtaxed the capacity of the manufacturers. However, up to July 31, 1918, there had been acquired under foreign contracts 1,617 training and 1,512 service, or a total of 3,129, planes with engines. The deliveries of planes and engines produced in this country up to July 1, 1918, were:

Planes.		
Elementary training	4,572	
Advanced training	1,046	
Service	533	
		6,171
Engines.		
Elementary training	7,662	
Advanced training	2,579	
Service	2,392	
		12,633

Since July 1st production has been such that up to October 11, 1918, the figures were:

Planes.		
Elementary training	5,187	
Advanced training	2,137	
Service	2,350	
		9,674
Engines.		
Elementary training	10,256	
Advanced training	4,479	
Service	9,937	
		24,672

When the 3,129 acquired abroad are added, we have total planes 12,803, and 27,801 engines. While the only service planes thus far produced in this country have been observation and bombing planes, those acquired abroad include pursuit and combat planes.

Conduct of Members of Aircraft Boards

The results, as above set out, in view of the inherent difficulties of hurriedly expanding the Signal Corps from almost nothing to an immense organization, selecting, upon more or less conflicting information from abroad, the proper types of planes and engines, securing responsible and efficient contractors to engage in a new line of work, the designing and making of enormous quantities of machinery and tools, and the development of an industry almost unknown in this country and undergoing constant changes abroad, cannot be said to indicate dishonesty or malversation.

An exhaustive examination into the entire conduct of aircraft matters fails to show that any member of either board has had any desire to retard or delay production, or has done anything intended to accomplish that result, or has intentionally caused the waste of funds, or been actuated by a disloyal motive, or been guilty of dishonesty or malversation, unless there be truth in the specific charges which will now be referred to.

A. Interest in Contracts.

I agree with the conclusion reached by Judge Hughes that there is no evidence upon which it can fairly be charged that any member of the aircraft boards, including Mr. Howard E. Coffin, General Squier, Colonel E. A. Deeds, Colonel R. L. Montgomery, Colonel S. D. Waldon, Mr. Richard F. Howe, Mr. Harry B. Thayer, Admiral Taylor, and other

naval officers, has been unlawfully interested in any contract or transaction relating to aircraft production. Indeed, as to this charge, there has, at no time, been ground for a question involving any of these gentlemen except Colonel Deeds.

B. Form of Contracts.

Growing largely out of the popular understanding that contracts for aircraft provide that the compensation of the contractor shall be a fixed per cent. of the cost of production, and thus make it to the interest of the contractor to increase that cost, the charge has been made that these contracts are themselves instruments for practicing frauds upon the Treasury.

The fact is that no such contracts have been made. The Government is to pay the cost of production plus a fixed sum, which cannot be enhanced by increasing the cost of production. On the contrary, it is provided that the contractor shall share in the saving if the actual cost shall be less than an "estimated cost" stated in the contract. Hence, whatever other objections there may be to the contract, it is to the interest of the contractor to keep the cost of production as low as possible. Moreover, the right is reserved to the Government to terminate the contract at any time by repaying the amount expended plus the fixed profit on finished articles and 10% of the cost of labor and materials in unfinished articles. If, therefore, experience should demonstrate that the contract would be unfair, the Government could terminate it unless the contractor would agree to a readjustment of terms.

In the case of the Liberty motor contracts, the practical result has been first a reduction of the estimated cost from $6,087 to $5,000 and of the fixed profit from $913 to $625, and finally the putting of the contracts on a fixed-price basis when experience had shown what would be a fair price.

In view of the fact that when this form of contract was adopted there was no available data as to what the cost ought to be, it seems to have been devised to protect the interest of the Government. I am unable to see how an inference of bad faith or official dereliction can be drawn from it.

C. Awarding of Contracts.

There have been charges of unfair discrimination and favoritism in the awarding of contracts. These complaints relate almost entirely to contracts for planes for which there were many applicants. Selections had to be made. It cannot be said that plausible reasons were wanting for those made. If mistakes were made nothing has been developed which would justify the charge that they resulted from corrupt motives.

D. Profits of Contractors.

It has been charged that exorbitant profits to contractors have been allowed. On their face, they appear to be unusually liberal, but when it is remembered that 60% or more of them must be paid to the Government as income and excess profits taxes, and that most of the net profits will be invested in buildings and facilities which may or may not be capable of profitable use for an indefinite period after the termination of the contract, my conclusion is that no such profits have been allowed as to justify a charge of bad faith.

E. Cross-License Agreement.

Whatever may be said of the charge that this arrangement tends to discourage future inventions, one of its results was to enable the Government, through contractors, to secure the use of all necessary patents at a fixed cost and with little friction. It was not entered into until the Attorney General had given an opinion that it did not conflict with the anti-trust law. I find no basis for the suggestion that in bringing it about the members of the aircraft board were actuated by any unlawful or dishonest motive.

F. Conduct of Colonel E. A. Deeds.

Of all the members of the aircraft boards, the one most severely criticized and against whom most charges have been brought has been Colonel E. A. Deeds. The evidence does not disclose any violation by Colonel Deeds of the criminal laws. In the early part of 1918 public statements were issued with official authority purporting to set out the progress which had then been made in the production of engines and planes and the prospects of immediate future. These publications were not only misleading, but they contained false statements, and were issued in reliance upon information principally furnished by Colonel Deeds, who was acquainted with the actual facts. While the conduct of Colonel Deeds in this matter was not criminal and cannot be said to have affected actual production, it was inexcusable and reprehensible.

I also find that Colonel Deeds was guilty of censurable conduct in acting as confidential adviser of H. E. Talbott and in conveying information to the latter with respect to transaction of business between the Dayton Wright Aeroplane Company and the division of the Signal Corps of which Colonel Deeds was the head.

Whether or not Colonel Deeds should be subjected to disciplinary measures for the acts referred to is a matter to be determined by the War Department. I acquiesce in the recommendation of Judge Hughes that the facts be submitted to the Secretary of War.

Officers and Employees of the Signal Corps

When war was declared and the carrying out of the aircraft program was entrusted to the Signal Corps, its official personnel was hurriedly increased from a small organization to one of enormous proportions. It has been impossible, of course, to critically examine the conduct of all the military officers and civilians connected with this branch of the service. The official acts of the more prominent ones have been gone into and the general situation has received as much consideration as was possible. The investigation has failed to show, unless the instances hereinafter noted constitute exceptions, that any person, military or civilian, connected with the Signal Corps has desired to retard or delay production, or has done anything intended to accomplish that result, or has intentionally caused waste of funds, or has been actuated by disloyal motives, or been guilty of dishonesty or malversation. The incidents referred to are as follows:

A. Conduct of Lieutenant-Colonel J. G. Vincent, Lieutenant-Colonel George W. Mixter, and Second Lieutenant Samuel B. Vrooman, Jr.

Many successful business men tendered their services to, or were invited to take part in the activities of, the Signal Corps. Naturally the men selected were chosen as far as was practicable from lines of business similar to those in which the Government expected to utilize their services. With the business interests of the country so largely involved in war work, many of these men, in the course of the performance of their official duties, not infrequently were brought in contact with corporations in which they held stock. It is to their credit that only three instances have been found in which officers or employees of the Signal Corps have apparently transacted business for the Government with corporations in which they were interested.

One of these was Lieutenant-Colonel Vincent, who had been Vice-President of the Packard Motor Car Company, in charge of engineering, and who, after he became an officer in the Signal Corps, continued to hold certain shares of stock in that company. He was one of the original designers of the Liberty motor, held several important positions in the engineering department, and is now in charge of the Aeroplane Engineering Division of the Bureau of Aircraft Production. Under the circumstances set out in Judge Hughes' report, Lieutenant-Colonel Vincent was instrumental in having certain payments made to the Packard Motor Car Company for drawings, models, tests, etc., and for eleven standardization engines. The course of procedure which resulted in the payments of this money was without a written contract and otherwise irregular and unusual. I agree with Judge Hughes' conclusion that Lieutenant-Colonel Vincent violated Section 41 of the Criminal Code, which prohibits any person, directly or indirectly interested in the pecuniary profits or contracts of a corporation, from acting as an officer or agent of the United States for the transaction of business with such corporation. I further agree with Judge Hughes that the evidence does not afford ground for the conclusion that the Government was defrauded, or that there was any intent to defraud on the part of any of the parties concerned, or that the services rendered were not worth the amount paid therefor, or that the estimates of the outlay of the Packard Company were not fair estimates.

Lieutenant-Colonel George W. Mixter held twenty-five shares (par value $2,500.00) of the preferred stock of the Curtiss Aeroplane and Motor Corporation. This corporation had important contracts with the Government for the production of aeroplanes. While holding this stock, Lieutenant-Colonel Mixter was in charge of the organization for the inspection of materials and products at one of the corporation's plants, and visited it from time to time in the exercise of his authority as head of the Inspection Department and as Production Manager. He stated on examination that he had bought a small amount of common and preferred stock of the corporation mentioned some years before and remembered selling some of it, that he did not remember whether he retained any and had not thought of it after entering the service. It appears that he had parted with ownership of the common stock, but still owned the preferred. I agree with the conclusion of Judge Hughes that this was a violation of Section of 41 of the Criminal Code.

Second Lieutenant Samuel B. Vrooman, Jr., was the owner of $10,000.00 in par value of the stock of the S. B. Vrooman Company, of Philadelphia, which had a contract with the Government for supplying mahogany. While holding this stock, Lieutenant Vrooman was put in charge of the inspection of propeller lumber, including mahogany. He selected the district officers, who in turn selected the inspectors; he issued instructions to the district officers and visited various plants to see that the inspectors were doing their duty and to pass on disputed points. The plant of the S. B. Vrooman Company was one of those subject to his jurisdiction, but he denies that he ever personally inspected its lumber. I agree with Judge Hughes' conclusion that he violated Section 41 of the Criminal Code.

B. Conduct of Mahogany Manufacturers and Importers Association.

For a short period of time J. C. Wickliffe, J. Edward McCullough and Second Lieutenant Samuel B. Vrooman, Jr., while representing the Government in dealing with mahogany manufacturers, received from one or more of these manufacturers salaries in addition to those paid by the Government. I agree with Judge Hughes that under the circumstances this was a gross impropriety on the part of those paying and those receiving the additional salaries, but that there is no statute making it a criminal offense unless a case is made out of bribery or of a conspiracy to defraud the Government. I am likewise of the view expressed by Judge Hughes that whether a charge of the sort indicated could be properly made would largely depend upon whether the terms and prices of the mahogany manufacturers were fair and reasonable, or excessive and the result of improper influence, and that the Federal Trade Commission, with its special facilities for conducting an examination of that kind, should be requested to make a survey of the mahogany industry and the cost of delivering the lumber involved and reach a conclusion as to the reasonableness of the prices paid.

C. Matters of Minor Importance.

In one office of the Signal Corps there seems to have been discovered petty graft fostered by a civilian employee, and evidence has been brought to our attention tending to establish dishonest inspection on a rather small scale in one of the least important plants. These matters are now under investigation by grand juries and indictments will be found if justified.

Contractors

A searching inquiry has been made into the conduct of the work by the principal contracting companies. Agreeing substantially, as I do, with the statement of facts made by Judge Hughes, I am of opinion that it cannot fairly be charged that a managing officer of any contracting corporation has desired or attempted to delay production or been actuated by disloyal motives. To what extent, if any, inefficiency or mismanagement is to be inferred from the facts stated, I do not deem it within my province to determine.

German Sympathizers

In some of the factories a considerable number of alien enemies and persons of German birth or descent, who, at least before our entry into the war, were German sympathizers, have been employed. No facts have been developed which would justify the belief that these men have been retained through any willingness on the part of their employers to have production retarded or defective planes produced. On the contrary, the Government itself provided a system of permits under which they could be used. They were employed and retained because the manufacturer felt that the great difficulty of obtaining skilled laborers in sufficient numbers justified such risk as might be incurred. In some instances the employer had faith in an old employee and was unwilling to discharge him because of mere rumors as to his loyalty. As an illustration of this, the head of the drafting department at the Ford Company's plant was of German birth and there were such persistent rumors that he was pro-German that some of the officers of the company thought it unsafe to retain him. He had been in the employ of the company for nine years, professed to be loyally interested in the work, and the officers referred to testified that nothing definite could be proved against him. Mr. Ford stated that, at a time when all citizens were called to make sacrifices, one of German birth might do so by helping to produce motors to be used for his adopted and against his native country. He stated further that he had absolute confidence in this man's loyalty and, in the absence of any proof of disloyalty, refused to discharge him. While this indicated the application of an almost idealistic policy of being just to employees, results seem to have justified the course pursued. Though this man has been the object of the greatest watchfulness on the part of officers of the company who suspected him, nothing has been discovered indicating that he has been other than a loyal and efficient employee. It is fair to say that no

(*Continued on page* 962)

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio

Notes

Note 1—Report to places mentioned in the order named.
Note 2—Report to Army Balloon School, Lee Hall, Va.
Note 3—Report to District Mgr. Aircraft Finance, Consumers Building, Chicago, Ill.
Note 4—Report to Speedway, Indianapolis, Ind., and wire DMA.
Note 5—Report to Dayton, Ohio, to the Mutual Building.
Note 6—Report to Washington, D. C., to Chief of Staff.
Note 7—Report to Buffalo, N. Y., to district Mgr. of Finance.
Note 8—Report to Washington, D. C., to acting chief of the Militia Bureau.
Note 9—Report to Little Rock, Ark., to commanding officer of aviation general supply depot.

Special Orders Nos. 306 to 309, Inc.

A

Albright, Oliver ..... EOT

B

Blood, Frank L. ..... WFO
Barber, Clifford L. ..... EOT
Boutwell, Leroy A. ..... EOT
Burgess, Walter K. ..... EOT
Burress, George H. ..... EOT
Byerly, Frederick M. ..... RSD
Bond, Carlton F. ..... PFO
Bennett, John J., Jr. ..... DMA
Blackburn, Glen R. ..... BFT
Bailey, Louis H. ..... BFT
Bijur, Harry ..... RSD
Bower, Byron Frank ..... SLA; LHV
Burroughs, Ambrose Matson ..... SLA; EOT
Bartholomew, Robert ..... DMA
Barrett, Clement J. ..... DMA
Barrington, Francis ..... Note 2
Boone, Ralph R. ..... CAF
Burge, Vernon Lee ..... RSD
Brown, Lucius Polk ..... PFO; LDT; EOT; Note 1

C

Campbell, John R. ..... EOT
Carr, Richard M. ..... EOT
Crawford, Ira M. ..... EOT
Curran, James M. ..... EOT
Cutts, George B. ..... EOT
Camper, John L. ..... TMA
Conrad, Franklin E. ..... KST
Coulter, William E. ..... KST
Cunningham, George Smith ..... LDT
Cressy, George G. ..... Note 2
Cousins, Ralph P. ..... PWM; WDM; Note 1

D

Dennett, Kenneth ..... RSD
Dinger, Jean T. ..... CGC
Davis, Everett S. ..... KST
Deke, Robert E. ..... EOT
Duvall, Donald W. ..... EOT
Dean, John W. ..... KST
Derham, Peter F. ..... DAP
De Obarrio, Peter ..... RSD; WDM; Note 1

E

Eble, Ferdinant, Jr. ..... EOT
Evans, Christopher C. ..... EOT
Egan, Thomas F. ..... KST
Ellis, Clinton B. ..... LDT

F

Fowler, George A. ..... PMT
Frissell, Patrick ..... Note 4
Fleming, Hugh Bidlake ..... Note 5

G

Gallup, Burton A. ..... EOT
Green, Wilbur A. ..... EOT
Gorman, Karl H. ..... DMA
Gould, Theodore J. ..... Note 3
Greenwood, John H. ..... DMA
Gribble, Frederick C. ..... Note 2

H

Harris, William L. ..... EOT
Hearn, James A. ..... EOT
Hilderbrand, Floyd R. ..... EOT
Harris, Harvey E. ..... DAP
Howe, Gladston M. ..... EOT
Hampton, Ernest E. ..... BFT
Hiller, Melvin Errol ..... SLA; LHV
Hendry, Frank C. ..... LDT
Herold, Armin F. ..... FRF
Harrison, George R. ..... Note 8

J

Jewett, Alfred L. ..... EOT
Johnston, Samuel ..... DAP

K

Keightley, George M. ..... EOT
Kaplowitt, Mack B. ..... CAF
Kinberg, George J. ..... Note 9

L

Laughlin, Richard J. ..... EOT
Lavigne, Francis A. ..... EOT
Lewis, Richard C. ..... EOT
Lassiter, Robert E. ..... DAP
Leonard, Charles M. ..... KST

M

Maurer, Paul G. ..... EOT
Morse, Herbert K. ..... EOT
Moser, William C. ..... EOT
Mulligan, Walter G. ..... Note 5
Malmgren, Carl E. ..... CAF

Mc

McCaffrey, James A. ..... EOT
McKinnon, Morton H. ..... EOT
McVoy, Richard K. ..... EOT
McCord, Oscar P. ..... DMA
McKenna, Edmund P. ..... CAF
McDaniel, Yancey C. ..... Note 2
McHuge, Michael E. ..... Note 2

N

Nash, Halsey R. ..... EOT
Nichols, Charles A. ..... EOT
Norcross, Wilbur Harrington ..... LDT
Nash, David M. ..... LDT
Neville, Ralph M. ..... Note 2

O

Orr, Alexander B. ..... EOT
Olive, Ryland W. ..... LDT

P

Purcell, Robert F. ..... BFT
Patterson, Stuart R. ..... EOT
Putney, Ellsworth T. ..... EOT
Pritchard, Chester E. ..... EOT
Pyne, Herbert R. ..... EOT
Pearson, William F. ..... DMA
Pulver, Seth Q. ..... TMA
Pierrepont, Rutherford Stuyvesant ..... FOB
Pyne, Herbert Rivington ..... DMA
Pavesich, Francis X. ..... CAF
Perry, Warren D. ..... RSD

R

Russell, Le Roy E. ..... HHN
Rhine, Mel ..... EOT
Robins, Edward J. ..... EOT
Robinson, Ralph R. ..... EOT
Rudolph, H. ..... MIA
Rowley, Garold N. ..... Note 2
Russell, Lindsey G. ..... RSD

S

Salmond, John ..... EOT
Smith, Frank W. ..... EOT
Stewart, Earl F. ..... MIA
Saunders, Isaac H. ..... DMA
Stenberg, Thornton R. ..... EOT
Skerratt, John W. ..... BFT
Stein, Carroll V. ..... DMA
Spiegal, Edward R ..... DMA
Smith, Lowell H. ..... RSD
Schroeder, Rudolph W. ..... MDO
Sewell, Bruce E. ..... DAP
Spicer, John H. ..... DMA
Schmied, Erich E. ..... LDT
Stanton, Lyman W. ..... LDT
Sage, Andrew G. C. ..... Note 6
Sandison, Wilber S. ..... Note 7
Steinle, Felix ..... DMA
Saunders, John M. ..... DMA
Showalter, Roy K. ..... DMA
Straw, Theodore A. ..... Note 2
Schiff, Loren D. ..... Note 2

T

Teasel, Chester C. ..... EOT
Taylor, Lewallace W. ..... FOB
Taylor, James G. ..... LDT
Taylor, Edward C. ..... KST

U

Underwood, Herbert Lyman ..... LDT

V

Vandermeer, Dirk J. ..... EOT
Von Spracken, Theodore M. ..... EOT

W

Warner, Leon G. ..... EOT
Wallace, Arthur E. ..... EOT
Wilber, Harold C. ..... EOT
Wright, Charles M. ..... EOT
Wieners, Fred B. ..... DMA
White, Earl F. ..... MDO
Willis, William H. ..... KST
Wright, William Bleecker ..... SLA; LHV
Williams, William Boyce ..... SLA; BFT
Wallace, Melvin ..... DMA

Y

Young, George, Jr. ..... FOB

Experience of a Balloonist

First Lieutenant W. J. B. Taylor, Observer, Balloon Corps, First Army, residence Rochester, N. Y., has reported to the Division of Military Aeronautics headquarters for overseas for discharge. Taylor wears the distinguished service cross awarded him in action on September 26 and October 10 for declining to discontinue making observations for the Division Commander when his balloon was attacked by enemy aeroplanes and refusing to abandon his records, although he could have safely jumped in his parachute.

Lieutenant Taylor is one of five room-mates, at Harvard in 1917, who enlisted, three of whom have been decorated and two killed in action. The other four were: Captain Douglas Campbell, aviator; Lieutenant L. A. Morgan, 328th Field Artillery; Lieutenant K. P. Culbert, aerial observer, Marine Corps, East Orange, awarded croix de guerre after death; Lieutenant A. K. Dunn, 76th Division, Charleston, Illinois, killed in action.

From the records it appears Taylor had several unusual experiences in parachute jumping under fire. One time he landed in a tree; another time on an army mule. This last adventure took place about the first of October near Montfaucon when the Infantry were assaulting Romagne. Taylor had been up about two hours watching the Boche Infantry digging in and fortifying machine gun nests in front of the U. S. Infantry attack. Suddenly in the midst of this observation his balloon was attacked by a single seater combat plane. The Hun pilot was so near him that he could easily distinguish the man's features. But on account of the close range and the very hot fire, Taylor did not hesitate to jump immediately. The German pilot missed the balloon in his first onslaught and turned to follow it down, as the crew below hauled it to earth. Despite the machine gun fire of the balloon company against him, the Hun came as low as 200 feet. His engine was finally so badly hit that he lost control and fell. The motor was cracked up, but the plane was undamaged, and as the Hun landed he vigorously cursed the Americans, one and all, whereupon a buck private punched him in the face. In the meantime Taylor's parachute had carried him well beyond this exciting scene into a peaceful pasture and a herd of army mules, on one of which he landed and was rescued from the bucking, kicking animal by some artillerymen who came by just in time. Taylor said he was more concerned over his seat on the army mule than he was about his safety in making the parachute jump.

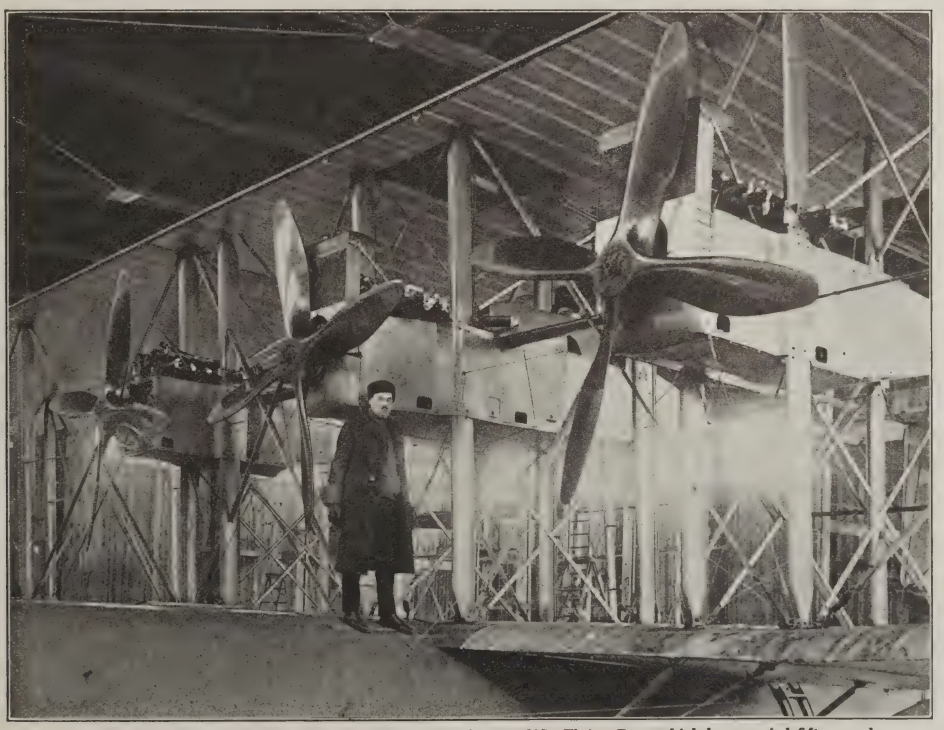
March Field Turns Out 185 Aviators

March Field has trained and graduated 185 Reserve Military Aviators. Of this number 180 were cadets, graduates of ground schools sent here for flying instruction. The remaining five were commissioned officers of this Post who qualified for flying instruction and made good.

Flying was started at March Field on June 15, 1918, and, since that time, up to and including December 14, a period of seven months, there has been a total of 35,468 flying hours. During this time, it is estimated that a total of 2,482,760 miles have been flown. The most remarkable feature of this record is that not a single casualty has occurred, despite the prevailing idea that flying is dangerous, especially in the instruction stage.

Most of the cadets graduated from this flying school have been transferred to advanced flying schools, where, reports indicate, they have more than held their own with men graduated from other fields, thus evidencing the thoroughness of their elementary training.

Under the after-the-war organization or rather re-organization of the field the flying department is to be run on a different basis. Under the new system there will be four flight squadrons, each consisting of four hangars.



Front view of the power units of the giant American Curtiss NC1 Flying Boat which has carried fifty people.

FOREIGN NEWS

New Altitude Record 30,500 Feet

London, January 3—Flying a British aeroplane at Ipswich yesterday Capt. Lang established a new altitude record, reaching 30,500 feet. Observer Blowers, who accompanied Capt. Lang, collapsed when his oxygen bottle broke, but recovered. Both were frostbitten.

Dayton, Ohio.—Capt R. W. Schroeder, an American pilot, of the Wilbur Wright Aviation field, held the altitude record just broken by Capt. Lang. He reached 28,900 feet on September 18, 1918, coming down near Canton, Ohio.

Record Climber Arrested

London.—Capt. Lang, the aviator who on January 2 established a new aeroplane altitude record of 30,500 feet, has been placed under arrest by the British army authorities, according to the *Evening News*. Capt. Lang was arrested, it is stated, because of his disclosing without authorization the details of his climb.

How Britain Developed Her Air Fighting Force

London.—The declaration of war by Great Britain at midnight, August 5, 1914, found the Royal Flying Corps with only four squadrons in being —representing well under 100 aeroplanes. Three of these squadrons went instantly to France. A new squadron followed these pioneers in about ten days' time, while the fifth squadron, mobilized and sent out in twenty-four hours, reached the fighting zone about the middle of September.

In those early days of the war machines were used simply for strategical reconnaissance. It was not until after the battle of the Aisne, when settled line warfare was established, that artillery fire control from the air and the crude forms of cooperation with the infantry were practised and developed.

As late as June, 1915, ordinary rifles with shortened barrels were carried by British pilots, and hand grenades were flung at enemy aviators in the air. The development of formation fighting and the evolution of aerial gunnery dates from about this time when the machine gun became an essential part of the equipment of fighting pilots and observers.

Zeppelin Crews Must Fly Craft to Surrender

London, January 5.—The *Echo de Paris* says a wireless despatch from Nauen, Germany, announces that a committee of three Allied officers has arrived in Berlin from Spa to superintend the carrying out of the conditions of the armistice relative to German airships at Friedrichshafen and Interborg.

The British and French experts, the newspaper adds, are agreed concerning the compelling of ordinary Zeppelin crews to bring the airships either to England or France after the aircraft have been examined and passed upon by competent authorities at special hangars which have been appointed to receive them. The procedure in the turning over of the airships will be the same as that followed in the surrender of German warships and submarines.

British Aerial Transport Chief Is Chosen

London, January 5.—Maj.-Gen. Sir W. Brancker, who recently visited America on a British mission, is taking an important post in connection with the Aircraft Manufacturing Company, of which Holt Thomas is managing director.

Announcement has been made already that this company is arranging an aerial passenger service between London and Paris. Plans will be developed in many other directions, including airlines from London to Glasgow, Edinburgh, Manchester, Newcastle, Wales and Ireland; also external lines from London to Sweden, Denmark, Holland, Spain and Italy.

Brancker will direct this scheme of aerial transport and also the higher aspects of international flying, the creation and development of an organization of pilots and aeroplanes. He will plan also the air routes over land, with landing grounds every ten miles, including a route from England to India, and at sea will look after the placing of a series of mark boats at intervals of 200 miles.

An American-British transatlantic air commerce line is one of the ultimate features which he will control, while still retaining the rank of Major-General in the Royal Air Service. Obtaining his services is regarded as a great triumph for the company.



The British Armstrong Whitworth Quadruplane with a 130 h.p. Clerget engine. It is a two seater, general utility machine and makes a speed of 84 m.p.h. at ground level

Carbide is New Fuel for Aero Motors

London.—The Goteborgs Handels-Tidning reports that experiments are being conducted at Messrs. Nielson and Winther's aeroplane factory, Copenhagen, with a motor fuel made from carbide. A Danish engineer, Herr Carsen, of the Danish State Railways, originated the idea and the experiments will probably be concluded in about 14 days.

If the results correspond to expectations, a factory will be erected at Amager for the production of aeroplane carbide.

The costs of production are at present high.

Bomb Captured Airdrome

Berlin.—It is reported that Polish forces have recaptured the village of Nakel, northeast of Posen, and that the City of Bromberg, just to the east of Nakel, is threatened. German troops have recaptured the village of Kolmar, further west.

German aviators from Frankfort-on-the-Oder have bombed a flying station near Posen which was captured by the Poles on Sunday. The Polish authorities have issued a warning that they will not be responsible for the lives of German citizens if the attack is repeated.

Cairo-to-Cape Air Schedule Planned

London.—Long-cherished plans for a transportation route from Cairo to the Cape seem likely to become effective by means of a regular commercial air service, according to Major Gen. Sir F. H. Sykes, Chief of Air Staff, in an address on January 7 on "Commercial Aviation in the Light of War Experience."

He said the Royal Air Force hopes to open an "all-red" route the length of Africa. In his talk he told of the achievement of a Zeppelin which remained four days in the air without landing, after carrying twelve tons of ammunition from Bulgaria to the relief of the besieged force in German East Africa; and which, on receiving word by wireless that the German force had surrendered, returned to the starting point in safety.

It is believed among air authorities here that Germany, in view of Zeppelin experiences in the war, will develop that means of transportation, especially in future trade with Russia. In the course of the war Zeppelin construction became expert and the men who can make the best machines are still available to build for peace trade. It is expected that an express service will be started to Moscow and Petrograd as soon as peace conditions arrive.

"It may be well," Gen. Sykes said in his address "that the airship will be utilized for long distance service, involving non-stop flights. There is practically no limit to the range of such service.

"One drawback to airship construction has been the great expense of constructing sheds large enough to house rigid ship. Possibly this difficulty may be surmounted by a method of mooring ships to masts or cables. In that case airships would need to be taken into sheds only for overhauling and repairs."

It is intended as previously reported, to use aeroplanes for carrying despatches to and from Paris at the time of the Peace Conference, and the suggestion is now heard that members of the British peace delegation may be conveyed to Paris and back at that time by the same service.

Feats of Flying Revealed

Some of the wonders achieved in aerial navigation and other wonders contemplated were spoken of by Major General Sir F. H. Sykes, who told how Paul D. Cravath and Oscar T. Crosby, American members of the Inter-Allied Council, had been carried from England to Paris and back on the same day in four hours and twenty minutes.

In four months, between July and October, 207 trips were made across the English Channel. The mileage traversed was 8,085 and 1,843 passengers were carried, although flying was possible only on seventy-one days.

The fatal accidents were surprisingly few, the average being only one fatality in every 1,170 hours flown. Since January, 1916, 340 officers had lost their lives on the western front, nearly all their deaths being due to battle. The total hours flown was close to a million.

The difficulties of a transatlantic flight, according to General Sykes, were not so much endurance of the machine and personnel, but of navigation, meteorology and wireless, and such a task should not be undertaken lightly.

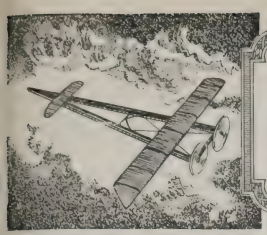
Night flying, according to General Sykes, is less liable to suspension than day flying, owing to weather conditions being more suitable. For instance, he said, it might be possible to make 130 night and only 100 day trips from London to the Rhine in a year.

The direction-finding wireless apparatus carried by aeroplanes was developed during the war, General Sykes said. This apparatus enabled machines to flying in all kinds of weather. The details of it remained a secret.

British Peace Delegates to Commute by Aeroplane

Paris.—One of the strange things this peace conference may see, unprecedented in history, is the delegates, even the British Cabinet Ministers, commuting by aeroplane between London and Paris. When the entire British delegation arrives it will get down to business at once, but until the negotiations reach their most absorbing stage they will go back and forth between the two capitals, attending to the international business during the week and going home to supervise national affairs at the week ends.

This can be done because the Paris-London journey now requires only ten and a half hours by train and boat, but it is much quicker by aeroplane. As soon as the weather improves the trip can be made rapidly and easily. It is fully expected that the British delegation will avail itself of this means of travel between the two cities.



ELEMENTARY AERONAUTICS and MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

HAVING completed the construction of the wings we will now turn to the making of the tail surfaces, fin, and rudder. These are built in the same way as the wings were built up. The reader can see from the drawings just what is necessary and the general assembly of them. The builder must take as much care when building these parts as he did when building the wings, as the control of the machine is done by these parts. Another part that we haven't made as yet is the turtle deck or false work which goes over the top of the fuselage and gives the machine a good shape.

The turtle deck is made of 3/8 x 3/16″ strips of light wood laid over formers, four in number, and set at equal distances from one another. These formers are a part of a circle and are made from 3/16″ thick 3-ply veneer. The first and last being solid, while the two inner ones are lightened out to save weight. The strips that are laid over the formers are laid on edge and are set in grooves made for this purpose, after which they are nailed and glued in place.

The tail is made up of ribs and spars as shown in the drawing. The ribs are made like the main ribs, only they have a curve top and bottom. A spar runs through from tip to tip at the rear edge to which the tail flaps are fastened.

The tail flaps are made separately, the webs being solid instead of hollowed out.

The fin and rudder are made up like the tail.

When finished control arms are fastened to the tail flaps, rudder, etc. These arms are made of ¾″ O. D. steel tubing 14″ long. These pieces of tubing are flattened at each end and at the centers.

Then the whole tube is crushed to make it an almost streamline section as shown. (It is possible to get this tubing already made oval in shape.)

The arms are then fastened to the flaps, rudder, and ailerons with bolts fastened right through the beams and the holes in the spars (see drawings).

After fastening the hinges in place on ailerons, tail, and etc., the body, wings, etc., can be covered with unbleached muslin. The covering job is very tedious and whether it is good or bad depends on the builder.

When fastening on the body, bottom and sides should be one piece ending at the two top sides and fastened with small tacks. The turtle deck is then covered after which the ends are fastened along each top longeron with ½″ tape and small tacks. Of course it is understood that the fabric must be pulled tight when covering.

The wings, ailerons, etc., are next covered. When covering wings, attach at one end first and then stretch and fasten to the other end with tacks after which the fabric is fastened to each rib with ½″ white tape and small tacks (small copper tacks are best). The front edges are then fastened. Next fasten along the wire edge by pulling tight and after folding over the wire pining it fast, it is sewed. The other side is then covered and fastened in the same way.

When all fabric is fastened, the dope is applied and lightly sandpapered, after which another coat is applied. Then a thin coat of spar varnish is applied, to make the fabric proof against moisture.

(To be continued)

A Motorcycle Engine Driven Monoplane

THAT many readers of AERIAL AGE are interested in the construction and flying of light aeroplanes powered with small horse-power engines is proven by the great number of photographs and specifications that are being received lately.

One of the most interesting and simplest is the one shown in the accompanying pictures. This machine was built by E. G. Marble and F. D. Burke of Chicago.

At first glance and before examining the photos closely one would think they were looking at a "Breeze" Penguin.

The designers claim for this machine a speed of 35-50 M.P.H., but I have my doubts in regard to the maximum speed, as the engine is rated at 12 to 14 horse-power and when one considers that the slippage of an airscrew is at least 25% the actual horse-power is only 10.5 horse-power, which is very low. I do not doubt the machine can make about 45 M.P.H. under favorable conditions, but at best there is very little or practically no reserve horse-power. The writer will check the machine up and in a later article will present a correct set of figures covering this machine.



A small monoplane showing very good design and careful construction

The machine is very light, as the full loaded weight is 400 pounds and the loading is 3½ pounds per square foot. The total surface being 115 square feet. The reader must remember that a monoplane is figured as 100 per cent efficient, which is in contrast by the highest efficiency a biplane can attain, namely 87 per cent. Of course the general form of monoplane construction is not as strong as the biplane and for this reason some people do not care as much for them.

The span of the wing is 26 feet; chord 5 feet; wing section, U. S. A. 3; weight empty, 240 lbs. The fuselage is of semi-monocoque construction, being built of 3 ply veneer over a sub frame. The length is 14 feet and 24″ wide and 28″ deep. The propeller is 5 feet in diameter and has a 3-foot pitch, and turns over at 1,800 r.p.m.

Mr. Burke in his letter to me says that his object in building a machine of this kind is to develop a medium fast light machine that will be simple and inexpensive for amateurs to build. The general design of the machine appears to have been carefully worked out and the tail surfaces and rudder are very large, thereby insuring good control even at low speeds or while taxying along the ground.



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

"Yes," said the Mineola sparrow, "I've had a deuce of a time. Ran into one of these airman fellows, and broke the tip of my wing. Didn't remember anything till I woke up at Garden City, and I've had to walk home."

When the first aeroplane flew over Constantinople before the war, the inhabitants scuttled for safety from the sky-devil. Now that the Hun is a menace to the Turk, the sight of a British squadron brings Turkish delight.

"And so you are still only first-class air mechanic?"
"Yes, but I've got my boss in civil life beaten on points."
"What is he?"
"He's only a third-class able seaman in the Navy."

Mrs. Grundy: "Yes, but this must be the last answer to correspondents—we mean it this time. The aviator was not using words unbecoming to a gentleman in the presence of a lady. Pterygoid, Blimp and Helicopter are not swear words, but useful terms used by all airmen. It was the last one that copped you, or rather misled you, wasn't it?"

He Did!

Said Willie the War Lord to Willie the Clown,
"I'm afraid on Berlin the bombs will come down
To Willie the Kaiser said Willie the pup,
"I didn't suppose the darned things would go up."

To Willie the Clown Prince spoke Willie the Hun,
"When they get to Berlin, you won't see the fun."
To Willie the Wastrel said Willie the weed,
"When they get to Berlin, like my chin, I'll recede."

Wireless Phones on Planes

"Hullo, Central, put me on to Sopwith Camel, 1,428, Extension 9. Hullo, are you there? That Lieut. Smith speaking?"
"Hullo, yes, but ring off, will you; I'm looping just now."
"Hullo, hullo. Don't go away. That you, Jim?"
"Yes, but who's speaking?"
"Oh, it's only me, Jim. I say, are you very busy? I only wanted to ask where you left the nail scissors this morning."
Operator (breaking in): "Sopwith 1,428. If you've got those scissors you'd better cut off the connection. Bad language is not permitted on the aerial lines."

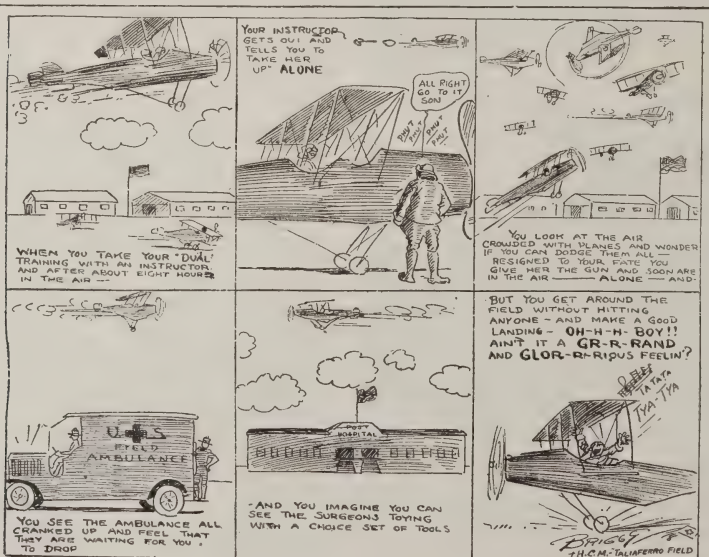
Too Quick

"Do you know," said Smith, "that before the parachute opened, I thought of every girl I'd made love to since I left school, and wondered if she'd think of me if the darned thing proved a dud."
"I didn't think they sent up sausage balloons such a height," replied Jenkins. "What a drop you must have had, old thing."

On the Farm

Young Hayseed chanced to be flying over the farm so he decided to descend and give the dad a surprise. Old man Hayseed was glad to see him, but didn't wave his arms about and get excited over the aeroplane. So Hayseed junior took him for a flip, did a loop, and rushed him home again somewhere about 90 per hour. But still the old man wasn't excited. "Speeds and loopin'," he said, "be great to you, maybe, but you should ha' seen me when the old bull tossed me onter his back and ran round the field so fast 'e wur runnin' 'is face whack into 'is tail."

Ain't It a Grand and Glorious Feelin'? . . . By BRIGGS

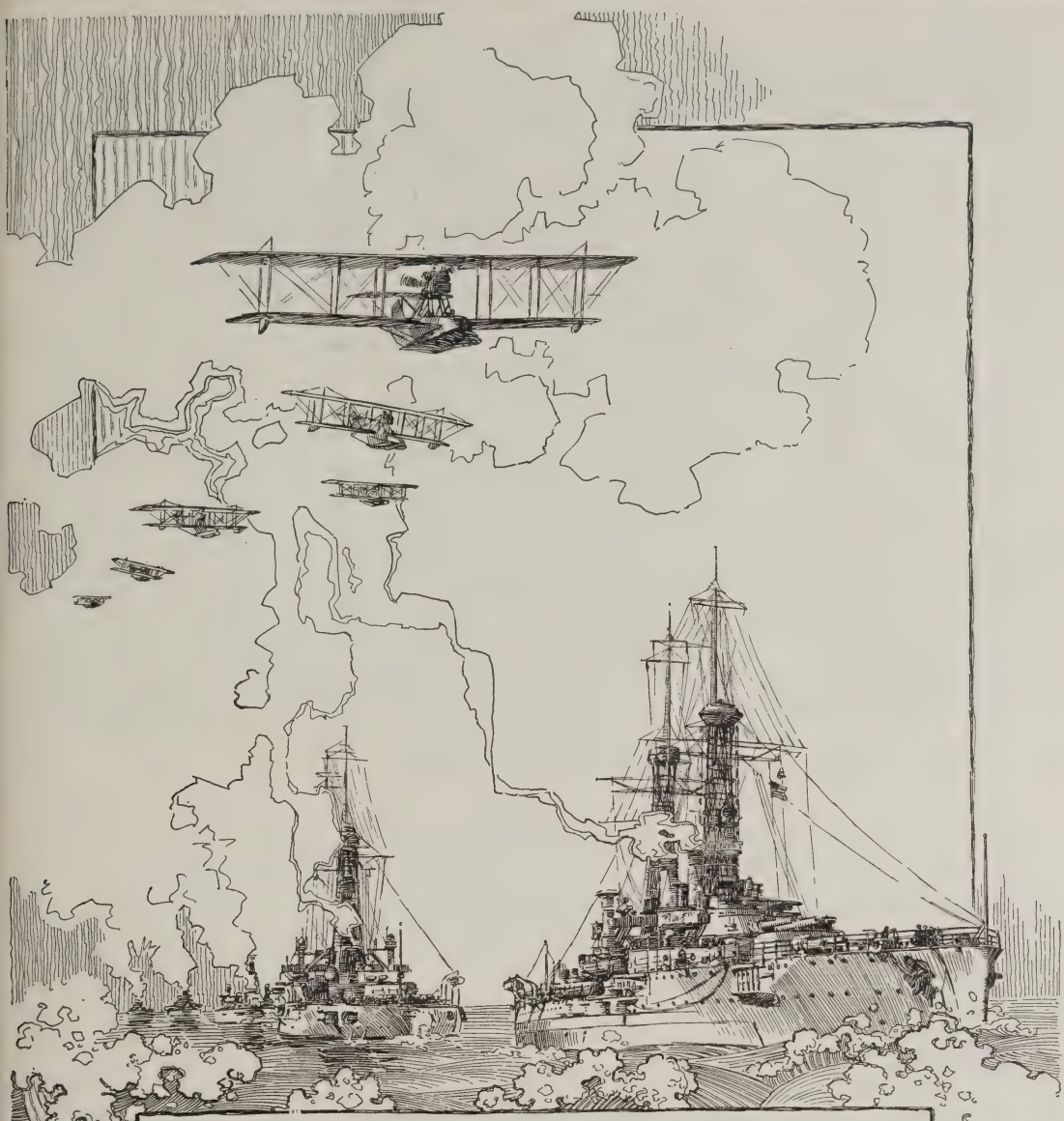


Additional Verses to "Locksley Hall"

(With apologies)

For I dipt into the future, looked
much farther yet ahead,
Saw my fellow creatures flying round
the world when I was dead.
Saw the City clerk in summer take
his seat without a fuss,
Through the air go winging swiftly in
the crowded Margate 'bus.
Saw Bill Sykes, when bent on burgling
other people's treasures rare,
Sneak from out his hangar, gaily, go
night-flying through the air.
P. C. Binns, the Bow Street bobby,
silent speed along the trail,
Drive him down until he got him
safely landed into gaol.
Saw the City merchant daily leave
his home to go to town,
Seated in a single seater, zooming up
and swooping down.
Saw the sportsmen get together, eager
youth and maiden fair,
Hopping over clouds and banking,
playing polo in the air.
Saw the lovers in the gloaming thinking 'planes a gracious boon,
All alone among the planets. What
a glorious honeymoon!
Saw the Income tax man chase me in
a speedy Sopwith pup,
Then my Camel started jibbing, so
thank goodness—I woke up.

—*Aubrey England.*

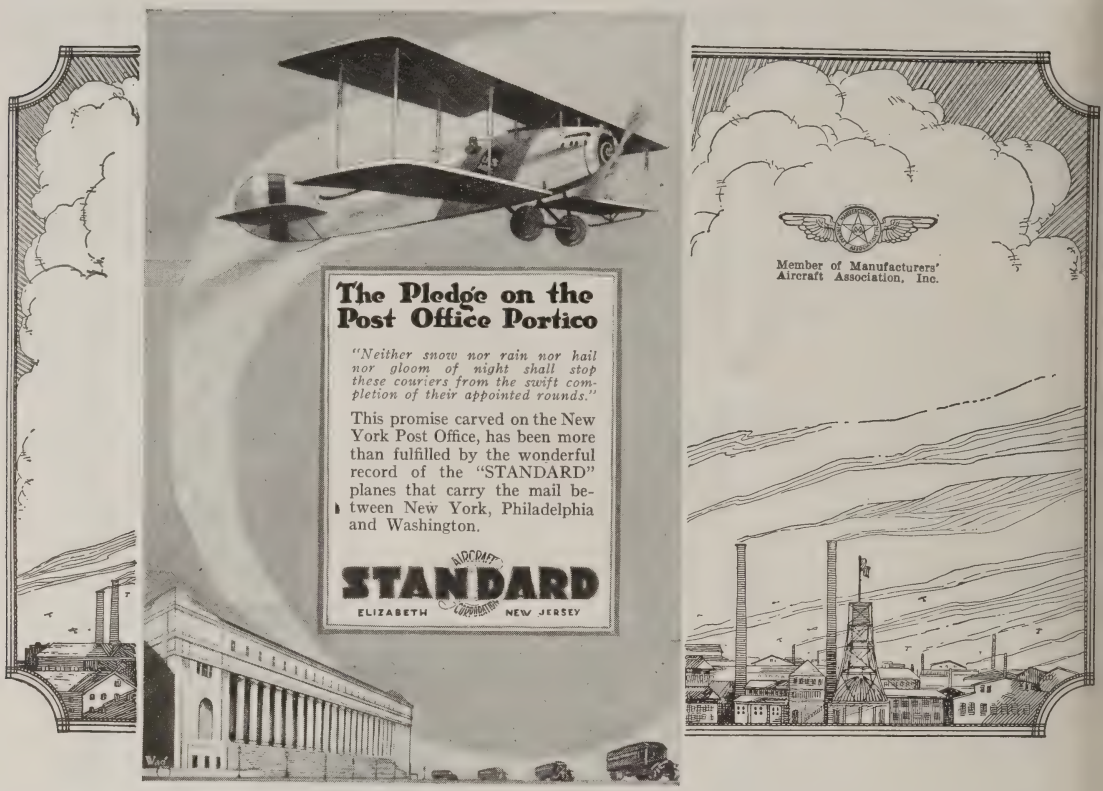


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Major Marr's Decoration Follows Him from Overseas

A letter received at the Division of Military Aeronautics recently from the overseas Air Service enclosed a Croix de Guerre awarded to Major Kenneth Marr, Commander of the 94th Squadron.

The citation which accompanied the medal stated that with the approval of the Commander General of the American Expeditionary Forces in France, the Marshall of France, Commander in chief of the French Armies of the East, cited in an order of the Army Corps as follows: "Captain Kenneth Marr, Commander of American Squadron 94th, excellent Squadron Commander of legondary bravery, has been a beautiful example to his entire unit. Previously cited."

Temporary Rank—Press Statement By the Secretary of War, January 6, 1919

"The problem presented by temporary rank of army officers is one which will of course have to be dealt with. The War Department has not yet undertaken to suggest what it thinks wisest about it. We have an anomalous situation; a very large number of men in the Regular Army have been promoted from lieutenants to captains, and captains to colonels, and so forth, and after a man has been doing duty with troops in war as a colonel it is pretty hard to revert back to a lower rank. The problem of how to stabilize rank is a serious one and one that cannot be solved until Congress decides what to do about the bill for the Army. If Congress provides for an army of a half million men (and all members I have talked with seem to be favorable), that would provide a much larger number of places for colonels, majors, captains, etc. So far as I know, it will take care of all the Regular Army men.

"An effort will be made to use all the present permanent officers and then fill in with those officers best qualified who are now in the temporary army and have signified their desire to stay in the military establishment."

Replying to a question regarding absent without leave cases in New York, the Secretary of War said:

"I was speaking to General Shanks yesterday in New York, and he told me that the situation there was somewhat difficult; that because of the relaxed pressure due to the termination of hostilities a great many of the younger officers felt that the bars were down and that they did not have to secure permits to be out, that many of them were absent without leave, and that there was a general relaxation in discipline. I told him I was quite sure that his own view was a wise one, and that demobilization must be an orderly demobilization, and that it is just as incumbent upon these officers to obey the military regulations during the period of demobilization as during the period of mobilization. We must insist upon the proper observance of duty by these officers."

Awarded Distinguished Service Cross

The commander in chief, in the name of the President, has awarded the distinguished service cross to the following named officers and soldiers for the acts of extraordinary heroism described after their names:

First Lieutenant James A. McDevitt, Air Service, United States Army. For repeated acts of extraordinary heroism in action near Ruisy, France, September 15 and October 5 and 6, 1918. On September 15, 1918, while performing an important mission Lieutenant McDevitt's balloon was attacked and riddled by an enemy plane firing incendiary bullets. He stuck to his post and gathered valuable information. On October 5 he was again attacked by several planes, and the basket was set afire by incendiary bullets. While descending he was fired upon and his parachute was hit many times; he, nevertheless, insisted upon returning to the air. On October 6 he was attacked and his balloon was riddled with bullets. Again, on the same day, he was attacked by several enemy planes; he remained with his balloon until it came down in flames; he then resumed his post in a new balloon. Home address, Mrs. James McDevitt, mother, 1114 Yale Avenue. Cincinnati, Ohio.

First Lieutenant Rodney M. Armstrong, Air Service, pilot, 168th Aero Squadronfi For extraordinary heroism in action November 4, 1918. As pilot of a D. H. 4 plane, Lieutenant Armstrong flew an infantry contact machine over the lines of the 7th Division November 4, 1918. Owing to low clouds and rain, he crossed the line at 1,000 feet in order to enable his observer to locate the position more accurately. While on the enemy's side he was wounded by an explosive bullet. In spite of his wound and weakness, he continued his mission, coming down to within 500 feet of the enemy's machine guns and troops, until his observer had signaled him that the mission was completed. Home address, Mrs. R. N. Armstrong, wife, 1012 East Eleventh Street, Winfield, Kans.

First Lieutenant James F. Manning, Jr., Air Service, pilot, 49th Aero Squadron. For extraordinary heroism in action near Doulcon, France, October 4, 1918. While leading a patrol of seven planes, Lieutenant Manning accepted combat with seventeen German machines (type Fokker) at an altitude of 1,200 meters. Through his courageous leadership and skillful maneuver of his petrol, seven of the enemy planes were shot down. Home address, J. F. Manning, father, Leesburg, Va.

First Lieutenant Field E. Kindley, Air Service. For extraordinary heroism in action near Bourlon Wood, France, September 24, 1918. Lieutenant Kindley attacked a formation of seven hostile planes (type Fokker) and sent one crashing to the ground. A bronze oak leaf is awarded to Lieutenant Kindley for the following act of extraordinary heroism in action near Marcoing, France, September 27, 1918. Flying at a low altitude, this officer bombed the railway at Marcoing and drove down an enemy balloon. He then attacked German troops at a low altitude and silenced a hostile machine gun, after which he shot down in flames an enemy plane (type Halberstadt) which had attacked him. Lieutenant Kindley has so far destroyed seven enemy aircraft and driven down three out of control. Home address, Utzer Kindley, cousin, care Bank of Gravette, Ark.

Second Lieutenant Kennth L. Porter, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Chateau-Thierry, France, July 2, 1918. Lieutenant Porter, with four other pilots, attacked twelve enemy air craft (type Pfalz), flying in two groups well within the enemy lines. As soon as the enemy planes were sighted, Lieutenant Porter maneuvered to get between them and the sun and with great difficulty gained the advantage. While three of the other American officers dived on the lower formation,. Lieutenant Porter and Second Lieutenant John H. Stevens engaged the upper formation in a bold and brilliant combat, two planes of which they crashed to the earth. Home address, Mrs. Harriet Porter, mother, 105 Green Street, Dowagiac, Mich.

Second Lieutenant John H. Stevens, deceased, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Chateau-Thierry, France, July 2, 1918. Lieutenant Stevens, with four other pilots, attacked twelve enemy aircraft (type Pfalz), flying in two groups well within the enemy lines. As soon as the enemy planes were sighted, Lieutenant Stevens maneuvered to get between them and the sun and with great difficulty gained the advantage. While three of the other American officers dived on the lower formation, Lieutenant Stevens and Second Lieutenant Kenneth L. Porter engaged the upper formation in a bold and brilliant combat, two planes of which they crashed to the earth. Home address, Mrs. Effie Stevens, 21 State Street, Albion, N. Y.



Cited for Bravery

Second Lieut. Dogan H. Arthur, pilot, Air Service, 12th Aero Squadron. The bronze oak leaf is awarded Lieut. Arthur for the following acts of extraordinary heroism in action October 18 and 30, 1918, to be worn on the distinguished service cross awarded him October 3, 1918. On October 18, 1918, while on artillery reglage, Lieut. Arthur and his observer were attacked by four enemy planes. His observer's guns were jammed, but Lieut. Arthur, with splendid courage and coolness outmaneuvered the hostile aircraft and escaped, although they followed his plane to within 25 meters of the ground, badly damaging it by machine gun fire. On October 30, 1918, Lieut. Arthur was one of a formation of nine planes which were to take photographs in German territory. Before the lines were reached six planes dropped out, but the remaining three entered the German lines, although the observed several large formations of enemy planes in the near vicinity. When they were 12 kilometers within the German lines they were attacked by eighteen enemy Fokkers. Regardless of his own safety, Lieut. Arthur engaged these planes in order to allow his companions to escape, and turned toward his own lines only when he saw them shot down. Then he fought his way home, and in the fight which ensued his observer shot down two enemy planes. Home address, W. D. Arthur, 632 East Main Street, Union, S. C.

First Lieut. Thomas M. Jervey, Ordnance, 1st Army Observation Group. For extraordinary heroism in action near Longuyon, France. Assigned to the 1st Army Observation Group, Air Service, armament officer, Lieut. Jervey volunteered as observer on a photographic mission from Ontedy to Longuyon, 25 Kilometers into the enemy lines. In combat with fourteen enemy aircraft which followed one enemy aircraft was destroyed. Lieut. Jervey, regardless of the fact that his plane was badly shot up and that his hands were badly frozen, continued on the mission, returning only upon its successful conclusion. Home address, Mrs. Frank J. Jervey, mother, 7 Pitt Street, Charleston, S. C.

Plywood in Aeroplane Construction

(*Continued from page* 947)

seriously constructed, is always in alignment, even after fatiguing flights, while prolonged exposure to the elements does not produce appreciable changes in this respect. Stresses up to the elastic limit of the material do not produce permanent deformations, while variations in temperature and humidity may be ignored. There is no more reason why an aeroplane should be repeatedly trued up than a ship should be subjected to such treatment, always assuming that corresponding methods of design and construction have been employed in both cases.

Already plywood has been used in the construction of certain portions of wings, notably in the leading edges, over which it is not easy to maintain a critical form with a covering of woven fabric. Portions which are exposed to injury, or are liable to be stepped on, are covered with plywood, and in some recent designs those portions which are severely influenced by the slip stream of powerful propeller have ben protected by plywood ccvering.

One of the serious problems in aeroplane construction has been the question of an ample supply of sound, thoroughly seasoned wood, especially of spruce. It does not seem to have been realized that the true solution of the spruce question lies in the employment of shaped and formed parts of plywood, using poplar, mahogany, gum, and other plentiful and wholly suitable woods. The reduction in weight is readily secured by the use of hollow members, especially for struts, spars, and similar parts, while for wing ribs there is nothing so good as properly disposed plywood.

The question of soundness is wholly in control of the maker, since the interior of the material is open and visible for inspection as it is laid up, and there need be no uncertainty in this respect. So far as seasoning is concerned, the thin sheets are readily dried when cut, and their freedom from moisture determined immediately, so that, instead of waiting for long periods of time for uncertain air drying, or the difficulties of kiln drying, with its accompaniment of possible case-hardening, etc., the plywood members may be manufactured from wood which, forty-eight hours before was lying in freshly-cut timber.

The real problem in the successful use of plywood in aeroplane construction lies in the determination of a moderate number of standardized parts, such as struts, wing-ribs, spars, and fuselage forms, capable of quantity production in accurately formed moulds, and not subject to continual and trifling alterations. There is every reason why such parts should be as thoroughly standardized as are rolled steel sections or standard drop-forgings, so that the designer may select from such standard shapes the parts required for any type of aeroplane upon which he may be working, and order these parts from stock, just as structural beams, girders, and rails are now ordered.

Such a standardization would facilitate, rather than hinder, freedom in general design, and strike the shackles from the aeroplane industry, and place it upon a true quantity production basis.

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(Continued from page 953)

sinister or disloyal influence has affected production in the Ford plant. The factory manager testified that there had been no sabotage and no efforts to retard production. Results in the Ford Motor Company compare favorably with those in the best of the companies manufacturing Liberty motors. Its contract for 5,000 motors was let in November, 1917, nearly three months after contracts had been let to the Packard and Lincoln Companies for 6,000 each. Up to October 11, 1918, it had produced 1,868, while the Packard Company had produced 3,864 and the Lincoln Company 2,787. Not a case of sabotage has been reported to the Department of Justice from this plant. Indeed it can be said that but little trouble has been traced to aliens or alleged German sympathizers in any of the plants.

Sabotage

To what Judge Hughes has said on this subject I wish to add that since his report was handed to me I have had the records of the Department of Justice examined for the purpose of ascertaining the number of substantial complaints of sabotage in the factories engaged in manufacturing aircraft, motors, or parts for the Government. The result shows twelve such complaints. Upon these complaints and the investigations which followed seven men have been indicted, two of whom have pleaded guilty and five of whom are awaiting trial. In this connection it is interesting to note that during the past eighteen months somewhere between 100,000 and 200,000 laborers have been engaged on Government work in the factories indicated.

Respectfully yours,
(Signed) T. W. GREGORY,
Attorney General.

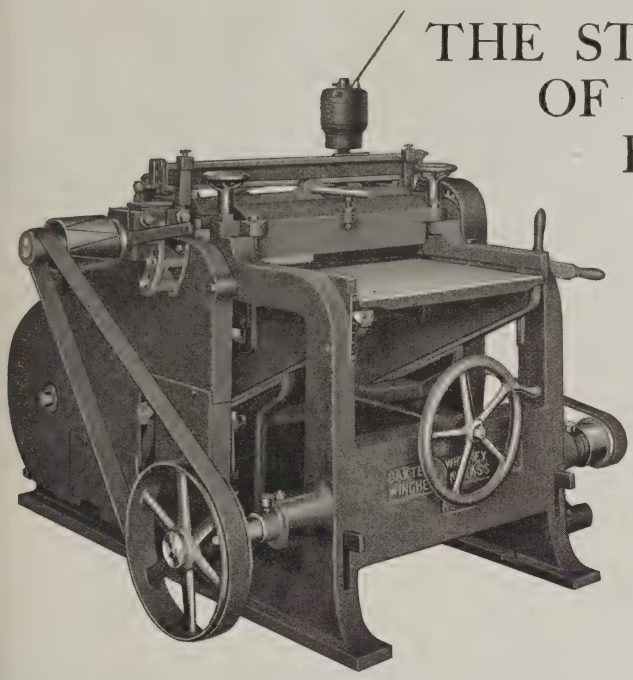
(Continued from page 936)

in this city on Tuesday night Lieut. Col. William A. Bishop, the Canadian ace, who has an officially certified record of seventy-two German planes brought down during the war in combat, declared that "the future of aviation is not in warfare, it is in commerce," and then he ventured to make a prediction:

"The first startling thing will be the transatlantic flight. At the end of another year I feel quite confident that scores of machines will have crossed the Atlantic."

The aviators will have to show some enterprise or the Zeppelins will sail into an Atlantic harbor first. Already, according to the *Echo de Paris,* the Germans are planning to convert military dirigibles into "aerial merchantmen." It is estimated that in fair weather they could travel at a rate of seventy miles an hour and remain in the air for several days. During the war a Zeppelin, carrying a crew of twenty-five men and twenty-five tons of munitions and medicines, started from Jamboli, in Bulgaria, to relieve General Lettow-Vorbeck in German East Africa, but turned back when sailing over Khartum upon receiving a wireless message that the German campaign had ended in disaster. The dirigible returned to Bulgaria after a voyage of 3,000 miles. This report has not been officially confirmed, but there seems to be no doubt that the Zeppelin, as improved by German inventors, is capable of traveling far enough to cross the Atlantic from Hamburg to New York in about fifty hours.

The aviators, therefore, must be up and doing if they are to make the Atlantic passage first. In their favor is the facility with which an aeroplane can be prepared for the adventure and its immunity from any handicap of strong winds. Unless the Zeppelin navigator could have weather specially arranged for him by Boreas, the great fabric would have to remain in its shed. Apparently Colonel Bishop believes that it would not be necessary to provide a giant, many-engined plane for the Atlantic trial. He has a preference for the small two-seater to make a dash across the ocean. Some daring fellow may probably be the Columbus of the air in such a craft. There will be plenty of volunteers to choose from. Some morning we may wake up and read in triumphant headlines that the thing has been done without a hitch—*Editorial in N. Y. Times.*



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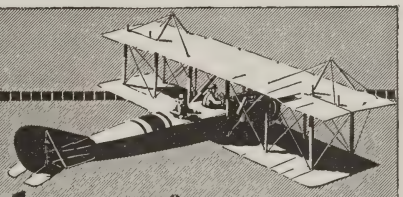
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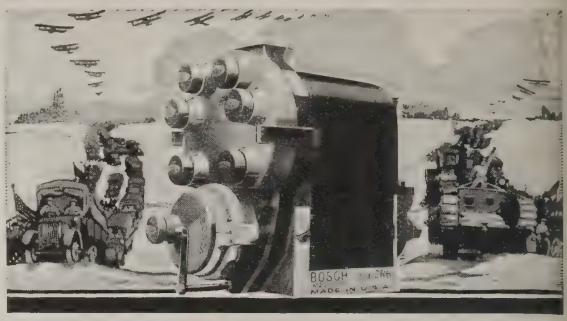


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Captain Victor H. Strahm, Air Service, pilot, 91st Aero Squadron. For extraordinary heroism in action near Metz, France, September 13, 1918. Captain Strahm displayed remarkable courage and skill in penetrating the enemy territory for a distance of 25 kilometers, flying at an altitude of less than 300 meters. His plane was subjected to intense fire from antiaircraft guns in the region of Metz, and he was attacked by a superior number of German planes, one of which he destroyed. He completed his mission and returned with information of great military value. Home address, Frank J. Strahm, Bowling Green, Ky.

First Lieutenant Oscar B. Myers, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Cierges, France, September 28, 1918. Sent on a particularly hazardous mission, he harassed and routed enemy troops. Lieutenant Myers then climbed higher to look for German planes. With two other officers he encountered nine Fokkers protecting a reconnaissance machine, flying in one of the most effective formations used by the enemy. Outmaneuvering the hostile planes, the three officers succeeded in routing them. After a quick turn Lieut. Myers dived at the reconnaissance machine and crashed it to the ground in flames. Home address, S. Oscar Myers, 109 South Third Avenue, Mount Vernon, N. Y.

First Lieutenant William T. Badham, Air Service, observer, 91st Aero Squadron. For extraordinary heroism in action near Nuzancy, France, October 23, 1918. .This officer gave proof of exceptional bravery while on a photographic mission 25 kilometers within the enemy lines. His plane was attacked by a formation of thirty enemy aircraft; by skillful work with his machine gun, Lieutenant Badham successfully repelled the attack and destroyed two German planes. At the same time he manipulated his camera and obtained photographs of great military value. Home address, H. L. Badham, Whitaker Street, Birmingham, Ala.

First Lieutenant George C. Kennedy, Air Service, pilot, 91st Aero Squadron. For extraordinary heroism in action near Jametz, France, October 9, 1918. This officer gave proof of his bravery and devotion to duty when he was attacked by a superior number of aircraft. He accepted combat, destroyed one plane and drove the others off. Notwithstanding that the enemy returned and attacked again in strong numbers, Lieutenant Kennedy continued his mission and enabled his observer to secure information of great military value. Home address, L. Gordon Glazier, 4 Egremont Road, Boston, Mass.

First Lieutenant Benjamin L. Atwater, Air Service, observer, 99th Aero Squadron. For extraordinary heroism in action near Landres-A-St. George, France, October 5, 1918. Lieutenant Atwater started on a photographic mission with Lieutenant Alexander, pilot, over the enemy's lines. Forced back by seven enemy pursuit planes, he determined to complete his mission, and recrossed the line eight minutes later. A large group of enemy pursuit machines again attacked his plane. Disregarding his wound, he operated his machine gun with such effect that the nearest of the enemy planes was put down out of control. Home address, Mrs. Ella C. Atwater, mother, 152 Maple Avenue, Red Bank, N. J.

Second Lieutenant William J. Brotherton, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Fere-en-Tardenois, France, on August 1, 1918. An enemy Rumpler plane being reported over the aerodrome, Lieutenant Brotherton with another officer ascended and soon encountered six Fokker planes that were protecting another Fokker serving as a decoy. Disregarding the enemy's superiority in numbers, he maneuvered so as to secure the advantage of the sun and dived on the decoy plane, pouring in a destructive fire. He killed the pilot and crashed the machine to the ground. Home address, C. J. Brotherton, Guthrie, Ill.

First Lieutenant Lansing C. Holden, Air Service, 1st Pursuit Group. For extraordinary heroism in action near Montigny, France, October 23, 1918. Lieutenant Holden was ordered to attack several German balloons, reported to be regulating effective artillery fire on our troops. After driving off an enemy plane, encountered before reaching the balloons, he soon came upon five balloons in ascension 1 kilometer apart. In attacking the first, which proved to be a decoy with a basket, his guns jammed; after clearing them he attacked the second balloon, forcing the observer to jump. His guns again jammed before he could set fire to this balloon. Moving on the third balloon at a height of only 50 meters, he set fire to it and compelled the observer to jump. He was prevented from attacking the two remaining balloons by the further jamming of his machine guns. Home address, L. C. Holden, father, 888 West End Avenue, New York, N. Y.

Major Harold E. Hartney, Air Service, 1st Pursuit Group. For extraordinary heroism in action near Fismes, France, August 13, 1918. Major Hartney voluntarily accompanied a reconnaissance patrol. Realizing the importance of the mission, Major Hartney took command, and, although five enemy planes repeatedly made attempts to drive them back, he continued into enemy territory, returning later to our lines with important information. The cool judgment and determination displayed by Major Hartney furnished an inspiration to all the members of his command. Home address, Mrs. Harold E. Hartney, care of Russell Hartney, Saskatoon, Saskatchewan, Canada.

Second Lieutenant Richard Wilson Steele, observer, Air Service, 166th Aero Squadron. For extraordinary heroism in action near Bois D'Barricourt, France, October 23, 1918. While on a bombing raid back of the German lines, Lieutenant Steele, accompanied by his pilot, was attacked by six German pursuit planes. They were forced to leave the formation in which they were traveling owing to engine trouble; the enemy began riddling their plane with machine-gun fire. Lieutenant Steele fought them on all sides and is credited by members of the 11th Aero Squadron, who were flying over him several thousand feet, with having brought down one of his opponents. He was wounded twice in the leg and twice in the arm and continued fighting, although each time he was hit he was knocked down into the observer's cockpit. At last, however, only his tail gun was in working condition, the other two having been disabled by bullets, and Lieutenant Steele sank unconscious into the cockpit. Home address, William Steele, father, 426 East Euclid Avenue, Oak Park, Ill.

First Lieutenant Hugh L. Fontaine, Air Service, 49th Aero Squadron. .The bronze oak leaf is awarded Lieutenant Hugh L. Fontaine for extraordinary heroism in action near Champigneulle, France, October 10, 1918. While leading a patrol of three other machines, Lieutenant Fontaine attacked four enemy planes in the region of Champigneulle. He succeeded in shooting down out of the enemy planes in flames. The first of these he shot down in the initial attack. The second he attacked while it was endeavoring to shoot down one of our planes which had been rendered helpless by the loss of one of its wings. He dived on the attacking plane and shot it down in flames. Home address, Dr. Bryce Fontaine, stepfather, 1839 Overton Park Avenue, Memphis, Tenn.

First Lieutenant Raymond P. Dillon, pilot, 24th Aero Squadron. For extraordinary heroism in action near Mezieres, France, November 3, 1918. Lieutenant Dillon exhibited courage in the course of a long and dangerous photographic and visual reconnaissance in the region of Mezieres with two other planes of the 24th Aero Squadron. Their formation was broken by the attack of ten enemy pursuit planes; five enemy planes attacked Lieutenant Dillon and his observer, who succeeded in shooting down two of these out of control. They then had a clear passage to their own lines, but turned back into Germany to assist a friendly plane with several hostile aircraft attacking it. They succeeded in shooting down one more of the enemy. Home address, Claude A. Dillon, brother, 5839 Prairie Avenue, Chicago, Ill.

OCT 20 1919

AERIAL AGE WEEKLY

Vol. 8, No. 20 JANUARY 27, 1919 10 CENTS A COPY



The aerial vista surpasses that of all other methods of transportation

Aerial Transportation in the United States and Elsewhere

The Duesenberg Model H Aero Motor Described

ISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
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AERIAL AGE WEEKLY

VOL. VIII JANUARY 27, 1919 No. 20

TABLE OF CONTENTS

PAGE

Aerial Transportation in the U. S. and Elsewhere 979

The Airman in Civil Life..... 979

Colonel Deeds Not to be Court-Martialed 980

The News of the Week..... 981

The Aircraft Trade Review..... 983

U. S. Aerial Mail 984

The Vought VE-7 Training Aeroplane 985

Nomographic Charts for the Aerial Propeller 988

The Duesenberg Model H 850 H.P. Motor 991

Naval and Military Aeronautics ... 998

Foreign News 1000

Elementary Aeronautics and Model Notes 1001

Aeronitis 1002

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
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Aeronautical Exposition

of the

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AERIAL AGE WEEKLY

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY
PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City
WASHINGTON OFFICE: 619 *Union Trust Bldg.*
LONDON OFFICE: *Thanet House, 231 Strand, W. C.*
Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879
Copyright, THE AERIAL AGE CO., January 27, 1919
Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, JANUARY 27, 1919 NO. 20

AERIAL TRANSPORTATION IN THE U. S. AND ELSEWHERE

AS AERIAL AGE goes to press the energetic Captain Benjamin B. Lipsner is concluding the arrangements for the purchase of a number of large planes, each capable of carrying forty passengers.

This is as important an event in the history of aeronautics as was the placing of the first order for an aeroplane by the United States Army in 1907 or by the Navy in 1911 or by the Post Office last spring.

It is an epochal event. The example will be followed. We may expect that scores of concerns will be organized during the coming year to establish aerial transportation lines.

The coming Aero Show being organized by the Manufacturers' Aircraft Association, which has the support and co-operation of the Army, Navy, Aero Club of America and Aerial League of America, will do much to stimulate interest in aerial transportation. So will the aeronautic events being planned by the Aero Club of America and Aerial League of America.

The War and Navy Departments are to cooperate with the Manufacturers' Aircraft Association in the aeronautical exposition which the association is to hold in Madison Square Garden and the 69th Regiment Armory.

Cooperation was asked of the officials at Washington, and as a result Army and Navy representatives were sent to New York with lists of prospective exhibits. Great interest will be created by the exhibiting of the large Navy flying boat, the NC-1, which is capable of carrying fifty passengers, and which may attempt the passage of the Atlantic. The Army group includes a Handley-Page and a Caproni. In addition there are a number of captured German 'planes and a large quantity of trophies.

Other countries are going ahead with aerial transportation. The second flight from London to Egypt and to India has ended successfully. An air line is in operation between London and Paris. According to the despatches in order to remedy the slowness of correspondence with Alsace-Lorraine, the French Aeronautic Department has organized an air mail service between Paris and the principal towns of Alsace-Lorraine.

A regular aerial passenger service between London and Paris for the benefit of British members of the Peace Conference was opened on January 20. Several aeroplanes were fitted up for this purpose. They have a comfortable cabin for two passengers, including cushioned seats and a table, the whole inclosed with glass.

Major-General Sir W. Brancker, who recently visited America on a British mission, is taking an important post in connection with the Aircraft Manufacturing Company, of which Holt Thomas is managing director.

Announcement has been made already that this company is arranging an aerial passenger service between London and Paris. Plans will be developed in many other directions, including airlines from London to Glasgow, Edinburgh, Manchester, Newcastle, Wales and Ireland; also external lines from London to Sweden, Denmark, Holland, Spain and Italy.

Brancker will direct this scheme of aerial transport and also the higher aspects of international flying, the creation and development of an organization of pilots and aeroplanes. He will plan also the air routes over land, with landing grounds every ten miles, including a route from England to India, and at sea will look after the placing of a series of mark boats at intervals of 200 miles.

An American-British transatlantic air commerce line is one of the ultimate features which he will control, while still retaining the rank of Major-General in the Royal Air Service. Obtaining his services is regarded as a great triumph for the company.

THE AIRMEN IN CIVIL LIFE

THERE has been no small amount of speculation as to whether the men whom war placed in dangerous and spectacular work would be willing to return to the comparatively quiet and humdrum pursuits of peace. Inasmuch as the aviators were the men to whom opportunity for individual adventure and daring was afforded more than to any other class, the wonderment was most keen as to the occupations which they would select upon their return to civil life.

According to a statement of the Aero Club of America, the airmen do not wish to take up their careers where the call to war broke them off. They have sensed the thrills of the upper air; the conquest of a new element has fascinated them. The aerial mail service affords them an opportunity to continue their work in aviation; but many of them appear to find this tame and uninteresting. The commercial development of aviation offers another field. A London-to-Paris passenger and freight service is already in prospect; one from New York to Philadelphia is planned for the early summer. These offer fields for the development of speed and carrying capacity in planes; but they do not provide—and, indeed, it is doubtful whether anything can do this—a substitute for the thrills of meeting enemy planes in aerial combat.

Perhaps the particular calling which will offer the greatest attraction to the more adventurous aviators is the development of new types of planes. The early years of this century brought the automobile racer into prominence. One disadvantage of the holding of an aerial sweepstakes would be that it would be rather farcical to attempt to charge admission to spectators; but there would no doubt be enough prize money offered to make the winning of such events well worth while. Then there are the trans-Atlantic and trans-Continental flights yet to be achieved, and there might be a market for the "gentleman's speedster" type of plane. It may be that there will yet be thrills enough, even in a world at peace, to satisfy the most insatiable aeronaut.—*Editorial in Baltimore News.*

COLONEL DEEDS NOT TO BE COURT-MARTIALED

THE following correspondence is published by the War Department:

January 16, 1919.

Chairman, Committee on Military Affairs,
House of Representatives.

MY DEAR SIR:

Upon the submission to the President of the report of Honorable Charles E. Hughes, and the report of the Attorney General covering the Aircraft investigation. I directed that *the specific recommendations* contained in these reports *be extracted* for my consideration and for such action by me as might be required in the premises. These *extracts* were referred to the Judge Advocate General of the Army directing a thorough and comprehensive inquiry into the allegations affecting the conduct of Colonel Deeds. He was directed, not only to review all evidence taken by Judge Hughes, which the Attorney General kindly made available, but to secure all other facts obtainable in this case.

The Judge Advocate General committed the matter to a board of review consisting of officers of high ability and character wholly disassociated from any previous business or personal relations either with Colonel Deeds or with any matters affecting aircraft production. This board carefully and systematically examined all of this evidence and obtained all possible additional facts and its conclusions are, therefore, based upon fuller inquiry than was found possible within the time and opportunities at the disposal of Judge Hughes, and this examination is in effect the accomplishment of the thorough inquiry which Judge Hughes had in mind when he suggested that these transactions be examined by a Court-Martial. The purpose of Judge Hughes' suggestion is therefore accomplished.

This record undoubtedly shows that Colonel Deeds, absorbed in the activities of Aircraft Production, neglected to give his personal attention to transactions affecting his personal financial affairs, and this neglect on his part gave rise to appearances which required painstaking investigation in order to show their true character.

The unanimous report of this board of review, approved by the Acting Judge Advocate General, recommends that Colonel Deeds be not tried by Court-Martial on any of the grounds suggested, and this recommendation has been approved by me.

Colonel Deeds was one of a large group of men who came to Washington at great personal and pecuniary sacrifice to render service to the Government in the great emergency caused by our participation in the war.

My duty as Secretary of War with regard to any public servant under my jurisdiction is clearly to bring about proper punishment for wrongdoing and equally clearly to protect those public servants whose conduct is faithful and upright against embarrassment, humiliation or loss.

Very wide publicity has been attached to the acts of Colonel Deeds as a member of the Aircraft board. Whether it will ever be possible to overtake the judgments which have been formed upon partial information on this subject, I do not know; but this department will make every effort to secure the widest publicity for the action now taken and for the grounds upon which it rests. To carry this into effect, I am therefore transmitting to your Committee for its information, and with the request for its publication in the Record, if the proprieties of the situation permit, a copy of the report of the Judge Advocate General. Similar copies are being furnished the Chairman, Committee on Military Affairs, United States Senate, the Attorney General and Colonel Deeds.

Inasmuch as the purpose of Judge Hughes' suggestion has been accomplished, I have directed that all the records in this case be filed in the War Department and that this matter be considered as closed.

Cordially yours,
NEWTON D. BAKER,
Secretary of War.

December 26, 1918.

MEMORANDUM FROM THE CHIEF OF STAFF:

SUBJECT: Proposed court-martial proceedings in the case of Colonel Edward A. Deeds, Signal Corps.

REVIEWED by THE BOARD OF REVIEW—READ, (Chief of Division) MILLAR, TUCKER and KEEDY, judge advocates.

1. Pursuant to the reference to this office of the report of Judge Hughes of the Aircraft Inquiry for review and recommendation (1) as to what disciplinary action, if any, should be taken with reference to the persons affected, and (2), as a subsidiary matter, for a statement from this office as to the desirability of granting requests of certain officers therein mentioned, for courts of inquiry, independently of any action which might be recommended as to disciplinary measures to be taken, this office submitted under date of November 11, 1918, a memorandum on the subject, *based solely upon the report of Judge Hughes* hereinabove referred to, and containing certain recommendations, among which was a recommendation that Colonel E. A. Deeds be tried by court-martial upon charges based upon certain facts set forth in said memorandum.

2. The memorandum from this office hereinabove referred to has since been returned with instructions to examine the question with regard to the case of Colonel Edward A. Deeds "with reference to all the facts obtainable," and to base the advice of this office on inspection of the evidence taken by Judge Hughes and all other facts obtainable with the suggestion that this office send for Colonel Deeds, his former counsel, Judge McCann, of Dayton, Ohio, Mr. W. W. Montgomery, counsel for the Aircraft Board, and any other persons who might aid in the inquiry.

3. Pursuant to these instructions Colonel Deeds, Judge McCann, and others who were in a position to lay before this office facts in addition to those referred to in the Hughes report, were sent for and interviewed. At the request of this office sworn statements have been submitted by Colonel Deeds, Judge McCann, H. E. Talbott and George B. Smith (Col. Deeds' confidential agent), and an unsworn statement by Major E. A. Coleman, Disbursing Officer, Bureau of Aircraft Production. In addition consideration has been given to letters from Hon. John D. Ryan, Director of Air Service, referred to this office by the Secretary of War, and to a letter from Mr. Montgomery, submitted by Mr. Ryan, all of which statements and letters are forwarded herewith. After reading these documents and the testimony relating to Colonel Deeds given at the inquiry made by Judge Hughes, and after careful consideration of the subject referred to it, this office submits the following memorandum:

INTRODUCTORY

4. In order to understand the true bearing of the transactions criticized by Judge Hughes in his report upon the relations between Colonel Deeds and the Government, it will be necessary to mention briefly the business associations of Colonel Deeds at the time the call came to him to serve the Government, together with events immediately preceding his being commissioned an officer in the United States Army.

In the early part of 1917, Mr. Deeds was a man of wealth, well-known in the field of aircraft development. He was a large holder of stock in the Dayton Metal Products Company, which had profitable fuse contracts with the British Government and other contracts with the United States Navy Department, and which had accumulated a considerable surplus in its treasury. Mr. Deeds was vice-president of the company, receiving as such a salary of $25,000 a year. He had also been a large stockholder in what was known as the Delco Company, the stock in which, owned by him and his associates, had been sold to the United Motors Company for several millions of dollars in cash and, in addition, stock in the company. He was president of the latter corporation, drawing as such a salary of $60,000 per year. He was also largely financially interested in the Domestic Building Company, which owned the land and erected the building in Dayton, Ohio, subsequently acquired by the Dayton Wright Airplane Company for its principal aeroplane plant. On April 9, 1917, the Dayton Wright Airplane Company was incorporated, taking over the Orville Wright Airplane Corporation, in which Deeds had also been financially interested before that time. Deeds was an incorporator of the Dayton Wright Airplane Company, in which he had intended to become a stockholder and of which he intended to become vice-president, until his plans were changed because of his subsequent connection with the Government, as will be hereinafter recited. In all these enterprises he had been very closely associated with Charles F. Kettering, H. E. Talbott, senior, and H. E. Talbott, junior. Relations between these four gentlemen appear to have been unusually close and friendly.

On March 6, 1917, Mr. Deeds was requested by the Secretary of War to serve on a commission to be known as the Munitions Standards Board, which was constituted to be an "advisory channel through which may be made available to the various departments of our military establishment the civilian expert technical and commercial knowledge in matters relating to the procurement of munitions and supplies."

The Secretary of War in the letter of appointment, informed Mr. Deeds that he was asking him to undertake this patriotic service for the country, although there was no authority of law for compensating him in any financial way for personal services. This appointment Mr. Deeds at once accepted. A family bereavement prevented him from performing any duty on the Board.

On April 4, Mr. Deeds reecived a telegram from Mr. Howard Coffin, of the Council of National Defense, requesting him to come to Washington at once, and to bring with him Kettering and Talbott. These three gentlemen came to Washington, and Mr. Coffin stated in a somewhat indefinite way that the Government needed men of experience to help work out the aeroplane problems in Washington. In response to Mr. Coffin's request that Messrs. Talbott and Deeds make an industrial survey of the United States with a view to apportioning the raw materials between war necessities and business in anticipation of shortages of raw materials, these two gentlemen spent a few days in consideration of the subject, but the project proved impractical and they returned to Dayton. Mr. Coffin afterwards communicated with Deeds with reference to his becoming a member of a committee to aid in the aviation project, in response to which Mr. Deeds sent the following telegram:

Washington, D. C.
May 10, 1917.

HOWARD E. COFFIN,
Darien, Georgia.

Appreciate very much your confidence in suggesting me on aviation commitee. Two things are troubling me. First, we will sell bonds and let contracts on conservancy this summer, which will require one-half my time after June fifteenth and this must take precedence. Twenty-five millions are to be spent. Second, my activity as Vice-President of the Dayton Wright Airplane Company might bring criticism. You may not know that our Dayton crowd got behind Orville Wright long before war was declared. Our first factory building one hundred by five hundred will be occupied in about six weeks. Our motive is to do some constructive work in aviation and our whole development force is being directed toward that end. We will undoubtedly build machines for the Government and the public might not understand. For these reasons I doubt the wisdom of my accepting. Whether I sit on the board or not, you may give me any specific job such as locating and building a supply station, equipping a field, or anything else, and I will come across as best I can. Would like your advice before giving final decision.

E. A. DEEDS."

(*Continued on page* 996)



THE NEWS OF THE WEEK



Aeronautic Exposition Plans Progressing

As the result of a conference held January 15 at the offices of the Manufacturers Aircraft Association, it is assured that the Aeronautical Exposition of the Association is to be one of the most remarkable affairs ever presented in the history of the United States.

When the Manufacturers Aircraft Association decided that aeronautics had a commercial future and therefore that the exposition was justified, it presented the proposition to the War and Navy Departments, with a request for cooperation and advice. The aeronautical industry from the time we entered the war against Germany has been closely bound up with the Government, and therefore it was natural for the association to turn to the two great Departments for counsel. The response was extraordinarily gratifying. The officials became personally interested in the idea of holding in New York City an exposition of national character. Heads of the various bureaus undertook to collect a possible list of exhibits, and on January 15 at the conference in this city these lists were presented for mutual consideration.

Commander G. C. Westervelt and Lieutenant Commander A. C. Read, represented the Navy. Major H. M. Clark, Major Henry J. Miller, Captain L. E. Rubel, Captain J. S. Maholl, Captain Roy Francis and Lieutenant John Tuerk represented the Army.

It is impossible at the present time to make public the lists as submitted by the Navy and Army representatives, but it may be stated with authority that never in the history of the United States have the Departments been able to gather together such a remarkable collection, judged from military, naval, scientific and commercial standpoints as that which will be available for the manufacturers' exposition.

The Navy has suggested for exhibition more than half a dozen aeroplanes and flying boats, one of which is the famous "NC1," which not long ago at Far Rockaway carried fifty passengers in a flight of considerable length.

The Army has in mind for the exposition twenty-five aeroplanes, some ten or more of which are foreign types. These include war trophies, among which are the latest examples of German aerial manufacture. Included in the proposed Army exhibit are a Handley Page and a Caproni. This is interesting inasmuch as it will enable the Manufacturers Aircraft Association to present to America for the first time at one place the greatest examples of aeroplane construction in the United States, Great Britain and Italy. In addition a representative group of airships, it is expected, will be included from France and Germany.

While, of course, it will not be stated absolutely that all of these planes will be placed on view, it is known that the committees representing the Army, Navy and Manufacturers Aircraft Association are working along these lines, and therefore announcements may be expected shortly.

It was evident from the lists as submitted by the Army and Navy that these Departments regarded the manufacturers' exposition as an extraordinary opportunity to present to the public the achievements of America in the air.

The lists of proposed planes, instruments and trophies reveal items around which heretofore secrecy was maintained due to military necessity. But now that the power of Germany is broken and the war virtually at an end, the Departments feel at liberty to take the world into their confidence and tell exactly how much America accomplished during the eighteen months we were in the conflict. Both Departments have proposed to stage demonstrations inside and outside of Madison Square Garden, and it is thus assured that the exposition will assume a semi-official character. It is evident from this that the Garden will be too small to house all the exhibits available from the Government and the various manufacturers, therefore it may be regarded as probable that the Manufacturers Aircraft Association will hold simultaneous shows in other available places. In this connection one or more of the armories have been mentioned, and negotiations are under way to obtain them for the period.

Macauley Plans New Flights

Fort Worth, Tex., January 18.—Major T. C. Macauley, commanding officer at Taliaferro Field, will soon attempt to fly from Fort Worth to San Diego and return in forty-eight hours and another to Jacksonville, Florida, and return. Major Macauley has made a round trip to the Pacific Coast in four days.

New Air Chief Receives D. S. M.

Upon recommendation of General Pershing, the Distinguished Service Medal has been awarded to Major General Charles T. Menoher, U. S. Army, for exceptionally meritorious and distinguished service. He was in command of the 42nd Division from Chateau-Thierry to the conclusion of the Argonne-Meuse offensive, including the Baccarat Sector, Rheims, Vesles and St. Mihiel Salient, with his division, he participated in all of these important engagements.

In awarding the medal, it is mentioned that the reputation as a fighting unit of the 42nd Division was in no small measure due to the soldierly qualities and the military leadership of General Menoher.

Capt, J. Norman Hall Set Free

Washington, January 19.—Captain James Norman Hall, according to information from the War Department, has been released together with 135 other war prisoners. Captain Hall was driven down behind the German lines last May, as a member of the Lafayette Escadrille.

Automobile Association to Hold Banquet for Capt. Rickenbacker

Captain Edward V. Rickenbacker, erstwhile champion automobile race driver, and, by virtue of his official record of bringing down twenty-six "Hun" fliers, America's leading "Ace," is to be the guest of honor at a banquet arranged by the Contest Board of the American Automobile Association, on behalf of the automotive sport and industry of the United States, which will be held in the ballroom of the Waldorf-Astoria February 3.

Vedrines Lands On Roof

Paris, January 19.—Jules Vedrines, the French aviator, landed in a plane on the roof of the Galleries Fafayette. The feat is notable, for the roof is fenced about by sky signs and other erections, its dimensions being approximately 46 feet in width and in length about 82 feet. The width of the aeroplane used by Vedrines is 39 feet.

For being the first airman to accomplish the feat of landing on a roof Vedrines is the winner of a $5,000 prize.

Air Service Histories

Special efforts are being made to secure the histories of every aero squadron that has been in the American Expeditionary Forces for use in the history of the Air Service. Lieut H. W. Heintz, A.S., has been detailed to the Aeronautical Information Branch of the Executive Section, D. M. A., to carry out this work in the United States. The original copies of the squadron histories will be kept in the Aeronautical Information Branch at Washington, carbon copies being forwarded to the Information Section, Air Service, A. E. F.

May Prohibit Hunting By Air

St. Paul, Minn.—Minnesota's game laws may have to be amended to protect its ducks and geese from a new menace. State game wardens are considering the suggestion that the Legislature be asked to pass a bill tihs winter making it illegal to hunt feathered fowl from aeroplane.

Minnesota has turned out a great many aviators. It is understood that many aviators who observed the flight of ducks late this autumn decided that the modern hunter will travel in the air "bus."

From casual discussion the possibility of such hunting has caused statewide attention. Game wardens believe that ducks and geese could be slaughtered by aviators. Therefore, there is a possibility that the State Legislature will forestall such hunting.

Navigation Maps for Airmen

Washington.—Aerial navigation maps are included, under War Department orders, in the permanent military maps to be prepared and kept up to date in the records of the Department.

The purpose is to furnish military aviators with accurate route guides in flying from one place to another.

Areas to be mapped out will consist of zones twenty miles wide and connecting such cities and training centers as may be designated by the chief of staff.

Columbia to Honor Aces

Columbia plans special honors for two of its athletes who were named in the official list of American aces published in AERIAL AGE last week. Lieutenant Francis M. Symonds, of 20 West Eighth Street, and Lieutenant G. De Freest Larner are the two aviators Columbia contributed to the ranks of the Yankee aces. Symonds, according to the list, brought down five German planes, while Larner received credit for bringing eight to earth.

Lieutenant Symonds was captain of the Columbia 'Varsity football eleven of 1915, the team which went through the season without a defeat. He was a member of the class of 1916, and rowed in the freshman eight at Poughkeepsie in 1913. He was noted for his punting.

Lieutenant Larner was in the class of 1920, and was a freshman when the war broke out. He had won a place in the outfield of the 'Varsity baseball team.

Monument to Aviators

Officers of the Division of Military Aeronautics will cooperate with the Interior Department in erecting a memorial to aviators killed in the War.

The following named officers are constituted a Board to meet at the call of the President for the purpose of assisting and cooperating with the Secretary of the Interior and Mr. George B. Dorr in the matter of the erection of a monument in the Sieur de Monts National Park to the aviators who have died during the war: Major General W. L. Kenly, A. S. A.; Colonel F. R. Kenney, A. S. A.; Colonel Arthur Woods, A. S. A., and Captain Grover O'Neill, A. S. A.

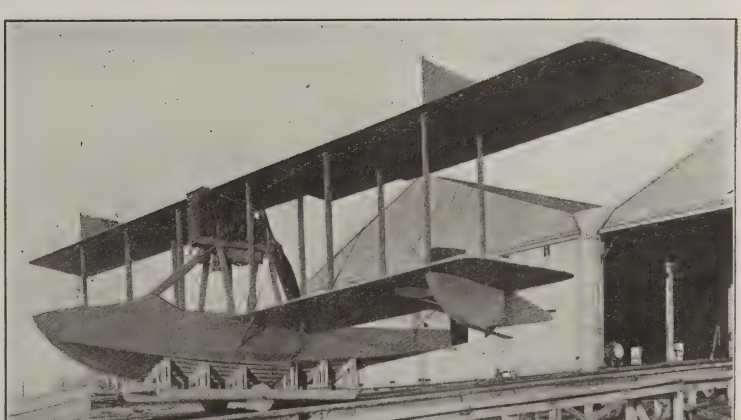
Aero Units En Route

Following organizations have been assigned to early convoy: 17th Aero Squadron, 4 officers, 154 men; 148th Aero Squadron, 4 officers, 154 men; 657th Aero Squadron, 2 officers, 149 men; 636th Aero Squadron, 3 officers, 147 men; 474th Aero Squadron, 7 officers, 460 men; 12th Balloon Company, 6 officers, 174 men; 102d Balloon Company, 8 officers, 170 men.

R. M. A.'s

The following named officers have been rated as Reserve Military Aviators, the date set after their respective names:

Major Charles Herrick Hammond, A. S. A.,



The Curtiss Model MF flying boat with a Curtiss OX5 engine at Port Washington, L. I.

January 8, 1919; Captain L. E. McQuitty, A. S. A., January 6, 1919; Captain Raymond Wilcox Smith, A. S. A., January 8, 1919; Captain Brady Walter Warner, A. S. A., January 8, 1919; 1st Lieut. Paul Royal Corner, A. S. A., January 8, 1919; 1st Lieut. Harry Walker Colmery, A. S. A., January 8, 1919; 1st Lieut. Forrest Smith Emery, A. S. A., January 8, 1919; 1st Lieut. Joseph S. Pliska, A. S. A., January 8, 1919; 1st Lieut. Eben Stanley, A. S. A., January 8, 1919; 1st Lieut. Albert Hector Torongo, A. S. A., January 8, 1919; 1st Lieut. A. W. Vanaman, A. S. A., January 6, 1919; 2nd Lieut. Clyde M. Allen, A. S. A., January 7, 1919; 2nd Lieut. Charles Cla k Bowen, A. S. A., January 8, 1919; 2nd Lieut. Otto F. Burney, A. S. A., January 6, 1919; 2nd Lieut. John S. Childs, A. S. A., January 9, 1919; 2nd Lieut. C. F. Cocke, A. S. A., January 8, 1919; 2nd Lieut. Elmer Fred Degon, A. S. A., January 8, 1919; 2nd Lieut. Wallis A. Frederick, A. S. (M. A.), January 6, 1919; 2nd Lieut. Taylor Nathan House, A. S. A., January 8, 1919; 2nd Lieut. John Prescott Hoyt, A. S. A., January 8, 1919; 2nd Lieut. Ellis A. Noland, Jr., A. S. (M. A.), January 9, 1919; 2nd Lieut. Mark H. Redman, A. S. A., January 6, 1919; 2nd Lieut. Watkins Wendell Reynolds, A. S. A., January 8, 1919; 2nd Lieut. Frederick H. Winston, A. S. (M. A.), January 6, 1919; Captain R. S. Porter, A. S. A., December 3, 1918; Captain R. H. Torrey, A. S. A., December 3, 1918; Captain Frank F. Dell, A. S. A., January 10, 1919; 1st Lieut. Harmar D. Denny, Jr., A. S. A., January 10, 1919; 2nd Lieut. John C. Bennett, A. S. A., January 10, 1919; 2nd Lieut. J. F. Dworschak, A. S. A., January 10, 1919; 2nd Lieut. H. A. Gulley, A. S. A., January 11, 1919; 2nd Lieut. George K. Rice, A. S. A., January 10, 1919.

Plans for Air Service

The suggested bill presented by Secretary Baker to Congress for the American Army on January 16th, included 1,923 officers and 21,853 men for the Air Service, specified as follows:

1 Major General	2,282 Sergts. 1st class
1 Brigadier General	1,737 Sergeants
22 Colonels	134 Mess Sergts.
45 Lieut. Colonels	2,485 Corporals
126 Majors	134 Buglers 1st class
438 Captains	2,738 Wagoners
696 First Lieuts.	584 Cooks
594 Second Lieuts.	4,366 Pvts. 1st class
1,923 officers	134 Buglers
515 Master Signal Electricians	6,744 Privates
	21,853 Enlisted Men

The Secretary of War reported to the Press January 16, 1919, as follows:

The Bill presented to the House Committee on Military Affairs today is the result of the study made by the General Staff for the creation of an army of five hundred thousand men, divided into such organizations and arms as have been shown by our experience in this war to be appropriate. Under the law as it now is, the present army is in process of demobilization. Some provision is therefore necessary to authorize a regular army for the transition period and until the situation growing out of this war is sufficiently clarified to enable the United States to determine the permanent military policy which will have a proper relation to its needs and obligations. No effort is made in tihs bill to treat the question of universal training or service, but merely to produce an army deemed adequate to meet obligations and needs which can now be foreseen.

In addition to this, the bill provides for the legalization of the present relations and organization in the General Staff in order to preserve what we have built up as the result of experience and growth. The present organization of the War Department is of course a wide departure from the organization which existed before we went into the war, and it is wiser to keep what we have than to go back to the beginning and start over at some future time. It is a part of the purpose of this bill to enable the government to officer the newly constituted regular army by retaining in the service officers of proved ability who have come in either from the national guard or from civil life during the war and who desire to make the army a permanent career. The principle of promotion by selection rather than by strict seniority is introduced above the grade of captain. During the war of course promotion has been by selection, and our experience shows it to be both a wise and a just method of promotion.

Officers Honorably Discharged

The following officers of the D. M. A. have been honorably discharged from the service of the Government.

Ralph C. Cook, Second Lieutenant, A. S. A.; Edward A. Robinson, Captain, A. S. A.; Hartwell L. Hall, Second Lieutenant, A. S. A.; Robert L. Warfield, Second Lieutenant, A. S. A.; James M. Magee, Captain, A. S. A.; Edward A. Stinson, First Lieutenant, A. S. A.; William J. R. Taylor, First Lieutenant, A. S. A.; Ward Bowers Fletcher, Second Lieutenant, A. S. (M. A.); Roy P. Crany, First Lieutenant, A. S. A.; James A. Higgs, Jr., First Lieutenant, A. S. A.; Duncan Langdon, First Lieutenant, F. A.; Roger Tuckerman, Second Lieutenant, A. S. A.; Henry A. McAleenan, Second Lieutenant, A. S. A.; Roy L. Helstrom, Second Lieutenant, A. S. A.; Lawrence G. Ganniny, Second Lieutenant, A. S. A.; Wm. R. Greogory, Second Lieutenant, A. S. A.; Edward R. Spiegel, Captain, A. S. A.; E. Hubert Litchfield, Major, A. S. A.; Charles F. Mills, Second Lieutenant, A. S. S. C.; Pendleton Howard, Second Lieutenant, A. S. A.; Michael A. Kiely, First Lieutenant, A. S. A.; Harry H. Singletary, Second Lieutenant, A. S. A.; Ralph Earle, First Lieutenant, A. S. A.; Edwin C. Smith; Second Lieutenant, A. S. A.; Theodore Sizer, First Lieutenant, A. S. A.; Nathaniel P. Davis, Second Lieutenant, A. S. A.; William G. Boggs, Second Lieutenant, A. S. A.; Philip E. Chase, Second Lieutenant, A. S. A.; William Bernard, First Lieutenant, A. S. A.; Edwin M. Eustis, Second Lieutenant, A. S. S. C.; Robert W. Pringle, Second Lieutenant, A. S. (M. A.); George H. Hannun, First Lieutenant, A. S. A.; Horace L. Stevenson, First Lieutenant, A. S. A.; Harry A. Irwin, Second Lieutenant, A. S. A.; David G. Logg, First Lieutenant, A. S. (M. A.); Lewis H. Mahony, Second Lieutenant, A. S. A.; Royal W. King, Captain, A. S. A.; Ray C. Bridgman, Captain, A. S. A.; Hyland P. Stewart, Second Lieutenant, A. S. A.; George D. Riedel, Second Lieutenant, A. S. A.; James M. Mason, First Lieutenant, Inf.; Anton Pieron, Second Lieutenant, A. S. S. C.

Phones from Air to General Kenly's Desk

A conversation was held Thursday morning, January 16, between Major General W. L. Kenly, Director of Military Aeronautics, seated before the ordinary desk telephone in his office, and Lieutenant Lucas of the Air Service, piloting a radio-equipped aeroplane. This communication involved the use of the telephone lines of the Chesapeake and Potomac system in combination with aeroplane radio. The connection between the line and wireless systems was made at the local radio station at Bolling Field, where apparatus was connected in such manner that speech originating in either system would be automatically transmitted over the other.

General Kenly, Colonel F. R. Kenney and Colonel C. C. Culver were among the Air Service Officers present in the office of the Director, and each talked with Lieutenant Lucas, who was piloting an aeroplane from Bolling Field. General Kenly's office 'phone was used and connected through in the ordinary manner with the branch line running to the radio hut at Bolling Field. At this point the conversation was automatically transferred to the radio system, by means of which it reached Lieutenant Lucas, the connection between the two systems being effected by means of apparatus and circuits designed and installed by members of the radio branch of the Air Service, under the supervision of Colonel Culver.

The aeroplane radio telephone has been in use for something over a year, and air fleets are being commanded by the voice of their commanders at several flying fields over the country. During the last summer communications have been made at some of the fields, in which conversation from the pilot in the air has been automatically transferred to land lines on the field with success, and conversation starting over land lines has been automatically transferred to radio, and by this means reaching the pilot in the air. The conversation yesterday morning, however, was the first official demonstration of a two-way conversation direct between a person using a line telephone and an aviator in flight.

Service Grant Suggested

Senator Vardaman on January 17th introduced a bill granting a bonus of $216 to all officers and enlisted men who served abroad and $180 to all who served in the United States.

Caproni Flies from Detroit to Dayton

Detroit.—A big Caproni bombing aeroplane, one of three built in Detroit, flew from Detroit to Dayton, Ohio. It was piloted by Capt. Edward L. Williams, Jr., chief instructor at the aviation field at Mineola, N. Y., and carried four passengers.

The plane, which has a wing spread of seventy-five feet, is equipped with four Liberty motors, capable of developing 1,050 horse-power.

In addition to the pilot those in the machine were Capt. U. V. D'Annunzio, son of Major Gabrielle D'Annunzio, Italian poet and avitor; Lieut. A. G. Lodewyck, Lieut. H. L. Harris and George Buzane, an automobile race driver, who is acting as guide on the trip.



Naval Officers detailed to supervise work at the Curtiss Engineering Corporation, Garden City. From left to right:—Lieut. J. K. Roosevelt, Lieut. William J. Lee, Captain S. V. Parker, Commander H. C. Richardson, Lieut. S. S. Pierce, Lt. Comdr. H. Wesson, Ensign T. P. Wright, Machinist Danly, Ensign T. J. McCarthy, Ensign G. N. Gregory, Ensign H. B. Sanford

The AIRCRAFT TRADE REVIEW

A. E. J.

Curtiss Offices Move to New York City

The Sales and Advertising Departments of the Curtiss Aeroplane and Motor Corporation have been moved from Buffalo to 52 Vanderbilt Avenue, New York City. At this location, representatives of the parent organization and subsidiary organizations will take care of duties formerly attended to in various cities, principally Buffalo. In fact, the new offices will be a general headquarters for all branches of the Curtiss Company, including the Curtiss Aeroplane & Motor Corporation, Curtiss Engineering Company, and the Curtiss Exhibition Company, which controls the flying schools.

Mr. J. P. Davies has been made General Sales Agent. Other officers of the Company who will be located here are C. W. Webster, E. H. Ballard, and F. Leon Faurote, Advertising Manager.

Prossen with Nilson-Miller

L. P. Prossen has resigned as Mechanical Superintendent of the Black & White Taxicab Company, New York City, and become associated with the Nilson-Miller Company, of Hoboken, N. J. Mr. Prossen has been elected Vice-President and will be in charge of the Gear Cutting, Piston and Piston Ring Departments.

Herring with Ferdinand & Co.

Lloyd C. Herring has joined L. W. Ferdinand & Company as sales manager. For more than thirteen years Mr. Herring was connected with the Boston Office of the General Electric Company and for the past ten years as assistant to the District Manager of the Apparatus Sales Department of that Company.

S. A. E. Anuual Meeting

Over 800 tickets have already been taken for the Victory Dinner of the Society of Automotive Engineers to be given at the Hotel Astor, New York, on February 6th. It is expected that the number of S. A. E. members in attendance together with their guests will amount to 2,000. This social gathering of the automotive engineers will, aside from S. A. E. Midnight Whirl Party atop the Century Theatre, mark the conclusion of the most promising annual meeting held by the man who developed the American motor car and motor truck and are responsible largely for the progress made in aeronautics, motor boats, farm tractors and semi-portable farm units.

Four technical sessions will be held on February 5th and 6th, the Standards Committee making its final recommendations to the Society for the curent half-year on February 4.

President Charles F. Kettering will tell of the results of his investigations of more efficient utilization of fuel. Dr. David White, chief geologist of the U. S. Geological Survey, will report on the unmined supply of petroleum in the United States. Dr. E. W. Dean, of the Bureau of Mines, will speak on the status of refinery practice with particular reference to cracking methods. Dr. J. E. Pogue will give an interpretation of the engine fuel problem. Dr. H. C. Dickinson, of the Bureau of Standards, will present a paper on the status of engine efficiency in the United States. An estimate of the extent and utility of Mexican crudes in the near future will be given by E. De Golyer.

The effect of aeronautic engineering practices on motor car design and construction will be discussed comprehensively by H. M. Crane, of the Simplex Motor Car Co.; Howard Marmon, of Nordyke & Marmon, and O. E. Hunt, of the Packard Motor Car Co. D. McCall White, of the Cadillac Motor Car Co., will talk on the high-efficiency automobile engine. Thermodynamic cycles of the future will be treated by Sidney A. Reeve.

A. Ludlow Clayden will open a discussion on the need for lighter and more efficient cars.

In connection with motor truck engineering, John G. Utz will give historical notes on military truck standardization, and Major A. B. Browne is scheduled tentatively to outline some lessons in truck design developed by the war.

Live topics involved in the design and use of tractors of the farm, industrial and military types, are to be taken up. Lieut.-Col. Herbert W. Alden will speak on the U. S. Army tanks. Lieut.-Col. William Guy Wall will analyze automotive ordnance apparatus. A paper by G. W. Watson on British tanks is expected from England. Edward R. Hewitt will present a paper on the principles of the wheeled farm tractor.

The most spectacular and in a way the most compelling session will be that on aeronautics. John W. Smith will describe the fixed radial cylinder type of aeronautic engine. J. G. Vincent, of the Packard Motor Car Co., and until recently chief of the Airplane Engineering Division, Bureau of Aircraft Production, will give an authoritative and complete statement regarding the Liberty engine. An entertaining and illuminating presentation on forest products for aircraft use will be made by Cylde H. Teesdale.

The Navy Department will co-operate very generously in the program, Commanders H. C. Richardson and F. G. Coburn speaking respectively on airplane and seaplane engineering and production. Starr Truscott will have dirigibles as a subject. It is hoped that Commander J. H. Towers will tell of the operation of naval aircraft.

George F. Crouch will speak on the automotive application of marine engines in the war.

Practical Aviation

Practical Aviation, by Major J. Andrew White, is a text book for intensive study by men preparing to become military aviators, containing all the knowledge of fundamentals required prior to actual flying and air combat.

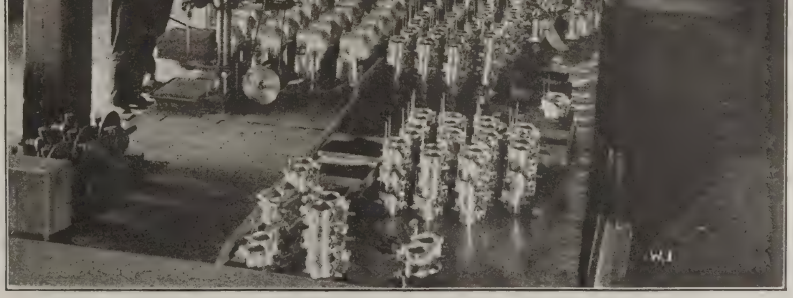
Each subject is presented by illustration and described completely for the reader without turning the page.

A broad treatment of subjects never before contained in general aeronautic text books is included, comprising operating and care of aviation engines, reconnaissance, map reading, signaling and cooperation with military bodies, radio and its uses, machine gunnery and bombing from aeroplanes.

Following is table of contents: The Theory and Principles of Flight; Elements of Aeroplane Design; Flight Stability and Control; Materials, Stresses and Strains, Rigging the Aeroplane; Fundamentals of Motive Power; Pistons, Valves and Carburetors; Ignition, Cooling and Lubrication of Engines; Types of Motors, Operation and Care of Engines; Instruments and Equipment for Flight; First Flights, Turning and Landing; Night Flying, Cross-Country Flight, Map Reading; Aerobatics; Meteorology for the Airman; Aerial Gunnery, Combat and Air Tactics; Observation, Reconnaissance and Fire Spotting; Bombing.

Definitions of aviation terms with their French equivalents and *phonetic pronounciation*. The book is designed particularly for individual and class study, with an analysis of important factors preceding each chapter and a set of review questions following every division.

This book can be purchased at The Aeronautic Library, Inc., 299 Madison Avenue, N. Y. C., at the price of $1.75 postpaid.



View in the final assembly department of the Zenith Carburetor Company, showing one-half day's Liberty Engine carburetor production

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service



PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

Progress in Preparation for Air Mail Service Between New York and Chicago

The Post Office Department authorizes the following:

Important progress in preparation for the New York-Chicago air-mail service was announced recently by the Post Office Department. While Otto Praeger, Second Assistant Postmaster General, in charge of aerial projects, was unable to announce the exact date on which the Atlantic Seaboard-Great Lakes route will be in operation, he declared that thorough plans for the utilization of war material as far as possible and the modification of unsatisfactory equipment should be completed within a few weeks and that flights would be made on schedule.

"Very few persons realize what an undertaking this is," said Mr. Praeger. "Never has a trip by air been undertaken whereby a ship leaves for an 800-mile voyage, one each way a day, flying over mountains with very few landing places —an undertaking which six months ago would have been regarded absolutely impossible. When you consider that this is being done with a single-motored plane the task is stupendous. This has never been attempted, either in America nor in any other country of the world, and great credit is due to the organization undertaking it.

Military Planes Not Suitable

"Through the absence of the fullest degree of co-operation the New York-Chicago air mail service was deprived of essential support. Our experiments demonstrated that military construction, especially the type available last December, was neither safe nor economical for mail purposes, and the Post Office Department, with a full appreciation of the desirability of utilizing all material left over from the war, is endeavoring to work out a system whereby there can be developed a ship capable of carrying at least 250 pounds of mail and yet afford the pilot the maximum degree of safety.

"A military plane is designed for military purposes, not mail or commerce. Its weight distribution is faulty, when it comes to carrying letters, and the hope in the future is to have in the New York-Chicago service a machine provided with a distinct compartment. This will do away with the makeshift of using the gunner's cockpit. The reason we have had success in the service between New York and Washington is that training planes and not fighting ships have been available.

Want Low-Compression Motors

"When the New York-Chicago service is resumed we expect to have low-compression Liberty engines, rather than the high-compression military type. This is a point now being worked out. The high-compression motor is designed for altitude work; in carrying the mails we fly at a comparatively low height and so require a motor that functions efficiently at the proper level.

"The Post Office Department feels that it will be possible to use much of the military equipment, though the fuselage and landing gear of available army planes must be strengthened or altered to meet commercial conditions. This work is under way. With regard to motive power, which caused some trouble at the start of the New York-Chicago service, the Post Office Department has on its staff the most competent Liberty motor mechanics and, in addition, has the help of expert mechanics and riggers placed at our disposal by the aeroplane industry.

Five Landing Fields

"Further preparations also are being made along the New York-Chicago route. The department has established five landing fields and emergency stops for the 800-odd miles. Leaving Belmont Field, N. Y., the air-mail pilot will have an emergency haven at Lehighton, Pa., 105 miles distant. One hundred and fifteen miles farther he will have a regular stop at Bellefonte, Pa. Across the crest of the mountains, a stage of 87 miles, he will have a safety field at Clarion, Pa."



The Aerial Mail Carriers' View of Rio de Janeiro

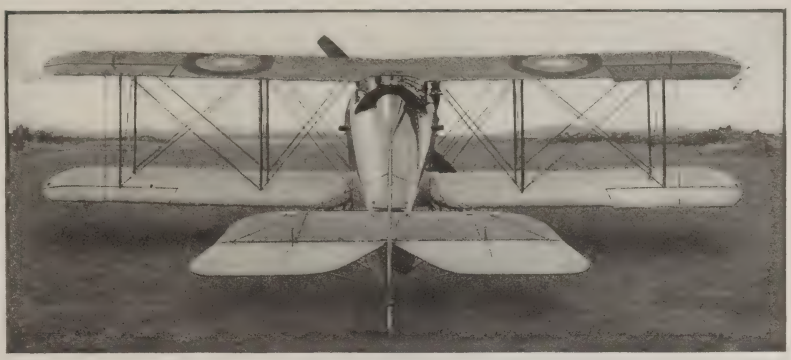
THE STANDARD E-1 SINGLE SEATER

THE "E-1" Single Seater built by the Standard Aero Corporation was designed as a secondary training machine. It is provided with either an 80 H.P. Le Rhone or a 104 H.P. Gnome engine, but in either case the dimensions of the machine remain the same. Slight difference in weights and performances result, depending upon which engine is used, so separate lists are given herewith where such differences occur.

The R. A. F. No. 15 wing curve is used. Dihedral, 3%; aspect ratio of both planes, 7; stagger, 13.02". There is no sweepback nor decalage. Wings are set at an angle of 2° to the propeller axis.

When at rest on the ground the axis of proper is 5' 6" above ground, and when the machine is in flying position the axis is 5' 1" above ground.

Maximum diameter of fuselage, 42½"; fineness ratio, 5.



Rear view of the Standard Model E-1 Secondary Training Aeroplane

General Dimensions

	Feet
Span, upper plane	24
Span, lower plane	24
Chord, both planes	3.5
Gap between planes	4
Length over all	18.85
Height over all	9.08

Areas

	Square feet
Upper plane	81
Lower plane	72.3
Ailerons (2 upper and 2 lower)	23.2
Total wing area with ailerons	153.3
Stabilizer	12
Elevator	12.7
Fin	2.6
Rudder	6.8

Summation of Weights
(With Le Rhone Engine)

	Weight in pounds	*Percentage of gross weight*
Power plant	434	36.4
Fuel and oil	140	11.8
Pilot and miscellaneous equipment	179	15.1
Armament	28	2.4
Body structure	141	11.9
Tail surfaces with bracing	36	3.1
Wing structure	156	13.1
Chassis	74	6.2
Total	1,188	100.0

Summation of Weights
(With Gnome Engine)

	Weight in pounds	*Percentage of gross weight*
Power plant	467	36.6
Fuel and oil	196	15.4
Pilot and miscellaneous equipment	179	14.0
Armament	28	2.2
Body structure	141	11.1
Tail surface with bracing	36	2.8
Wing structure	156	12.2
Chassis	74	5.7
Total	1,277	100.0

Weight per h.p. ..... Le Rhone, 14.5
Weight per sq. ft. ..... Le Rhone, 7.6

Power Plant

	Gnome *Pounds*	**Le Rhone** *Pounds*
Engine complete with carburetor and ignition system	300	280
Pipes and braces	9	15
Fuel Tank, empty	28	21
Oil Tank, empty	11	11
Propeller	33	21
Propeller Hubs	7	7
Cowling	79	79
Total	467	434

Fuel and Oil

	Gnome *Pounds*	**Le Rhone** *Pounds*
Fuel	156 (27 gal.)	116 (20 gal.)
Oil	40 (25 gal.)	24 (3 gal.)
Total	196	140

Pilot and Equipment

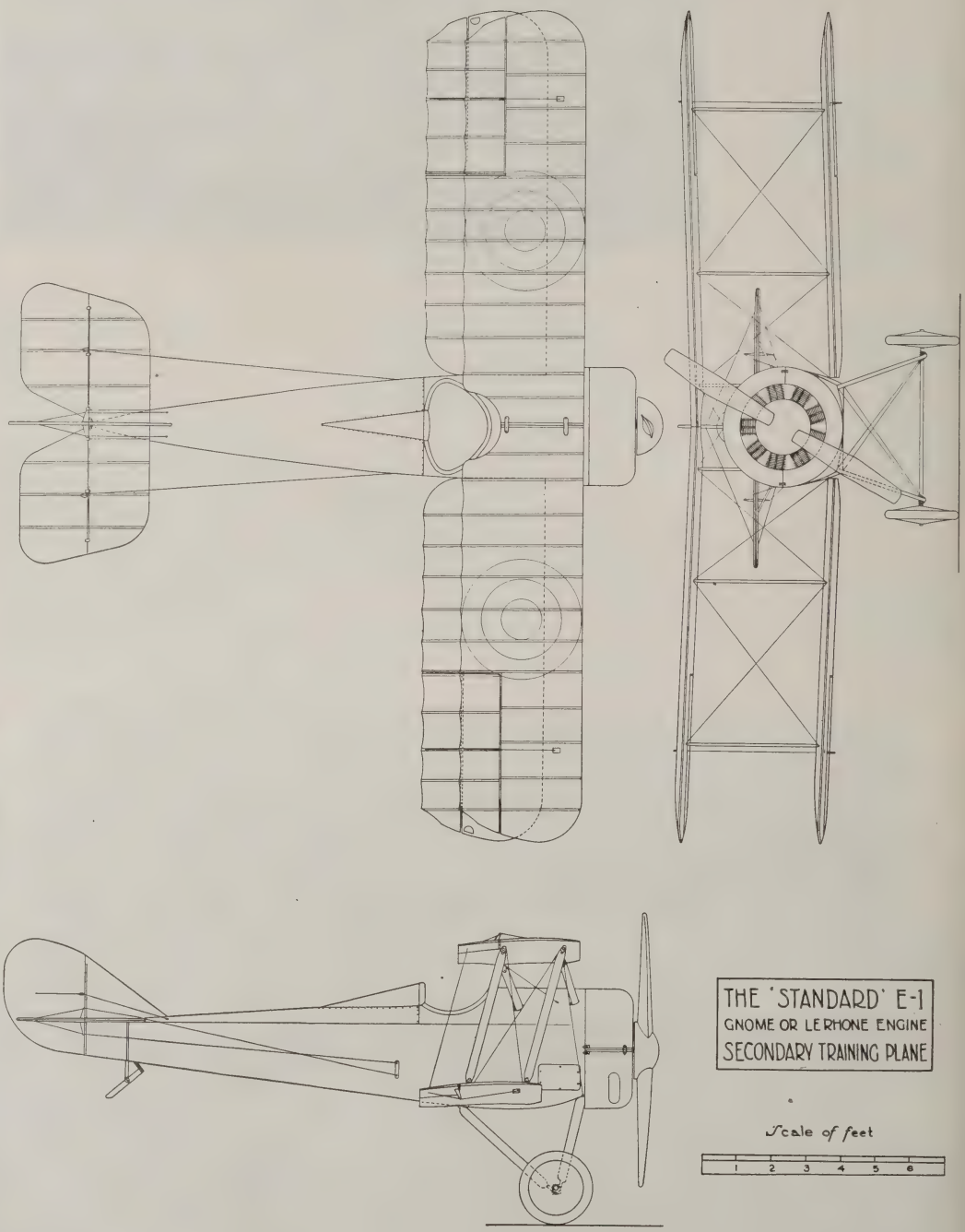
Pilot and clothing	170
Dashboard instruments*	6
Fire extinguisher	3
Total	179

*Compass, aneroid, tachometer, and oil gauges.

(*Continued on page 987*)



The Standard Model E-1 Single Seater equipped with an 80 H.P. Le Rhone engine


THE 'STANDARD' E-1
GNOME OR LE RHONE ENGINE
SECONDARY TRAINING PLANE
Scale of feet
1 2 3 4 5 6
McLaughlin

Armament

Gun Camera	19
Sights	4
Mount	5
Total	28

Body

Body Frame, Engine Bed, Seats, and Floor	118
Controls	23
Total	141

Tail Surfaces with Bracing

Stabilizer	11
Elevators	14
Fin	2
Rudder	5
Bracing and fittings	4
Total	36

Wing Structure

Upper Wing (with fittings and ailerons)	56
Lower Wing (with fittings and ailerons)	40
Interplane Struts	22
Interplane Cables	22
Total	140
Ailerons	14
Controls	2
Total	156

Chassis

Wheels complete	32
Axle	13
Shock Absorber	1
Miscellaneous parts	28
Total	74

Power Plant

(*Le Rhone*)

The Le Rhone is a nine-cylinder, air-cooled rotary engine developing 80 h.p. at 1,200 r.p.m. and 84 h.p. at 1,290. Bore and stroke, 4 1/16" by 5½".

The carburetor is especially designed for the Le Rhone. Ignition is supplied by a gear-driven, high-tension magneto.

Fuel tank located near center of gravity, has a capacity of 20 gallons. Fuel is consumed at the rate of .725 lbs. per h.p. per hour.

Oil tank, located below fuel tank, has a capacity of 3 gallons. Oil is consumed at the rate of .03 lbs. per h.p. per hour.

(*Gnome*)

The nine-cylinder rotary Gnome, manufactured by the General Vehicle Company, is known as type B-2. At 1,200 r.p.m. it delivers 104 h.p. Bore and stroke, 110 mm. by 150 mm.

Fuel tank has a capacity of 29.5 gallons; rate of consumption, .80 lbs. per h.p. per hour.

Oil tank capacity, 5 gallons; rate of consumption, .20 lbs. per h.p. per hour.

Summary of Performances

(*With Le Rhone Engine*)

Height (*Feet*)	Speed (*M.P.H.*)	Time of Climb	Rate of Climb *Ft. per min.*
Ground	100–103	0 min. 0 sec.	705
5,000	.....	8 min. 0 sec.	705
5,500	95	.....	...
8,500	90	16 min. 30 sec.	...
10,000	85	22 min. 20 sec.	200

Ceiling, 14,500 feet.
Stalling speed, 48 m.p.h.
Gliding angle, 1:7.
Maximum range: At 5,000 ft., 200 miles; 10,000 ft., 160 miles.



Detail of fuselage front, showing Gnome engine installation, Standard E-1 Single Seater

Cited for Distinguished Service

Maj. Harold E. Hartney, Air Service, 1st Pursuit Group. For extraordinary heroism in action near Fismes, France, August 13, 1918. Maj. Hartney voluntarily accompanied a reconnaissance patrol. Realizing the importance of the mission, Maj. Hartney took command, and, although five enemy planes repeatedly made attempts to drive them back, he continued into enemy territory, returning later to our lines with important information. The cool judgment and determination displayed by Maj. Hartney furnished an inspiration to all the members of his command. Home address, Mrs. Harold E. Hartney, care of Russell Hartney, Saskatoon, Saskatchewan, Canada.

Second Lieut. Richard Wilson Steele, observer, Air Service, 166th Aero Squadron. For extraordinary heroism in action near Bois D'Barricourt, France, October 23, 1918. While on a bombing raid back of the German lines Lieut. Steele, accompanied by his pilot, was attacked by six German pursuit planes. They were forced to leave the formation in which they were traveling owing to engine trouble; the enemy began riddling their plane with machine gun fire. Lieut. Steele fought them on all sides and is credited by members of the 11th Aero Squadron, who were flying over him several thousand feet, with having brought down one of his opponents. He was wounded twice in the leg and twice in the arm and continued fighting, although each time he was hit he was knocked down into the observer's cockpit. At last, however, only his tail gun was in working condition, the other two having been disabled by bullets, and Lieut. Steele sank unconscious into the cockpit. Home address, William Steele, father, 426 East Euclid Avenue, Oak Park, Illinois.

First Lieut. Hugh L. Fontaine, Air Service, 49th Aero Squadron. The bronze oak leaf is awarded Lieut. Hugh L. Fontaine for extraordinary heroism in action near Champigneulle, France, October 10, 1918. While leading a patrol of three other machines Lieut. Fontaine attacked four enemy planes in the region of Champigneulle. He succeeded in shooting down two of the enemy planes in flames. The first of these he shot down in the initial attack. The second he attacked while it was endeavoring to shoot down one of our planes which had been rendered helpless by the loss of one of its wings. He dived on the attacking plane and shot it down in flames. Home address, Dr. Bryce Fontaine, stepfather, 1839 Overton Park Avenue, Memphis, Tenn.

First Lieut. Raymond P. Dillon, pilot, Air Service, 24th Aero Squadron. For extraordinary heroism in action near Mezieres, France, November 3, 1918. Lieut. Dillon exhibited courage in the course of a long and dangerous photographic and visual reconnaissance in the region of Mezieres with two other planes of the 24th Aero Squadron. Their formation was broken by the attack of ten enemy pursuit planes; five enemy planes attacked Lieut. Dillon and his observer, who succeeded in shooting down two of these out of control. They then had a clear passage to their own lines, but turned back into Germany to assist a friendly plane with several hostile aircraft attacking it. They succeeded in shooting down one more of the enemy. Home address, Claude A. Dillon, brother, 5839 Prairie Avenue, Chicago, Ill.

Second Lieut. John B. Lee, 3d, Air Service, observer, F. A. 24th Aero Squadron. For extraordinary heroism in action near Mezieres, France, November 3, 1918. Lieut. Lee exhibited extreme courage in the course of a long and dangerous photographic and visual reconnaissance in the region of Mezieres with two other planes of the 24th Aero Squadron. Their formation was broken by the attack of ten enemy pursuit planes; five enemy planes attacked Lieut. Lee and his pilot. With remarkable coolness Lieut. Lee succeeded in shooting down two of the planes. They then had a clear passage to their own lines, but turned back into Germany to assist a friendly plane with several hostile aircraft attacking it. They succeeded in shooting down one more of the enemy. Lieut. Lee and pilot returned to our lines with information and photographs of great military value. Home address, John B. Lee, jr., father, 667 Highland Avenue, Newark, N. J.

First Lieut. George A. Goldthwaite, pilot, Air Service, 24th Aero Squadron. For extraordinary heroism in action near the Bois de Bantheville, France, October 15, 1918. In the course of a special reconnaissance to locate a hostile concentration massing for a counterattack in the vicinity of the Bois de Bantheville, Lieut. Goldthwaite and his observer flew generally at an altitude of 400 meters, at times as low as 50 meters, 5 kilometers into the enemy's lines. Antiaircraft guns riddled his plane with bullets, pierced the gasoline tank, and drenched both pilot and observer. He continued on until the

(*Continued on page 995*)

NOMOGRAPHIC CHARTS FOR THE AERIAL PROPELLER

By S. E. SLOCUM, Ph.D.

Professor of Applied Mechanics, University of Cincinnati, Member S. A. E.

IN discussing propeller performance it has been customary to assume that the power absorbed by the propeller varies as N^3D^5, and that the thrust varies as N^2D^4, where N denotes the propeller speed in revolutions per minute or per second, and D is its diameter. These assumptions, however, are only true for an ideal propeller; that is, one which is perfectly rigid and perfectly symmetrical. For a propeller as actually constructed, the law governing power and thrust may differ materially from the above theoretical assumptions. This fact has been shown by the writer in articles appearing in this magazine for August 26 and November 18, 1918. In these articles the actual laws governing propeller thrust and power for a particular propeller were developed directly from experimental data obtained by M. Eiffel and Captain Dorand, without making any theoretical assumptions whatever, the method employed being the standard process for the adjustment of observations by the method of Least Squares. The results showed that the performance of a given propeller may differ materially from that prescribed by theory for an ideal propeller, and also showed how experimental data on propellers may be analyzed on its own merits, independently of all dynamical assumptions.

As long as the whole subject of propeller performance was in the experimental stage, it was doubtless wise to base all calculations on the assumption of an ideal propeller, as it gave a certain uniformity to results. At present, however, when propeller types are becoming standardized, it certainly permits of greater refinement in design to determine by experiment the characteristics of the standard types of propeller adopted. This is the method followed in all lines of engineering. For instance, the performance of aviation motors is determined for a given type of motor by actual test of this type and not solely from the principles of thermodynamics, while as another example, the firing data for a long range gun are based on experiments made on this particular type of gun and not on the ideal assumptions of a perfect projectile fired in vacuo.

Of course it cannot be expected that general formulas for thrust and power can be derived which will apply universally to all types of propellers, any more than that a gas engine power formula can be derived which will apply accurately to all types of motors. It is perfectly possible, however, to derive formulas by the method mentioned above which will apply accurately to a *given type* of propeller, which will assist materially in the problem of powering aircraft, that is, in determining the most effective combination of motor and propeller for a given wing and fuselage assembly.

The formulas so obtained, however, are exponential, and consequently somewhat difficult to use in their algebraic form. To represent graphically the various combinations of quantities involved, M. Eiffel devised what he called "Polar Logarithmic Diagrams," which constitute, in fact, a very ingenious and practical application of vector algebra. But the application as well as the theory of these diagrams, is rather complicated, while the results depend in part at least on determining the intersection of lines which meet at an acute angle, and such points of intersection are liable to a considerable error when determined graphically.

There has recently come into use another means for the graphical solution of exponential formulas which is similar in principle to that devised by M. Eiffel in that it depends on the reduction of an exponential to a linear form by the use of logarithms, and the employment of logarithmic scales. This device consists in the construction of diagrams called nomographic charts, or alignment charts, from which the required results may be obtained by simply connecting the points representing the given data by straight lines, and then reading off the intercepts on the proper scale, the method being similar to that of using a slide rule.

In Plates I and II accompanying this article, nomographic charts are shown which represent the formulas for thrust and power of the aerial propeller as previously derived by the writer in the references given above. These charts, of course, are not universal, as they simply represent the performance of a particular propeller, but similar charts differing only very slightly from these may be constructed for any standard type of propeller, and their use will facilitate calculations on this propeller to the same extent that the use of the ordinary slide rule simplifies arithmetical calculations.

It may be noted that the effect of varying the exponents of N and D will be to move the intersection axes slightly to one side. For instance, if we follow the theoretical assumption that the thrust varies as N^2D^4, the intersection axis on the thrust chart will be moved slightly to the right of the position shown; while similarly on the power chart, the assumption of N^3D^5 will also move the intersection axis slightly to the right. Likewise any change in the quadratic terms involved in these formulas will affect the relative location of the points on the scale giving the ratio $\frac{V}{ND}$, and in this way change the readings on the horsepower and thrust scales. Except for such shifting of the intersection axes and changes in the graduation of the various scales, the nomographic charts will be exactly similar in form for all types of propellers.

Having determined the thrust and power for a given propeller, the torque and efficiency are easily found. Thus

$$\text{Torque} = \frac{\text{H. P.}}{2\pi N}$$

and

$$\text{Efficiency} = \frac{\text{Useful work}}{\text{Total work}} = \frac{F.V.}{550\ \text{H. P.}},$$

where F denotes the propeller thrust, and V is the speed of the plane, or relative velocity of the wind with respect to the propeller. To make the graphical solution complete, however, nomographic charts may also be constructed to give torque and efficiency, as shown on Plate III.

These charts are presented separately in Plates I, II and III for the sake of clearness, and an example of their use is shown on each.

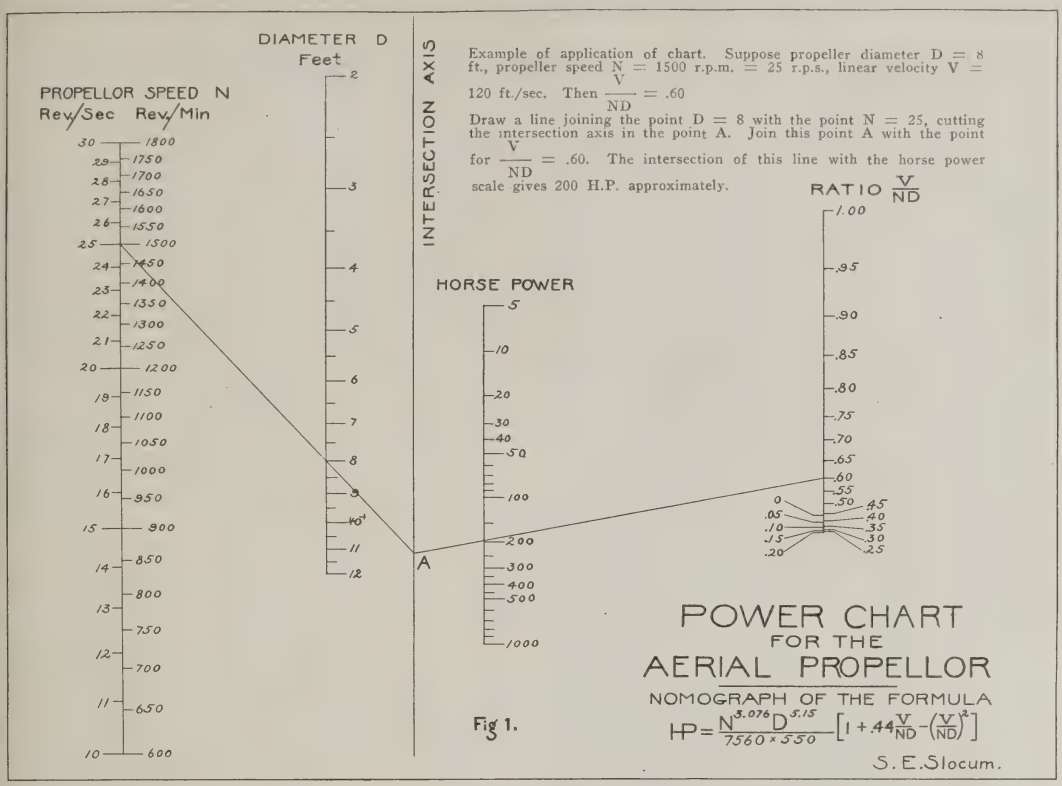
For practical purposes it is more convenient to put all the charts on one sheet, as shown on Plate IV. As an example of its use it may be well to follow through the construction shown on Plate IV. In this example we are given propeller diameter $D = 8$ ft.; propeller speed $N = 1{,}500$ r. p. m. $= 25$ r. p. s.; linear speed $V =$ 90 miles per hour $= 132$ ft. per sec. First join $N = 1{,}500$ with $D = 8$, cutting power axis in A and thrust axis in B. Since $\frac{V}{ND} = .66$, join A with this point on the scale $\frac{V}{ND}$ for power. The intercept of this line with the power scale gives H. P. $= 180$. Next join B with the point .66 on the scale $\frac{V}{ND}$ for thrust. The intercept of this line with the thrust scale gives Thrust $F = 590$ lbs. Now join H. P. $= 180$ with $N = 1{,}500$. The intercept of this line with the torque scale gives Torque $T = 650$ ft. lbs. Lastly, join the point Thrust $F = 590$ with the point $V = 132$ on the velocity scale, cutting the efficiency axis in the point C. Join this point C with the point H. P. $= 180$. The intercept of this line with the efficiency scale gives Efficiency $=$ 76 per cent.

Cited for Distinguished Service

First Lieutenant Ralph P. Bagby, Field Artillery, observer, 88th Aero Squadron. For extraordinary heroism in action near Tailley, France, November 1918. Lieutenant Bagby and First Lieutenant Louis G. Bernheimer, pilot, on their own initiative went on a reconnaissance mission, flying 50 kilometers behind the German lines, securing valuable information as to the condition of the bridges across the Meuse River and enemy activity in the back areas and also harassing enemy troops. Home address, R. J. Bagby, father, New Haven, Mo.

Second Lieutenant John B. Lee, 3d., observer, F. A., 24th Aero Squadron. For extraordinary heroism in action near Mezieres, France, November 3, 1918. Lieutenant Lee exhibited extreme courage in the course of a long and dangerous photographic and visual reconnoissance in the region of Mezieres with two other planes of the 24th Aero Squadron. Their formation was broken by the attack of ten enemy pursuit planes; five enemy planes attacked Lieutenant Lee and his pilot. With remarkable coolness Lieutenant Lee succeeded in shooting down two of the planes. They then had a clear passage to their own lines, but turned back into Germany to assist a friendly plane with several hostile aircraft attacking it. They succeeded in shooting down one more of the enemy. Lieutenant Lee and pilot returned to our lines with information and photographs of great military value. Home address, John B. Lee, Jr., father, 667 Highland Avenue, Newark, N. J.

Second Lieutenant Dogan H. Arthur, pilot, Air Service, 12th Aero Squadron. The bronze oak leaf is awarded Lieutenant Arthur for the following acts of extraordinary heroism in action October 18 and 30, 1918, to be worn on the distinguished service cross awarded him October 3, 1918. On October 18, 1918, while on artillery reglage, Lieutenant Arthur and his observer were attacked by four enemy planes. His observer's guns were jammed, but Lieutenant Arthur, with splendid courage and coolness, outmaneuvered the hostile aircraft and escaped, although they followed his plane to within 25 meters of the ground, badly damaging it by machine-gun fire. On October 30, 1918, Lieutenant Arthur was one of a formation of nine planes which were to take photographs in German territory.



Example of application of chart. Suppose propeller diameter D = 8 ft., propeller speed N = 1500 r.p.m. = 25 r.p.s., linear velocity V = 120 ft./sec. Then $\frac{V}{ND} = .60$

Draw a line joining the point D = 8 with the point N = 25, cutting the intersection axis in the point A. Join this point A with the point for $\frac{V}{ND} = .60$. The intersection of this line with the horse power scale gives 200 H.P. approximately.

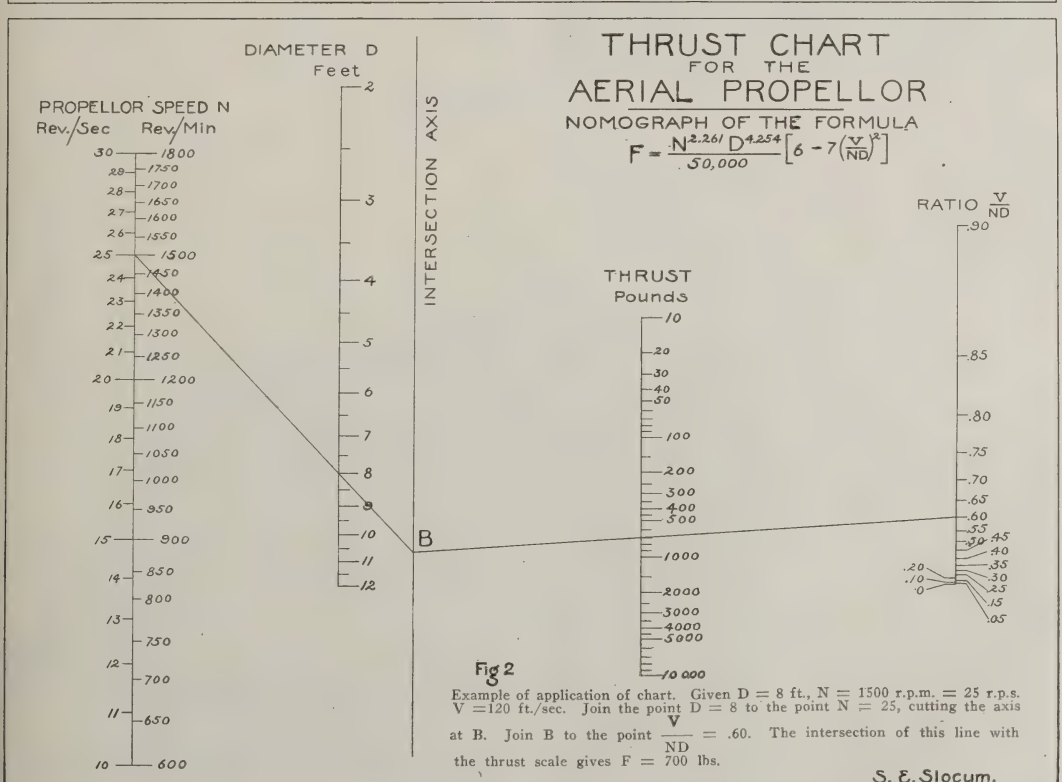
Fig 1.

POWER CHART FOR THE AERIAL PROPELLOR

NOMOGRAPH OF THE FORMULA

$$HP = \frac{N^{3.076} D^{5.15}}{7560 \times 550}\left[1 + .44\frac{V}{ND} - \left(\frac{V}{ND}\right)^2\right]$$

S. E. Slocum.



THRUST CHART FOR THE AERIAL PROPELLOR

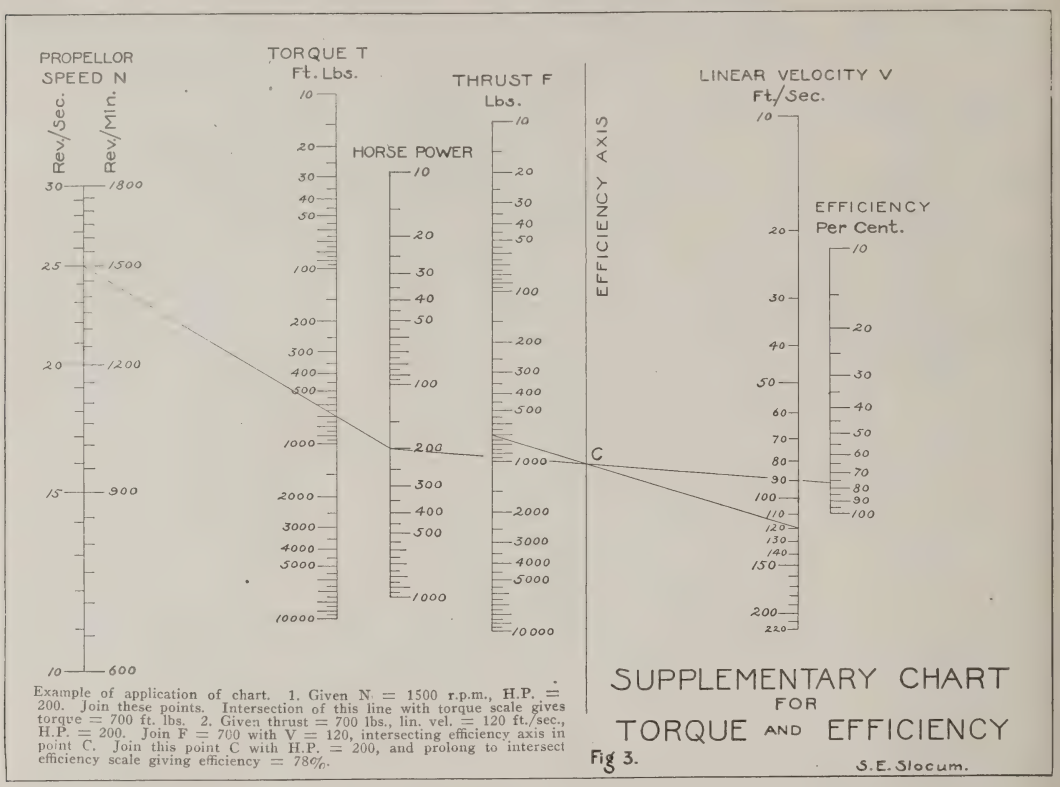
NOMOGRAPH OF THE FORMULA

$$F = \frac{N^{2.261} D^{4.254}}{50{,}000}\left[6 - 7\left(\frac{V}{ND}\right)^2\right]$$

Fig 2

Example of application of chart. Given D = 8 ft., N = 1500 r.p.m. = 25 r.p.s. V = 120 ft./sec. Join the point D = 8 to the point N = 25, cutting the axis at B. Join B to the point $\frac{V}{ND} = .60$. The intersection of this line with the thrust scale gives F = 700 lbs.

S. E. Slocum.

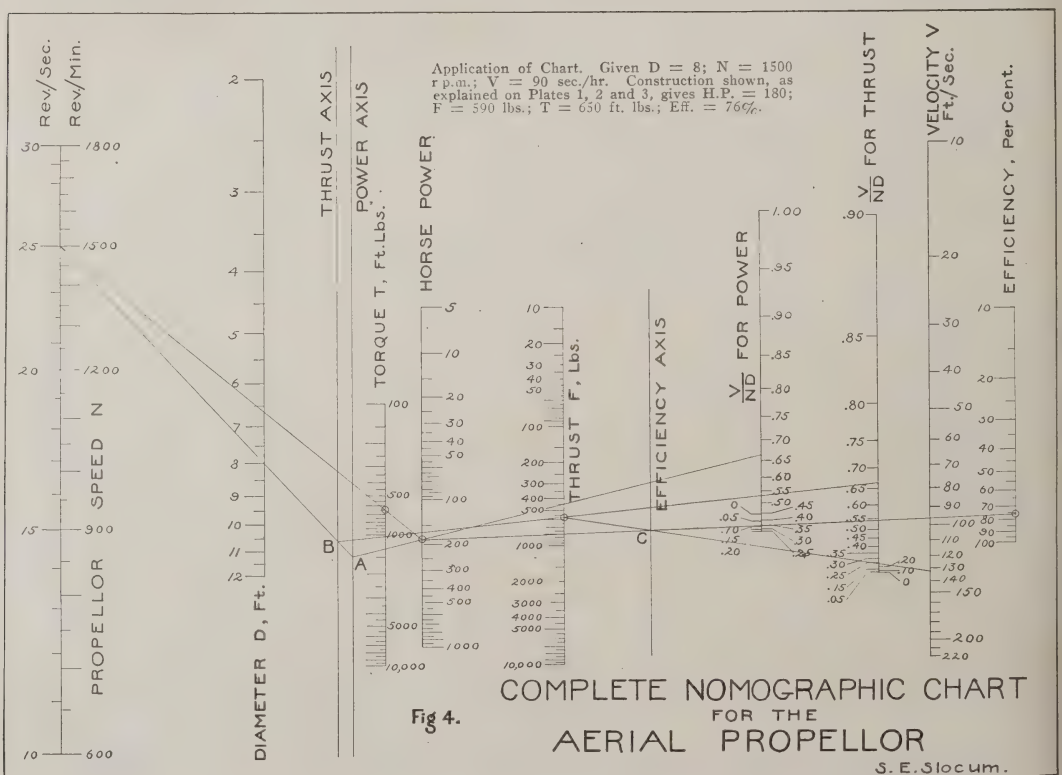


Example of application of chart. 1. Given N. = 1500 r.p.m., H.P. = 200. Join these points. Intersection of this line with torque scale gives torque = 700 ft. lbs. 2. Given thrust = 700 lbs., lin. vel. = 120 ft./sec., H.P. = 200. Join F = 700 with V = 120, intersecting efficiency axis in point C. Join this point C with H.P. = 200, and prolong to intersect efficiency scale giving efficiency = 78%.

SUPPLEMENTARY CHART FOR TORQUE AND EFFICIENCY

Fig 3.

S.E. Slocum.



COMPLETE NOMOGRAPHIC CHART FOR THE AERIAL PROPELLOR

Fig 4.

S.E. Slocum.

THE DUESENBERG MODEL H 850 H. P. MOTOR

By G. DOUGLAS WARDROP, M. S. A. E., A. S. M. E.

THE Model H Duesenberg motor, developing 850-900 horsepower, built by the Duesenberg Motor Corporation, of Elizabeth, N. J., is the most ambitious aero engine development that has been attempted, and carried through successfully, in the United States. It was designed by F. S. Duesenberg, the pioneer builder of automobile speed engines, and he had the able assistance and cooperation of William Beckman. The motor is of the sixteen cylinder, V type, with the cylinders at an angle of 45°, and the weight of the power plant with gear drive is 1,575 lbs., without gear drive 1,390 lbs.; remarkably low weight ratio for a power plant of its power.

General Data

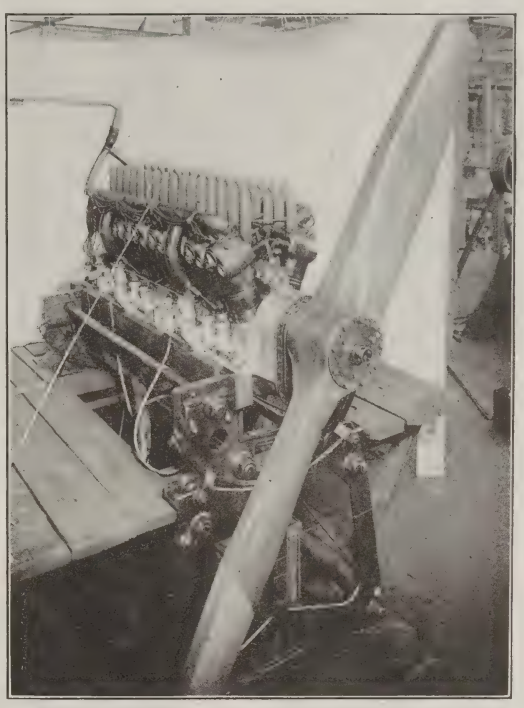
Number and arrangement of cylinders	Sixteen V
Included angle	45°
Bore	6″
Stroke	7½″
Normal Brake Horsepower	800 at 1800 r.p.m.
Type of gear	Overhead camshaft and valve rockers
Number of carburetors	Four Miller

Valves

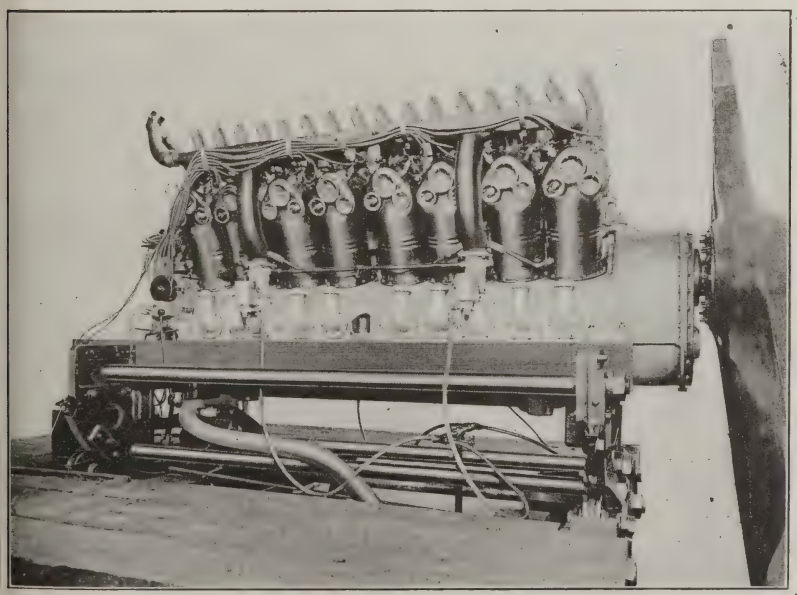
Number per cylinder	One inlet and two exhaust
Outside diameter	Exhaust 2-3/16″, Inlet 2-5/16″
Port diameter	Exhaust 1-31/32″, Inlet 2-23/32″
Width of seat	7/64″
Angle of seat	30°
Valve lift (inlet)	9/16″
Valve lift (exhaust)	½″
Diameter of stem	Inlet ½″, Exhaust 7/16″
Length of valve	Exhaust 6-27/32″, Inlet 6⅞″
Number of springs per valve	two concentric
Length of springs in position	Outer 2⅞″, Inner 2¾″
Mean diameter of coils (large spring)	1⅛″
Mean diameter of coils (small spring)	1″
Inlet rocker clearance	.010
Exhaust rocker clearance	.015

Cylinders

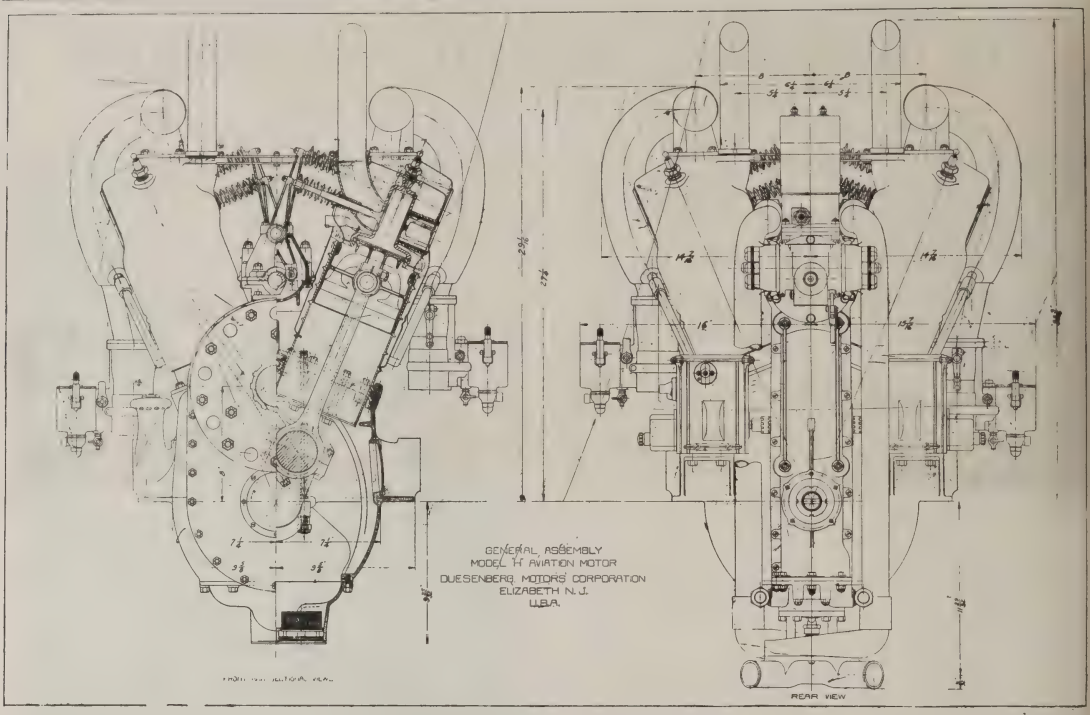
Overall height of cylinders	19-1/16″
Length of projection in crankcase	2¾″
Diameter of cylinder over waterjacket	6-27/32″ min.
Diameter of cylinder over waterjacket	7-7/32″ max.
Thickness of flange (base)	¼″
Number of studs	9
Thickness of waterjacket	18 gauge
Thickness at cylinder head	7/32″
Thickness of combustion chamber wall	9/64″
Thickness of cylinder barrel	3/32″

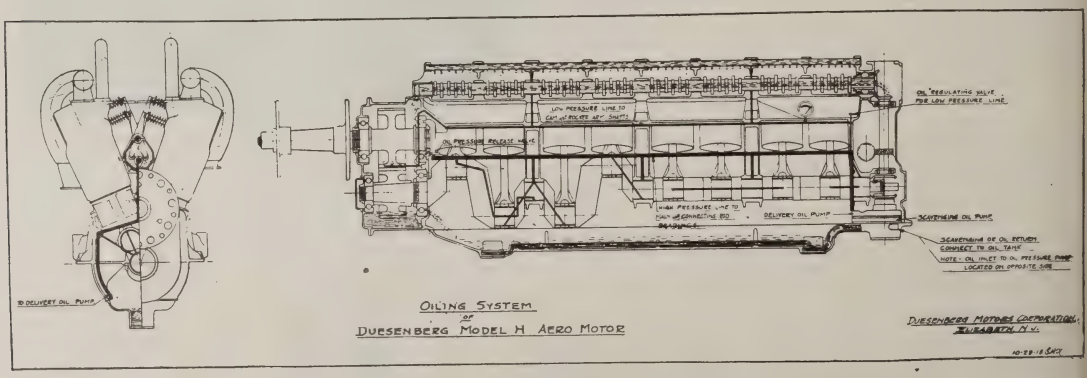


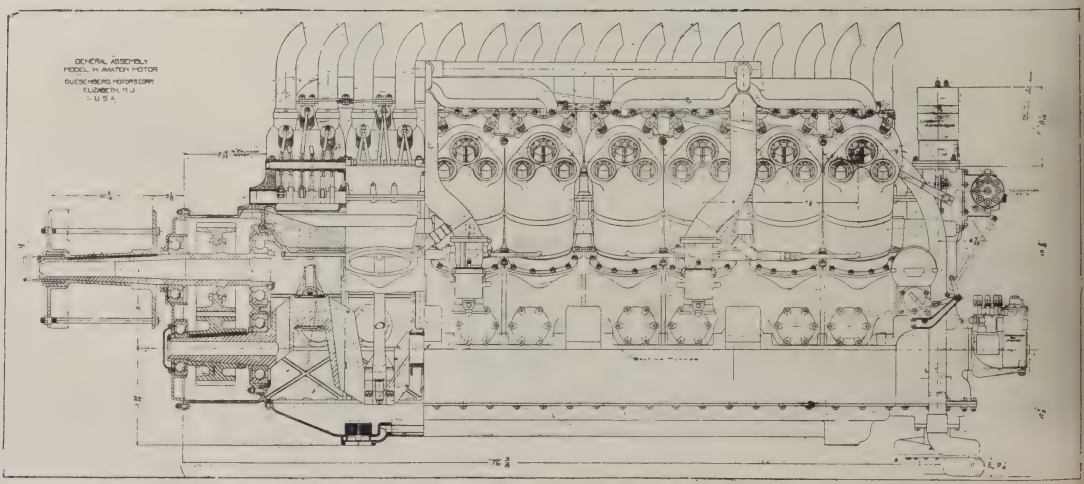
The Model H Duesenberg 850 h.p. aero motor

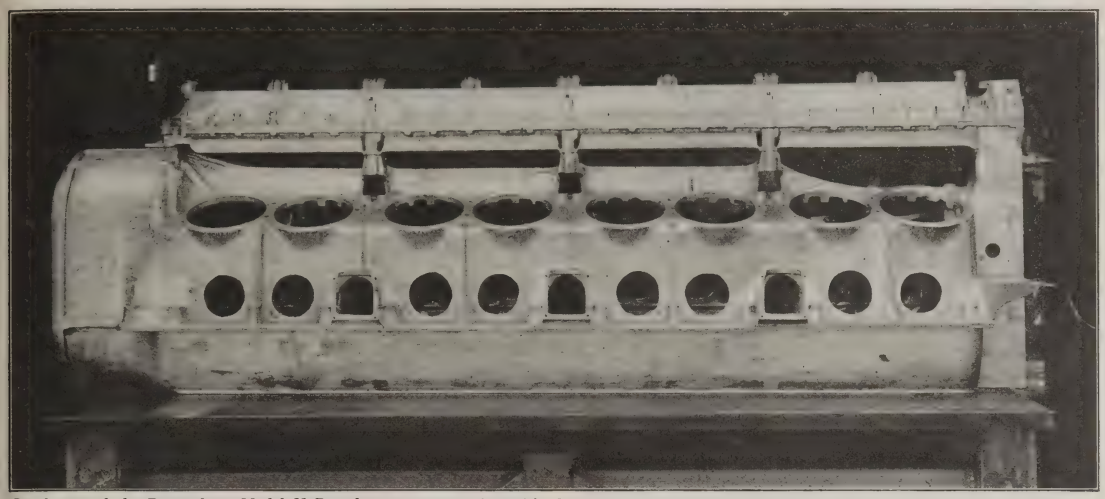


The Duesenberg Model H 850 H.P. aero motor


GENERAL ASSEMBLY
MODEL "H" AVIATION MOTOR
DUESENBERG MOTORS CORPORATION
ELIZABETH N. J.
U.S.A.
REAR VIEW


TO DELIVERY OIL PUMP
OIL REGULATING VALVE FOR LOW PRESSURE LINE
OIL PRESSURE RELEASE VALVE
SCAVENGING OIL PUMP
DELIVERY OIL PUMP
OILING SYSTEM
OF
DUESENBERG MODEL H AERO MOTOR
DUESENBERG MOTORS CORPORATION
ELIZABETH N.J.


GENERAL ASSEMBLY
MODEL H AVIATION MOTOR
DUESENBERG MOTORS CORP.
ELIZABETH, N.J.
U.S.A.



Crankcase of the Duesenberg Model H Barrel type construction with dry sump oil pan. A strainer is located at forward end connected to oil scavenging pump by tube, thus oil is drained from either end, regardless of angle of flight

Number of reinforcing ribs.....7
Thickness of valve ports.....120″
Diameter of port at valve.....Intake 2⅝″, Exhaust 2″
Number of spark plugs.....2 per cylinder

Pistons

Type of piston.....flat
Material.....Magnalite
Length of piston.....5¼″
Number of rings per piston.....1 three piece
Position of rings.....⅞″ to the top groove
Width of rings.....½″
Distance from bottom to center of gudgeon pin.....2¾″
Thickness of head.....3/16″
Thickness of wall at bottom.....⅛″
Diameter of gudgeon pin.....1¼″
Thickness of gudgeon pin wall.....3/16″ tapered to 3/72″

Connecting Rods

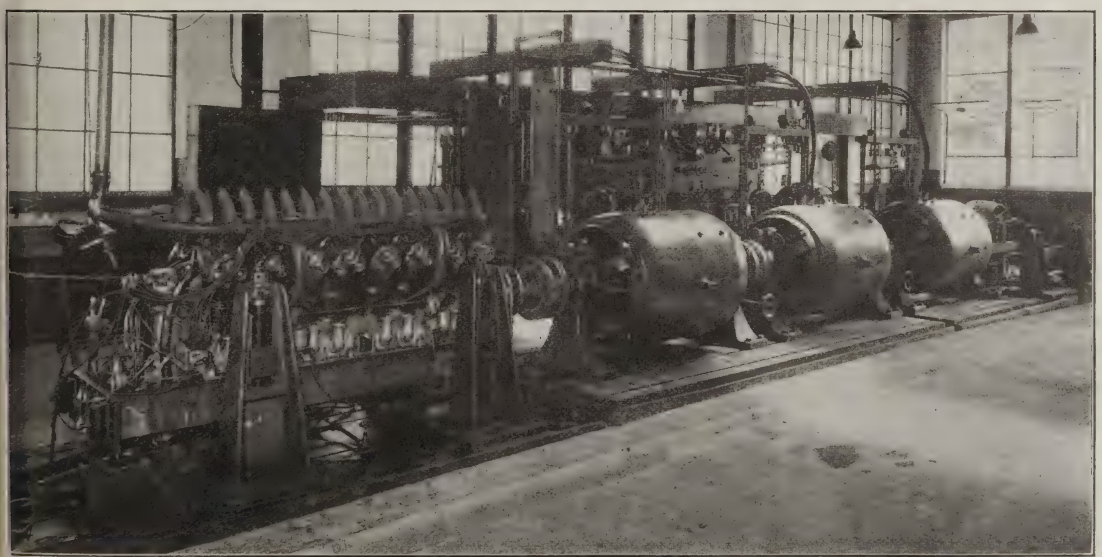
Type.....Forked
Length between centers.....12¾″
Outside diameter.....1⅛″ taper to 1-1/16″
Type of section.....Tuber
Large end bearing.....2⅞″
Inside diameter.....3-11/32″
Outside diameter.....2⅞″
Thickness of babbit.....1/32″

Crankshaft

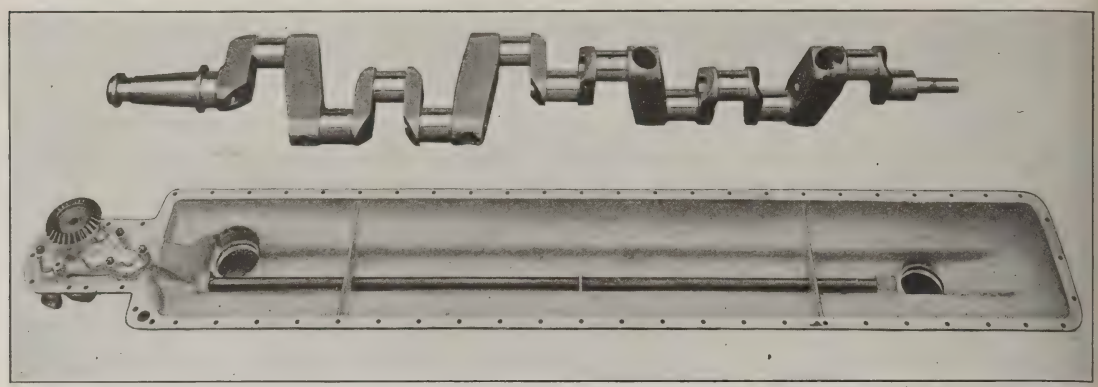
Number of bearings.....Four bronze and one ball bearing
Cylinder centers.....7″
Crank pins (outside diameter).....2⅞″
Crank pins (length diameter).....3″

Camshaft

Diameter of shaft.....1¼″
Inside diameter.....¾″
Number of bearings.....8
Length of bearing (3 intermediate).....2-3/16″
Width of cam face.....7/16″
Number of cams per cylinder.....1 inlet and 2 exhaust
P. D. of gear.....5″
Number of teeth.....40
Width of face.....⅝″
Camshaft housing.....Barrel type
Material.....Aluminum



Duesenberg Model H ready for test on Sprague Dynamometer Equipment



The chrome-nickel crankshaft, forged and machined by Gill, with bearing between every other throw. It is of the hollow type, with oil forced under heavy pressure direct to shaft and connecting rod bearings

P. D. of pinion....2½″
Number of teeth....20
Width of face....⅝″
Diameter of inclined drive shaft....1.183″

Crankcase (Upper)

Material....Aluminum
Thickness of wall....¼″ taper to ⅜″
Thickness of cylinder pads....½″
Thickness of supporting flange....⅜″
Center distance of motor support bolts....17¼″

Crankcase (Lower)

Material....Aluminum
Thickness of wall....3/16″

Lubrication

Type....Forced Feed
Type of pumps....Rotary Gear
No. of pumps....1 double pressure and 1 scavenging
Ratio of pump speed to chankshaft speed....1 to 1

Ignition

Type....Battery and generator
Firing order....L: 4-8-2-6-1-5-3-7; R: 1-5-3-7-4-8-2-6
Type of plug....A.C.
Ratio of generator speed to crankshaft speed....2 to 1

Cooling System

Type....Water cooled
Pump....1 centrifugal
Diameter of inlet pipe....1⅝″
Diameter of outlet pipe....1⅝″
Number of outlets....2
Diameter of rotor....5¾″
Ratio of pump speed to crankshaft speed....1 to 1
Water temperature inlet....125 F
Water temperature outlet....155 F

The ignition mountings permit of any standard make magnetos being used and recent motors have been equipped with two 8-cylinder Dixie magnetos of fixed spark and Delco special distributor with battery current furnished by Delco and Liberty generator. The Philbrin battery ignition system has been tested on this engine also with very successful results.

In the cooling system the water is delivered from the pump through two 1⅞″ diameter tubes which connect to two headers or manifolds, one along each side and one located directly under the valves near the top of the cylinders. This header is joined to the cylinder by means of the outlet connections. At each cylinder where the water enters is welded a distributor which leads two streams of water, one directly beneath each exhaust port and a third stream to the outside of the cylinder wall or barrel. The water is taken out of the cylinder by means of an opening at the top of the cylinder which

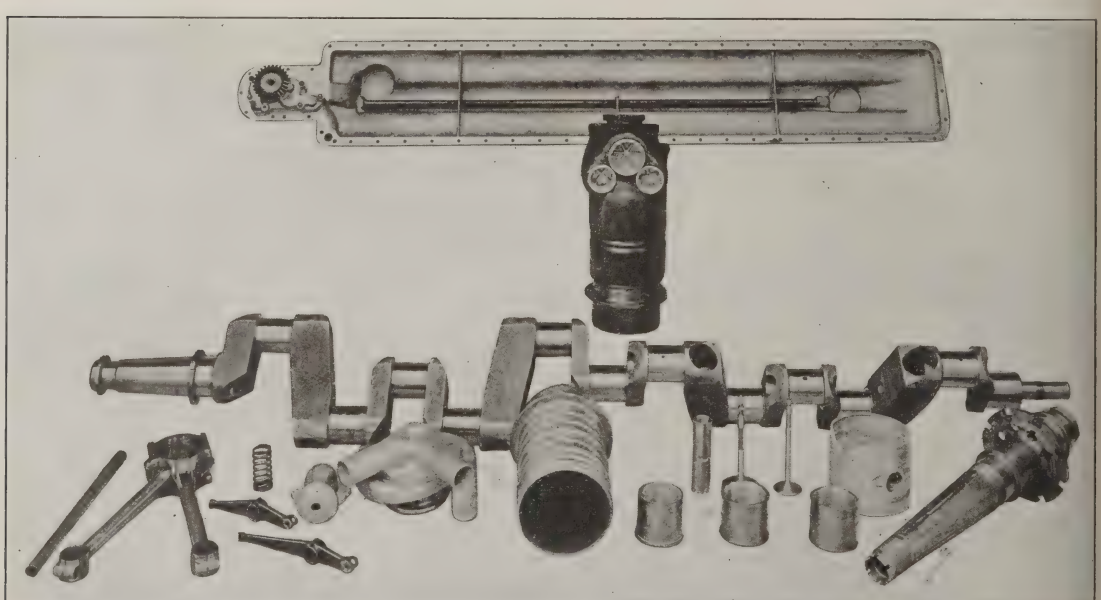


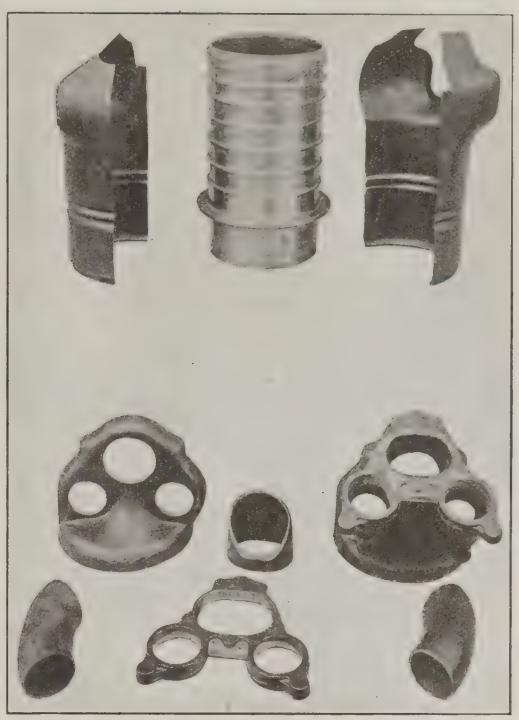
Illustration above shows dry sump oil pan, cylinder, crankshaft, rocker-arm shaft, connecting rod, rocker arms, valve spring, breather tube, water pump, cylinder barrel, bearings, piston pin, valves, and piston

registers with openings and water jacketed gas inlet manifolds; also, a small connection leads the water from the lower part of cylinder jacket to lower portion of water jacket and gas intake manifold. This system permits of a very even temperature, and by tests it has been found that the water pressure is the same at all parts of the motor.

The four Miller carburetors are used, each to feed four cylinders. Two of these carburetors are clamped directly to footings on the crankcase and two are attached to an air duct, which, in turn, is fastened to footings in order to prevent vibration. These footings are of the box girder construction and extend through the width of crankcase and located over each intermediate main crank bearing so that the air to the carburetors is drawn through these footings, which tends to cool the main crank bearings as well as furnish heated air to carburetors.

The rocker arms in the Model H are much shorter than on the normal Duesenberg type. They are of chrome-nickel steel forgings. The camshaft and rocker arm actuating mechanism are entirely enclosed in a dust-proof and oil-proof housing, the oil being fed to both the cams, camshaft bearings and rocker arm shafts under pressure. The rocker arm bearings are of Non-Gran bronze, and the camshaft bearings of babbit lined aluminum.

The oiling system consists of a high pressure and low pressure line operated by a unit of tripe gear pressure and scavenging pumps mounted in the oil pan inside of the crankcase. The high pressure line feeds the crankshaft, connecting rods and thence through a regulating valve to the low pressure line feeding cylinder barrels, cams, camshaft and rocker arms.



The cylinder construction. Barrel of chrome-nickel steel, water jacket of sheet steel, head portion of steel stampings

Cited for Distinguished Service

(*Continued from page* 987)

enemy's concentration was located and military information of great value secured. The bravery of Lieut. Goldthwaite saved the lives of many American soldiers and brought large losses to the enemy. Home address, Mrs. Condace Goldthwaite, mother, Fifth and Garfield Streets, Marion, Ind.

First Lieut. Field E. Kindley, Air Service. In action near Bourlon Wood, France, September 24, 1918. Lieut. Kindley attacked seven hostile planes (type Fokker) and sent one crashing to the ground. A bronze oak leaf is awarded to Lieut. Kindley for the following act in action near Marcoing, France, September 27, 1918. Flying at a low altitude, this officer bombed the railway at Marcoing and drove down an enemy balloon. He then attacked German troops at a low altitude and silenced a hostile machine gun, after which he shot down in flames an enemy plane (type Halberstadt) which had attacked him. Lieut. Kindley has so far destroyed seven enemy aircraft and driven down three out of control. Home address, care of Bank of Gravette, Ark.

Second Lieut. Kenneth L. Porter, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Chateau-Thierry, France, July 2, 1918. Lieut. Porter, with four other pilots attacked 12 enemy aircraft (type Pfalz), flying in two groups well within the enemy lines. As soon as the enemy planes were sighted, Lieut. Porter maneuvered to get between them and the sun and with great difficulty gained the advantage. While three of the other American officers dived on the lower formation, Lieut. Porter and Second Lieut. John H. Stevens engaged the upper formation in a bold and brilliant combat, two planes of which they crashed to the earth. Home address, 105 Green Street, Dowagiac, Mich.

Second Lieut. John H. Stevens, deceased, Air Service, 147th Aero Squadron. For extroadinary heroism in action near Chateau-Thierry, France, July 2, 1918. Lieut. Stevens, with four other pilots, attacked 12 enemy aircraft (type Pfalz) flying in two groups well within the enemy lines. As soon as the enemy planes were sighted, Lieut. Stevens maneuvered to get between them and the sun, and with great difficulty gained the advantage. While three of the other American officers dived on the lower formation, Lieut. Stevens and Second Lieut. Kenneth L. Porter engaged the upper formation in a bold and brilliant combat, two planes of which they crashed to the earth. Home address, Mrs. Effie Stevens, 21 State Street, Albion, N. Y.

Capt. Victor H. Strahm, Air Service, pilot, 91st Aero Squadron. For extraordinary heroism in action near Metz, France, September 13, 1918. Capt. Strahm displayed remarkable courage and skill in penetrating the enemy territory for a distance of 25 kilometers, flying at an altitude of less than 300 meters. His plane was subjected to intense fire from antiaircraft guns in the region of Metz, and he was attacked by a superior number of German planes, one of which he destroyed. He completed his mission and returned with information of great military value. Home address, Frank J. Strahm, Bowling Green, Ky.

First Lieut. Oscar B. Myers, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Cierges, France, September 28, 1918. Sent on a particularly hazardous mission, he harassed and routed enemy troops. Lieut. Myers then climbed higher to look for German planes. With two other officers he encountered nine Fokkers protecting a reconnaissance machine, flying in one of the most effective formations used by the enemy. Outmaneuvering the hostile planes, the three officers succeeded in routing them. After a quick turn Lieut. Myers dived at the reconnaissance machine and crashed it to the ground in flames. Home address, S. Oscar Myers, 109 South Third Avenue, Mount Vernon, N. Y.

First Lieut. William T. Badham, Air Service, observer, 91st Aero Squadron. For extraordinary heroism in action near Nuzancy, France, October 23, 1918. This officer gave proof of exceptional bravery while on a photographic mission 25 kilometers within the enemy lines. His plane was attacked by a formation of thirty enemy aircraft; by skillful work with his machine gun, Lieut. Badham successfully repelled the attack and destroyed two German planes. At the same time he manipulated his camera and obtained photographs of great military value. Home address, H. L. Badham, Whitaker Street, Birmingham, Ala.

First Lieut. George C. Kennedy, Air Service, pilot, 91st Aero Squadron. For extraordinary heroism in action near Jametz, France, October 9, 1918. This officer gave proof of his bravery and devotion to duty when he was attacked by a superior number of aircraft. He accepted combat, destroyed one plane and drove the others off. Notwithstanding that the enemy returned and attacked again in strong numbers. Lieut. Kennedy continued his mission and enabled his observer to secure information of great military value. Home address, L. Gordon Glazier, 4 Egremont Road, Boston, Mass.

First Lieut. Benjamin L. Atwater, Air Service, observer, 99th Aero Squadron. For extraordinary heroism in action near Landres-A-St. Georges, France, October 5, 1918. Lieut. Atwater started on a photographic mission with Lieut. Alexander, pilot, over the enemy's lines. Forced back by seven enemy pursuit planes, he determined to complete his mission, and recrossed the lines eight minutes later. A large group of enemy pursuit machines again attacked his plane. Disregarding his wound, he operated his machine gun with such effect that the nearest of the enemy planes was put down out of control. Home address, Mrs. Ella Atwater, mother, 152 Maple Avenue, Red Bank, N. J.

Second Lieut. William J. Brotherton, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Fere-En-Tardonois, France, on August 1, 1918. An enemy Rumpler plane being reported over the aerodrome, Lieut. Brotherton with another officer ascended and soon encountered six Fokker planes that were protecting another Fokker serving as a decoy. Disregarding the enemy's superiority in numbers, he maneuvered so as to secure the advantage of the sun and dived on the decoy plane; pouring in a destructive fire, he killed the pilot and crashed the machine to the ground. Home address, C. J. Brotherton, Guthrie, Ill.

First Lieut. Lansing C. Holden, Air Service, 1st Pursuit Group. For extraordinary heroism in action near Montigny, France, October 23, 1918. Lieut. Holden was ordered to attack several German balloons, reported to be regulating effective artillery fire on our troops. After driving off an enemy plane, encountered before reaching the balloons, he soon came upon five balloons in ascension 1 kilometer apart. In attacking the first, which proved to be a decoy with a basket, his guns jammed; after clearing them he attacked the second balloon, forcing the observer to jump. His guns again jammed before he could set fire to this balloon. Moving on the third balloon at a height of only 50 meters, he set fire to it and compelled the observer to jump. He was prevented from attacking the two remaining balloons by the further jamming of his machine guns. Home address, L. C. Holden, father, 888 West End Avenue, New York, N. Y.

(Continued from page 980)

In response to this Mr. Deeds received from Mr. Coffin this telegram on the following day:

"1917 May 10 PM 8:56

Darien, Ga.
E. A. DEEDS,
New Willard Hotel, Washington, D. C.
Do not hesitate for reasons given. Want your advice and membership on board be sure and be on hand for Tuesday and Wednesday next as I desire Board to put up strong program to council on these dates See you Tuesday morning

HOWARD E. COFFIN."

This was followed by a telegram from Mr. Deeds in the following language:

"Washington, D. C.
May 11, 1917.

HOWARD E. COFFIN,
Darien, Georgia.

Will accept membership on the board and be on hand Tuesday and Wednesday.

E. A. DEEDS.

Under date of May 17, Mr. Coffin sent to Mr. Deeds a letter in the words and figures as follows:
"DEAR MR. DEEDS:
On April 12th, 1917, the following resolution was passed by the Council of National Defense:
'That Commissioner Coffin be asked to take the Chairmanship of an Aircraft Production Board, as outlined in letter of April 10, 1917, of Dr. C. D. Walcott, Chairman Executive Committee, National Advisory Committee on Aeronautics, the personnel of which he shall select
'The National Advisory Committee for Aeronautics have the honor to recommend to the Council of National Defense that a Board be appointed by the Council of National Defense, to be known as the Aircraft Production Board.
'The function of this Board shall be to consider the situation in relation to the quantity production of aircraft in the United States, and to cooperate with the officers of the Army and Navy, and of other Departments interested in the production and delivery to these Departments of the needed aircraft in accordance with the requirements of each Department.'
In accordance with this resolution I desire to ask you to serve as a member of the Aircraft Production Board. The names of the other members who will constitute the personnel of the Board are as follows:

Brig. General George O. Squier, C. S. O.
Rear Admiral Taylor, Bureau of Construction,
Mr. S. D. Waldon
Mr. R. L. Montgomery

and such other additional appointments as future developments may make necessary or desirable.
I trust I have your acceptance,

Very truly yours,
(Signed) H. E. COFFIN.

Mr. E. A. Deeds,
Room 527, Munsey Building,
Washington, D. C."

Mr. Deeds accepted the appointment so tendered him and served on the Aircraft Production Board until August 2, 1917, when he was appointed acting chief of the equipment division of the Signal Corps, at a salary of $1 per year.

On August 24, 1917, Mr. Deeds received a letter from the Adjutant General of the Army informing him that the President of the United States had appointed him temporarily a Colonel in the Signal Corps in the Regular Army of the United States, to rank as such from the 15th day of August, 1917, and instructing him immediately upon receipt of the communication, to return the oath of office properly filled in, subscribed and attested. He accepted this appointment on August 27th, 1917. Before doing so, however, he called upon the Secretary of War and stated very frankly what his business connections were and suggested that if he accepted the commission, he might be criticized, and asked advice from the Secretary of War. He then sent for his attorney, Judge McCann, of Dayton, Ohio, who came to Washington and advised Mr. Deeds what he ought to do with reference to his various activities. This advice was solicited by Mr. Deeds because, to use his own words, he did not "want to do anything that would not be in strict accordance with the law." He left the matter in the hands of his attorney "to finish up." He took immediate steps to sever his connection with the various corporations with which he was affiliated, and on August 28th signed and sent to the Aircraft Production Board and to the Secretary of War letters which had been prepared by his attorney and which were as follows:

"August 28, 1917.

HON. NEWTON D. BAKER,
Secretary of War,
Washington, D. C.
SIR:

You have honored me by appointment temporarily as an Officer in the Regular Army of the United States, and as a member of the Aircraft Production Board connected with your Department. It is possible that that this Board in the development of the aeroplane work may wish to recommend a contract with some of the corporations in which I have had an interest. Following the advice of counsel, I have resigned my official relations with these corporations, and made bona fide transfers of my stock therein to other parties.
For your protection as well as my own, I desire to file with your department a copy of a written disclosure of my relations, both past and present, to these corporations which I have this day filed with the Aircraft Production Board, and I enclose same herewith.
In serving in the positions to which you have appointed me, I desire to comply with both the spirit and letter of the law, and to do no act which might invite criticism upon myself or your department.
I count it an honor and privilege to be thus called into the service of our country, and am pleased to make whatever sacrifice of time and money that service may demand.
I enclose an extra copy of my statement to be filed with you as Chairman of the Council of National Defense.

Yours very respectfully,
(Signed) E. A. DEEDS.

"THE AIRCRAFT PRODUCTION BOARD,
Munsey Building,
Washington, D. C.
GENTLEMEN:

As a member of your Board and interested in the letting of contracts on the recommendation of that Board on behalf of the Government, I desire at this time to make a full and complete disclosure of the interest I may have in any corporation which might be a party to any such contract, or which might furnish supplies to the Government through the instrumentalities of your board.

I was a stockolder and officer in the following, to wit:

1. The United Motors Corporation of New York, being a union of several companies manufacturing automobile parts.

2. The Dayton Engineering Laboratories Company, of Dayton, Ohio, manufacturing ignition and starting devices for automobiles.

3. The Dayton Metal Products Company, of Dayton, Ohio, engaged among other things, in the manufacture of munitions.

4. The Domestic Building Company, of Dayton, Ohio, a corporation formed for the development of real estate and which now owns the land and buildings leased to the Dayton Wright Airplane Company.

In all of the foregoing corporations I have severed my official connection therewith by resignation and have made a bonafide transfer to other parties of all my stock therein.
In addition to the above corporations, I was an incorporator of the Dayton Wright Airplane Company, but never owned any stock therein. I am also President of and a large stockholder in the Domestic Engineering Company, of Dayton, Ohio, makers of Delco Light Plants, and expect to retain my official connection therewith and my financial interest therein.
I also own the ground embraced in the Moraine Experimental Flying Field.
I make this disclosure now so that your Board, as the representative of the Government, may be fully informed as to my relations, past and present, with these corporations, and be thus enabled to act wisely on any order or contract involving any of those corporations either directly or indirectly. I desire that this written disclosure be recorded in the minutes of your Board for the mutual protection of all of us.

Yours very respectfully,
(Signed) E. A. DEEDS."

In response to above written to the Secretary of War Col. Deeds received the following:

"September 2, 1917.

MY DEAR COLONEL DEEDS:

I have received your letter of August 28th and have directed to be filed in the office of the Assistant and Chief Clerk of this Department the statement submitted by you as to your connection in business which might be in some way concerned in the matter of aircraft production. I feel very sure that this statement and your own wise discretion and good judgment will save us from any embarrassment in the matter, but I cannot send this letter, a mere acknowledgment, without adding to it a word of grateful appreciation for the splendid service which you are rendering the Government, and particularly the War Department. I think it is safe to say that neither our Government nor any other has ever had from its citizens service of more distinguished effectiveness or fineness of spirit than is being rendered by you and your associates in the Aircraft Production Board.

Cordially yours,
NEWTON D. BAKER, Secretary of War.

Col. E. A. Deeds, Aircraft Production Board,
Munsey Bldg., Washington, D. C."

5. The former memorandum from this office based entirely upon the report submitted by Judge Hughes recommended court-martial proceedings against Colonel Deeds by reason of the transactions to which reference will now be made.

I

Telegram Dated September 16, 1917

The telegram referred to was sent by Colonel Deeds from Old Point, Va., to H. E. Talbott at Dayton, Ohio. This is the same Talbott who has been hereinbefore referred to as a former business associate and close friend of Colonel Deeds. At the time the telegram was sent, Mr. Talbott was president of the Dayton Metal Products Company, which owned the stock in the Dayton Wright Airplane Company of which Talbott was also an officer. A contract between the Government and the Dayton Wright Airplane Company for the construction of 3,900 aeroplanes was then in process of negotiation. The telegram is in the following language:

"For your personal information as coming from your local attorney, Judge Advocate General has ruled it legal for government to select one, contractor one, and the two a third, as appraisers of market value of plant at expiration of contract. If you care to raise the question the above will be found to be the final ruling."

Judge Hughes in his report of the Aircraft Inquiry sets forth the above telegram immediately after two telegrams dated August 4, one from Kettering (also a former business associate of Deeds and largely interested in the Dayton Wright Airplane Company) addressed to Deeds, and the other from Deeds to Kettering. The two telegrams are as follows:

"Dayton, Ohio, August 4, 1917.

E. A. DEEDS,
Room 527 Munsey Building,
Washington, D. C.

We believe all confidential telegrams should be sent to Mr. H. E. Talbott, Sr., City National Bank Building, or George B. Smith, instead of the Dayton Wright Airplane Company.

C. F. KETTERING."

"August 4, 1917.

MR. C. F. KETTERING,
City National Bank Building,
Dayton, Ohio.

Hereafter all confidential telegrams will be sent to H. E. Talbott, Sr., instead of the Dayton Wright Airplane Company.

E. A. DEEDS."

These two telegrams should be considered in connection with other telegrams not set forth in Judge Hughes' report, but which were introduced in evidence in the Aircraft Inquiry.
The request from Kettering to Deeds contained in the first telegram of August 4 hereinabove quoted was caused by the receipt at the office of the Dayton Wright Airplane Company of the following telegram dated August 3, 1917:

"August 3, 1917.

DAYTON WRIGHT AIRPLANE COMPANY,
Dayton, Ohio.

The machine about which we talked with Mr. Talbott today will be

expressed to Dayton Monday. This must be placed under strictest guard and under no conditions are any visitors to be permitted to see it. Between the time the machine starts and while the machine is in transit please see that your laboratory is so organized that it is under as thorough control as though it were strictly a military research station. This goes far beyond anything that has been done by your organization before, but must be started vigorously and continually maintained. No one outside of Government officials must know where this machine is.

DEEDS—AIRCRAFT PRODUCTION BOARD.

Charge—Aircraft Production Board."

At that time, as is well known, there was great anxiety not only among the various Government officials, but also among private individuals in all parts of the country, especially those connected with plants which were engaged on Government contracts, concerning the activities of German agents in this country. When the telegram of August 3d, above quoted, was received at the office of the Dayton Wright Airplane Company, it was opened by some one connected with the office force, its contents became known, and it was a subject of some discussion among the employees of the company. That company then had several offices, one in the City National Bank Building in Dayton and another at the factory, and there was uncertainty where telegrams would be delivered, which uncertainty would be obviated by addressing telegrams to Mr. Talbott, at the City National Bank Building. For this reason, Mr. Kettering sent the telegram of August 4th. This was followed the next day by the two telegrams of August 4th quoted by Judge Hughes in his report and noted in his memorandum. These two telegrams of August 4 were followed by three telegrams dated respectively August 6, August 13 and August 14, which were in the following language:

"(DeVine Ex 47) (7/12/18)
August 6, 1917.

MR. H. E. TALBOTT, SR.,
City National Bank Building,
Dayton, Ohio.

Plane will be shipped this afternoon or tomorrow. Will advise particulars later.

DEEDS—Equipment Division, S. C.

Charge—Equipment Division, S. C. (Confirming tele, this date).

"(DeVine Ex 49) (7/12/18)

Washington, Aug. 13, 1917."

"MR. H. E. TALBOTT, SR.,
City National Bank Building,
Dayton, Ohio.

Am sending D. H. four drawings by personal messenger on six ten train tonight. Have him met at train this is the only set of drawings in existence arrange special safe to make their safety absolute also when duplicating the D H four at the laboratory make special provision for fire protection by extra watchman and fire extinguishers after you have the drawing work started will send officer from plane design division to assist messenger will also bring standard tracing sheets to be used making D H four drawings so that they will fit into our Standard Government regulations.

DEEDS—Equipment Division."

"(Sherer Ex 38) (7/11/18)
Dayton, Ohio, Aug. 14, 1917.

E. A. DEEDS,
Aircraft Production Board,
Washington, D. C.

Your wire received will be governed accordingly. Plane not yet received.

TALBOTT—Dayton Wright."

A perusal of these telegrams as a series clearly indicates a very proper degree of solicitude on the part of Colonel Deeds zealously to protect the best interests of the Government and negatives the implication raised by Judge Hughes' report that it was the purpose of Colonel Deeds and Mr. Kettering by the telegrams of August 4th to establish improper secrecy in communications passing between them relating to matters in which the Government was concerned.

The history of the transaction calling forth the telegram of September 16th which was adversely criticized by Judge Hughes, is as follows: When negotiations were first entered into between the Government and private manufacturers looking to the production of aeroplanes, a number of serious obstacles stood in the way of concluding the contracts, one of the most important of which was the question of an allowance for depreciation to cover shrinkage in facilities which the manufacturers would be obliged specially to provide. They realized that this shrinkage was something that could not be absorbed in the profits under the contracts. Among those to whom these obstacles appeared most serious were the Curtiss Manufacturing Company and the Dayton Wright Airplane Company. A basis of adjustment had been suggested, as a result of which the Signal Corps adopted the policy of allowing the constructors, at the completion of their respective contracts, amounts of money equal to the difference between the actual cost of the facilities specially provided, and the fair value of these facilities at the completion of the work, these amounts to be fixed by appraisement. The question was then raised as to how the appraisement should be made. There seemed to be an impression prevalent at the time among certain Army officers that the principle which prevented the government from settling disputes by arbitration, negatived its power to allow appraisements to be made either wholly or partially by those unconnected with the Government. Some of the manufacturers insisted that they be allowed to nominate arpraisers to act in conjuction with the Government apparaisers. It was then decided to submit the question to the Judge Advocate General of the Army. Mr. Montgomery, chief of the consulting department, stated the question to the Acting Judge Advocate General, who orally confirmed Mr. Montgomery's opinion that it would not be illegal to permit the manufacturers to nominate appraisers to act in conjunction with those nominated by the Government. The next day, Mr. Morgan, of the Curtiss Company, was notified, at a meeting of the Aircraft Production Board, of the views of the Acting Judge Advocate General and a contract with the Curtiss Company followed a few days later. The minutes of the Aircraft Production Board show that this meeting occurred on September 14, 1917. The oral opinion given by the Acting Judge Advocate General was confirmed by his letter dated September 19, 1917. Thus it appears that Mr. Morgan, of the Curtiss Company, was advised of this decision of the Acting Judge Advocate General two days before Mr. Deeds communicated it to Mr. Talbott. This is evident from the fact that the telegram to Mr. Talbott was not sent until the 16th of September. It is therefore clear that there was nothing of a confidential character in the information conveyed in Colonel Deed's telegram. Mr. Morgan, of the Curtiss Company, had been advised of these facts at the meeting of the Aircraft Production Board two days before. Such opinions of the Judge Advocate General are as much of a public nature as are the opinions of the Attorney General of the United States. The telegram appears to have been sent in order to expedite the closing of the contract betwees the Government and the Dayton Wright Airplane Company, a contract which, although dated September 7, 1917, was not actually signed and delivered until October 1st. That it was closed after the opinion of the Acting Judge Advocate General above referred to, is shown by the fact that it contains a clause providing for appraisement in accordance with his opinion. Reading the closing of the contract, production was naturally delayed, and it was advisable from the standpoint of the Government that the Dayton Wright Airplane Company be advised that the differences standing in the way of the final consummation of the contract had been removed.

Why Colonel Deeds, in his telegram, used the language, "as coming from your local attorney," is difficult to understand. The fact probably is that he felt that it would be wiser that Mr. Talbott, in discussing the subject with his associates should not use Colonel Deed's name. As there was nothing confidential in the telegram, there seems to be no reason why the name of Colonel Deeds could not properly have been used, as the source of the information conveyed by it. Colonel Deeds was not the Attorney for the Dayton Wright Airplane Company and is not even at attorney at law. The language, therefore, could not be construed as intended to refer to him as occupying any such relation to the company.

Colonel Deeds' explanation of this phrase is given in this language in the affidavit submitted by him:

> "Deeds' idea was to put the information in such a way that it would not look to Talbott like a proposition from the Aircraft Production Board. The application of the ruling of the Judge Advocate General would obviate the principal objection upon which Talbott was insisting. The idea was to impress upon Talbott the prospect of obviating that objection by further negotiation, through his local attorney at Dayton, who was Charles L. Craighead. Deeds was not acting as attorney or confidential advisor of Talbott, nor was he such attorney or confidential advisor. The purpose was to get Talbott to sign up the Dayton Wright contract which is referred to (P. 29) as dated September 7, 1917, but which, as Montgomery says, was not signed until after October 1, 1917. Production was being held up by delay in signing the contract."

From this explanation it appears that while Colonel Deed's real endeavor was to aid the Government in expediting its program of aircraft production, through some mistaken notion he deemed it proper to accomplish that object by a species of deceit which would result in concealment of the source of the information which the telegram conveyed. This was not only foolish, but provocative of the severe criticism which has been visited upon him and in a manner unjustly.

Upon the evidence now before this office, however, court martial proceedings against Colonel Deeds, based upon this transaction, are not advised, (1) No fraud against the government, nor disclosure of confidential information was intended; (2) None was accomplished; (3) The purpose of the telegram was to expedite the earnest efforts which the government officials were making to speed up aeroplane production.

II

Statement Regarding Transfer of Stock in United Motors Co.

Judge Hughes, in his report, finds that on August 28, 1917, when the letters to the Secretary of War and the Aircraft Production Board, above quoted, were written, Colonel Deeds was the owner of 17,000 shares of the capital stock of the United Motors Company, one of the companies mentioned in the letter to the Aircraft Production Board, and of an interest in a pool of certain shares of the stock of that Company, on which 3,880 additional shares were received in November, 1917. He further finds that the only transfer made by Colonel Deeds of any of his shares in that company was by gift to his wife; that he endorsed for transfer the certificates for 17,500 shares on October 13, 1917, and that they were transferred to Mrs. Deeds' name on October 17, 1917. Thereafter these shares of stock were held by George B. Smith, the confidential agent of Colonel Deeds, for Mrs. Deeds' account. It is further found that entries of the transfers were made in Col. Deeds' books by Smith not earlier than October 17, 1917, and were dated back to August 28, 1917; also in the statement of his assets on August 31, 1917, submitted to him by Smith, the shares appeared as part of his property; that Mrs. Deeds' name first appeared in the statement of assets on October 31, 1917. It is further found that the remaining shares (3,880) received on the dissolution of the pool about November 22, 1917, were transferred from the pool manager directly to Mrs. Deeds, as Col. Deeds' donee, and that the certificates were received by Mr. Smith on her behalf; that prior to the transfer of the stock in October, and at the time of Col. Deeds' letter to the Aircraft Production Board, he had simply told his wife that it was to be her stock, but that it does not appear that there had been an effective gift of the shares. The actual value of the 21,380 shares is found to be approximately $500,000.

It must be remembered that at the time Mr. Deeds received his commission he was in Washington and not in Dayton where his business interests were located. It is obvious that all persons connected with aircraft production in Washington in the summer of 1917 were overwhelmed with work. Col. Deeds could not reasonably have been expected to attend to the details of the stock transfers himself and did not attempt to do so. Nor could it reasonably be expected that he would be required to force upon the market stock worth approximately $500,000, to be disposed of, as would inevitably have been the case, at a sacrifice. It does appear from the testimony taken before Judge Hughes, however, that he did offer for sale his stock in the Dayton Metal Products Co., but apparently without result. It is equally clear that Col. Deeds could not be expected to make a gift of this stock to a stranger. What he testified before Judge Hughes he actually did was to give the stock to his wife. It would undoubtedly have been more frank had he disclosed in his letter that he had given the stock to his wife instead of using the language that he had "made a bona fide transfer to other parties" of his stock. Notwithstanding the fact that the gift was to his wife, it may nevertheless have been intended as a bona fide transfer. His original reluctance to accept service under the Government based upon possible conflicting interests (notwithstanding the pressure brought to bear upon him to do so) evidenced by his telegram to Mr. Coffin and by his subsequent voluntary verbal and written disclosure to the Secretary of War and to the Aircraft Production Board of his business relations, is inconsistent with the thought that he was intentionally guilty of lack of frankness.

As bearing upon his attitude throughout, the subsequent actions of Col. Deeds when the Government had under consideration the acquisition of the tract of land owned by the Moraine Development Co., adjoining the factory of the Dayton Wright Airplane Co., for use as a testing field, may well be considered. Col. Deeds was the owner of approximately 25% of the stock of this development company. The Government believed it to be essential that this field be acquired. Col. Deeds found his

(*Continued on page* 1009)

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.

Note 2—Report to Aviation General Supply Depot, Middletown, Pa.

Note 3—Report to Aviation General Supply Depot, Little Rock, Arkansas.

Note 4—Report to Dist. Mgr., Aircraft Finance, Consumers, Building, Chicago, Illinois.

Note 5—Report to Army Balloon School, Los Angeles County, California, to commanding officer for duty.

Note 6—Report to Dist. Mgr., Aircraft Finance, 360 Madison Avenue, New York City, and by wire to DAP.

Note 7—Report to Bolling Field, Anacostia, D. C., thence to E. O. T. by aeroplane.

Note 8—Report to Commanding Officer, 271st Aero Squadron, Aberdeen, Md.

Note 9—Report to general, Eastern Department, for duty as department Air Service Officer.

Note 10—Report to Speedway, Indianapolis, Indiana.

Special Orders Nos. 310 to 312, Inclusive

A

Austin, Robert H.....CPA
Allen, Arthur F.....FLA
Ashby, William T.....CAF
Ashe, Harry P.....MAC
Ackerman, Herschel D.....FLA
Arthur, Dogan H.....FLA
Aldrich, Harry S.....FRF
Applewhite, Scott Carter.....KST
Ackerman, Edwin DeWitt.....Note 6
Abbey, Evers.....KST
Ashby, William T.....DMA

B

Bahr, Frederick C.....DMA
Bartholomew, Robert.....MDO
Beeler, George W.....MAC
Balinger, Albert J.....DMA
Bagley, Harvey B.....DMA
Badham, William T.....FLA
Brant, Gerald C.....EOT
Bridgman, Ray C.....DMA
Barnes, James.....DMA
Burdick, Jesse Jerome.....ELA
Brown, Morris E.....ALF
Brewer, Thurlow W.....FLA
Brereton, Lewis H.....LTA
Bowen, Thomas S.....LTA
Besore, Douglas D.....FLA
Blakeman, Frederick T.....MJA
Bisland, Theodore W.....UTA
Boulware, Barrett W.....UTA
Bolster, Richard H.....BFT
Brooks, Arthur R.....FLA
Buckley, Harold R.....CPA
Biddle, Charles J.....MJA
Bradley, Edgar L.....FLA
Byrne, Edward P.....DMA
Bloom, Harry Henry.....DMA
Bollman, Henry.....ELA
Biddle, Charles J.....DMA
Baker, Robert L.....EOT

C

Clark, Edward S.....FLA
Conklin, David E.....CAF
Case, Kenneth B.....AMV
Cohen, Abe Wright.....DMA
Chapin, Donald A.....DMA
Chambers, Reed M.....CPA
Cook, Everett R.....CPA
Chadbourn, Philip H.....DMA
Coate, Roland E.....FLA
Chilson, Clinton H.....CPA
Condon, Frank Maurice.....FLA
Canda, Henry G.....CPA
Curry, Howard S.....MJA
Crane, Baron D.....FLA
Clark, Harold Ames.....CPA
Chevalier, John B.....FLA
Carter, William R.....BFT
Cousins, John W.....CPA
Clark, William Henry.....RSD
Chisum, Jenner Y.....DMA
Cormack, Joseph M.....Note 3

D

Dargue, Daniel L.....MAC
Dickman, Frederick T.....SAG
Davenport, William H.....DMA
Donnelly, Robert Thomas Marie.....MAC
Day, Henley F.....DMA
Douglass, Kingman.....CPA
Dunlap, Edwin W.....DMA
Dundore, Charles H.....BFT

DeCastro, Ralph E....FLA
Diekema, Willis A....CPA
Doten, Lorenzo S....FLA

E

Egan, T. Francis....LDT
Este, J. Dickinson....CPA
Evans, Floyd E....CPA

F

Flaucher, Asahel J....BFT
Ford, Christopher W....CPA
Folger, Lee A....CPA
Foster, Philip L....MJA
Fowler, Harold....LTA
Fleming, William Samuel....ELA
Foote, Kenneth M....LDT
Ferson, Oliver S....CPA
Foist, Carl J....DMA
Folkner, Arnold F....CAF

G

Garrison, William H., Jr. Note 2; WDM; Note 1
Gianniny, Lawrence G....DMA
Garrison, George G....PMT
Gorrell, Edgar S....CLA
Glose, Charles W....BFT
Goodwin, Harold C....TFT
Galiher, Harry DeMoss....CPA
Glover, William B....EOT
Giblon, Earl Z....DMA
Gilbert, Donald F....FLA
Gilpatric, John G....CPA
Grey, Charles G....CPA
Guilford, Samuel G....BFT
Gay, Strawn A....RSD
Goldsborough, William C....RSD
Guilford, Edward H....CAF
Gallop, Harold M....CPA

H

Harwell, Gordon L....EOT
Henry, Frank M....FOB
Haldeman, George W....CAF
Heinrichs, Carl F....DMA
Heimer, Roy Andrew....HHN
Hoffman, Edward L....MDO
Hosp, William W....LDT
Hutchinson Byron M....BFT
Hyde, Harley C....BFT
Hexter, Avrome N....FLA
Hirst, Barton C., Jr....FLA
Huntley, James W....DMA
Hammond, Leonard C....CPA
Hurt, Samuel F....UTA
Hassell, Bert R. J....EOT
Hamilton, Stewart A....CAF
Hoover, Lawrence E....PMT
Haslett, Elmer R....CPA
Hale, Frazer....CPA
Howell, George R....DMA
Howard, Earl W. G....FLA
Hoover, William John....CPA
Howard, Frank J....FLA
Heffnor, Roy J....RSD
Howard, Ten Broeck....DMA
Heberton, Craig....LDT
Heath, Charles E....FLA
Hicks, Samuel C....FLA
Hill, Charles A....CPA
Hankey, Albert H....FLA
Hewes, Harry P....DMA

J

Jones, Marshall W....DMA
Jones, Morton V....DMA
Jones, Parke P....FLA
Jones, Lloyd T....MAC
Jones, Carleton C....CPA
James, Ashby M....Note 3
Johnson, Leonard H....DMA
Johnson, Reuben Alford....MAC

K

Kelly, Arthur H....FLA
Kirwan, Thomas A....CPA
Keil, Emil C....RSD
Kenyon, Hugo A....FLA
Koenig, Ira R....CPA
Kleyla, John Raymond....MAC
Kinne, Howard I....FLA

L

Lloyd, Charles E....CPA
Lehr, Robert P....Note 5
Langston, James A....MAC
Lake, Chester H....DMA
Lehman, Harold M....Note 6
Larner, Gorman DeFreest....CPA
Lewis, Chauncey G....DAP
Littauer, Kenneth P....MJA
Lawson, Walter R....CPA
Lakin, Paul E....FLA
Lawler, William Charles....DMA
Loney, Charles R....BFT
Lambrix, Otto H....FLA

M

Munson, Charles C....Note 4
Morris, Joseph T....MAC
Mabry, Palmer V....ASM
Miller, Harry Adelbert....CGC
Middleton, Ellis P....DMA
Mills, Byron H....SRC
Mittendorf, Theodore H....FLA
Maudlin, Archie A....LDT
Melin, Charles R....CPA
Maier, Harmon....CPA
Menrath, Joseph E....DMA
Miller, Laurence W....CPA
Mowry, Rollin I....MJA



Capt. W. F. Jones, commanding officer of the proving station at Wilbur Wright Field

Meade, Robert W....EOT
Maddux, Leo Fulton....LDT
Munsell, Warren P....CPA

Mc

McCaulley, Edgar L....DMA
McCammon, Ormsby....LDT
McDonald, John C....LDT
McMillin, Gail H....Note 8
McAleenan, Henry Alvin....DMA
McClintock, John....Note 9
McMahon, Joseph B....LDT
McIntosh, Charles F....CPA
McEniry, Stephen George....PFO
McCan, Charles P....FLA
McGinn, Leo James....LDT
McKinley, Ashley C....CPA
McGough, John F....CPA
McGrath, James L....CPA
McKinley, Leo G....FLA
MacDill, Leslie....LTA
MacWhirter, Donald....FLA

N

Newman, Nathaniel....Note 3
Neel, Roland H....FLA
Niergarth, Omer O....KST
Nickerson, Truman K....DAP
Nestle, Joseph H....CAF

O

O'Rouke, Lawrence James....PFO
Oliver, William P....RSD
Oliver, Clarence....CPA
Overlees, Milo H....BFT
Owens, Norris W....CPA
Oberrender, Graaf R....EOT

P

Palmer, George M....Note 7
Paquin, Albert J....BFT
Pratt, Henry C....KST; WDM; Note 1
Price, Simeon T....FLA
Prussian, Aaron....DMA
Powers, Earnest A....ELA
Pepper, Joseph H....DMA
Pughe, Earle W....CPA
Powell, Harford, W. H., Jr....DMA
Philip, Walter J....DMA
Page, Victor W....MJA
Pacglow, John A....LTA
Powell, Lyle S....CPA
Parker, Albert N....FRF
Piercy, James M....DAP

Q

Queal, William N....CGC

R

Robertson, William A....RSD
Rowley, Garold N....Note 8
Rowe, Charles B....DAP
Rodgers, Benjamin C....PMT
Randall, Joseph F....DMA
Reis, Alvin C....CPA
Reynolds, John N....LTA
Rathbone, Claud H....FLA
Rogal, Edward....LDT
Rath, Howard G....FLA
Rucker, Edward Walter, Jr....CPA
Roper, George M....ELA
Rockwell, George, Jr....FLA
Radcliffe, Earle W....FLA
Rhinehardt, Claude K....KST
Robertson, Alexander R....MJA
Reynolds, John R....CGC
Redman, Mark H....UTA

S

Street, St. Clair....CPA
Smith, Allyn G....RSD
Smith, Walter James....DMA
Smith, Charles M....ELA
Smith, Richard....CPA
Smith, Jonathan Bayard H....CPA
Shutan, William H....LTA
Soule, Edgar C....DMA
Sloan, James....ELA
Stinson, Edward A....DMA
Slocum, Paul F....EOT
Snow, Winter N....FLA
Spencer, Clarendon K....PMT
Silver, Eugene....FLA
St. John, Royal U....FLA
Seymour, Alonzo M....FLA
Sisson, Benjamin F....BFT
Spinney, Byron H....CPA
Shawhan, Romer....CPA
Sultan, Thomas P....FLA
Simon, Louis C., Jr....FLA
Sousa, William B....Note 7
Stipp, John C....FLA
Strahm, Victor H....CPA
Stevenson, William A....FLA
Simonds, Francis M....FLA
Shumaker, Floyd N....MJA
Sweeley, William R....EOT
Southee, Earl R....RSD
Stephens, Robert G....FLA
Stornhagen, John Meir....DMA
Sewell, Bruce E....DMA
Schwartz, Edgar L....UTA
Simmons, Vernon H....CPA

T

Tobin, Edgar C....DMA
Trowbridge, Jones R....DMA
Tobin, Edgar C....CPA
Thaw, William....DMA
Thompson, Homer T....BFT
Thorp, George B....FLA
Tourison, Edward G....CPA
Tomkins, Sterling....FLA
Taylor, Thorne C....CPA

U

Upman, Frank....CPA

V

Vierling, George William, Jr....FLA
Valentine, Everett M....EOT
Vanderpool, Charles H....DMA

W

Willis, Eppa Hunton....DMA
Wade, Robert M....DMA
West, Henry....DAP
Waste, James A....Note 4
Wash, Carlyle H....MDO
Warfield, Robert L....DMA
Wiggins, Grafton....EOT
Williams, Isaac J....MAC
Williams, John G....Note 7
Winne, Irving K....DMA
Wentworth, John....CPA
Wyman, Oliver B....CPA
Wilson, Donald Ray....ELA
Walker, Edward W....RSD
Weston, Harold W....RSD
Wynn, William B....MJA
White, Horace W....CPA
Wingate, Harry L....CPA
Warren, Harry P....CPA
Watson, Henry L....MAC; WDM; Note 1
Welty, Clair W....FLA
Wilson, Ray Q....DMA
Walker, Kenneth N....BFT
Williams, Philip L....BFT
Wales, Edward V....RSD
Woody, Albert M....FLA

Y

Yount, Burton K....RSD

Cited for Distinguished Service

The commander in chief, in the name of the President, has awarded the Distinguished Service Cross to the following named officers and soldiers for the acts of extraordinary heroism described after their names:

Sergt. (First Class) Fred C. Graveline, 20th Aero Squadron, first day bombardment group (A. S. No. 20083). For repeated acts of extraordinary heroism in action near Villers-Devant-Dum, France, and Mouzon, France, September 29 and November 5, 1918. Volunteering to act as observer and aerial gunner because of the shortage of officer observers. Sergeant Graveline started on seventeen bombing missions, successfully reaching his objective on fourteen of these expeditions, shooting down two enemy aircraft. On two occasions, while flying in the rear of his formation, he drove off superior numbers of German machines. Home address, Mrs. Josephine Graveline, wife, 537 Main Street, Springfield, Mass.

Capt. Christopher W. Ford, Air Service, 103d Aero Pursuit Squadron. For repeated acts of extraordinary heroism in action near Rheims, Farnce, March 27, 1918, and near Armentieres, France, May 21, 1918. Near Rheims on March 27th Captain Ford, while on a patrol with two other pilots, led his formation in an attack on eight enemy planes. After twenty minutes of fighting, the American formation shot down three German machines, of which one was destroyed by this officer. Near Armentieres on May 21st he again led a patrol of six planes in attacking twenty enemy aircraft. The attack resulted in ten individual combats. Captain Ford shot down one hostile plane and with his patrol routed the others. Home address, Mrs. Harriet Chuff, aunt, 462 West One hundred and thirty-first Street, New York City, N. Y.

FOREIGN NEWS

75,105 French Fliers in War

Paris, Jan. 15.—It is now permitted to give details of the progress of French aviation. When the war started there were twenty-one squadrons, 321 pilots and a total personnel of 4,342.

At the end of 1916 the personnel had increased to 75,105, the pilots numbering 6,417 and the observers 1,682. The aviation program in July, 1918, brought the number of machines to more than 6,000.

Credits voted for the French aviation service in 1914 were about $11,000,000. This sum was quadrupled in 1916, and by 1917 had exceeded $65,000,000.

Australia-London Flight Being Prepared for in Melbourne

Melbourne, Jan. 13.—A company has been formed under the name of the Aerial Service Limited of Australia to finance an aerial transport flight from Australia to London. The voyage will be made by way of the Dutch East Indies and Bagdad. The air line from Australia to London is perhaps 2,000 miles shorter than any of the routes used now.

British Ocean Flight Plan

London, Jan. 9.—The *Daily Mail* announces that several aeroplanes are under construction in different parts of Great Britain and with the assistance of the Air Ministry are planning to attempt a transatlantic flight.

The *Daily Mail* says the Air Ministry is less anxious to demonstrate that a single machine can fly across the Atlantic than that a group of machines of various types can do so. Consequently machines of more than one type are under construction in anticipation of their flying across next Spring.

Raids On England Cost 1,570 Lives

London, Jan. 11.—In raids on England by the Germans during the war, 5,511 persons were killed on injured, of whom 4,750 were civilians. The deaths numbered 1,570. An official summary of the casualties caused by German airships, aeroplanes and bombardments from the sea shows the secasualties among civilians:

Killed, 554 men, 411 women, 295 children.

Injured 1,508 men, 1,210 women, 772 children.

Three hundred and ten soldiers and sailors were killed and 551 were injured.

There were fifty-one raids by airships, causing the deaths of 498 civilians and the injury of 1,236, and the killing of 58 soldiers and sailors and the injuring of 121.

In fifty-nine aeroplane raids 619 civilians were killed and 1,650 were injured. In these raids 238 soldiers and sailors were killed and 400 wounded.

The greatest losses inflicted by Zeppelins were in raids on Norfolk, Suffolk and the home counties of London on October 13, 1915, when 54 civilians and 17 soldiers and sailors were killed, and in West Suffolk and the midland counties on January 31, 1916, when 70 civilians were killed and 112 injured. The raid on Lincolnshire, Essex and Suffolk on March 31 of the same year caused the death of 17 civilians and 31 soldiers and sailors.

The most serious aeroplane raid was that of Margate, Essex and London, on June 13, 1917, when 158 civilians and four sailors and soldiers were killed. The next in severity was that of Kent, on September 4 of the same year, when 131 soldiers and sailors lost their lives. On this occasion a crowded barracks was hit. Almost as severe as the raid on Kent was that on Folkestone, on May 25, 1917, when 77 civilians and 13 sailors and soldiers were killed. The attack on Kent, Essex and London on January 28, 1918, caused the death of 65 civilians and two soldiers and sailors.



Edward W. Beatty, President of the National Advisory Committee, Canada, who is also President of the Canadian Pacific Railway

"Aeroplane Spies" Informed Gen. Diaz

Rome, January 3.—During the period just before the great Italian offensive started considerable attention was attracted to the extraordinary accuracy of the knowledge of affairs behind the Austrian lines in possession of Gen. Diaz and his staff. It is now known that much of this exact information was secured by men who were dropped in enemy territory by Italian aeroplanes and, after an interval for observation, picked up and brought back by aviators.

During the three months just prior to the launching of the Italian drive eighty men were engaged in this perilous work. All of them had thrilling adventures and experiences. The story of Captain Romiati may be taken as representative of what might be related by any of them.

Captain Romiati served as a doctor in an Austrian hospital for ten days, and later made his escape in the guise of a cattle dealer. Lieutenants Maso and Tubero were arrested as spies, but managed to overpowe their guard and escape.

The first of the "aeroplane spies" was Giacomo Camillo de Carlo, a Venetian, who volunteered for the dangerous work. Before the war he was head designer for a widely known firm of modistes in Paris. He was a bold and resolute officer and in addition owned some property in the invaded district, where he was well known and loved by the peasants. He was carried across the Austrian lines in an aeroplane, taking with him a number of carrier pigeons. These he liberated from time to time with messages to the Italian staff. He was sheltered by the peasants, but was at last detected and forced to flee. He made his way to the seacoast and managing to get a rowboat reached an Italian port.

His success led to the formation of a regular service among bold young Italian officers. This was known as the "Giovane Italia" and played an important part in preparing for Italy's final victory.

Prince of Wales Flies in U. S. Plane

Coblenz, Jan. 11.—A flight over the Coblenz bridgehead area, a luncheon with Major-Gen. Muir and a dinner dance occupied the time to-day of the Prince of Wales who is the guest of Major-Gen. Dickman, commander of the American Army of Occupation.

The Prince professed keen pleasure in his visit to the American aerodromes and the aeroplane trip was at his request. He went up with Brig.-Gen. William Mitchell, Chief of Air Service of the Third Army. It was Gen. Mitchell's last flight at Coblenz as he is leaving for duty in the United States.

The Prince was in the air for forty-five minutes. He was taken up the Moselle, across the Rhine and then flew down the Rhine from the Lorelei rock to Neuwied, returning to the aerodrome near Coblenz. The flight was made in a two seater Spad. The Prince studied the maps during the entire flight and talked with Gen. Mitchell. He declared afterward that the flight was the most picturesque he ever had.

Albert's Plane Disabled

Paris, Jan. 11.—King Albert of Belgium, flying yesterday morning with Albert Combez, the noted Belgian aviator who finished fourth in the international aeroplane race at Rheims in 1913, was forced to land two miles from Attigny on the Aisne when the motor stalled.

Both occupants of the machine escaped injury and the plane was undamaged.

Britain Plans Air Industry Subsidies

London, Jan. 8.—The British Government may subsidize the air industry to give it the necessary financial stability for rapid peace time commercial development. The air subsidy plan is being considered by the air ministry among other proposals.

Under subsidies it is hoped private concerns will be building thousands of commercial planes and operating them as mail and passenger carrying vehicles. This, it is pointed out, would insure employment to thousands of expert aviators trained during the war. Furthermore, it would enable Great Britain at all times to have an immense air fleet at her disposal, together with the necessary trained aviators.

The success of the subsidy plan, as it has worked out in connection with the merchant marine and the motor lorries, is being cited as a strong argument in favor of air subsidies.

When war was declared, Great Britain had at her disposal thousands of merchant craft, many which were quickly transferred into the fighting strength of the navy immediately. Hundreds of motor lorries were sent to France from London and other cities were cited.

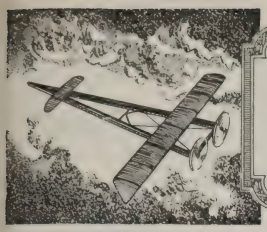
Germans Reluctant to Give Up Aeroplanes

London, Jan. 14.—Germany is surrendering the aeroplanes required by the armistice terms with reluctance. The total number to be delivered to the Allies in good and serviceable condition is as yet far from having been reached. German machines were simply left behind without guards in the aerodromes, and as the British advancing cavalry patrols reached them, guards were posted. In many cases the cavalry found the machines damaged or deficient in instruments or parts, and the question arises whether they were so left by the Germans or whether they had suffered owing to souvenir-hunting propensities of the civilian population.

This point is being investigated with strict impartiality. On the British sector the proportion of large bombing planes—only about twenty were left by the Germans—is very small. This emphasizes the German comprehension of the commercial possibilities of converted bombers.

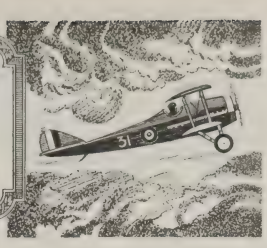
The total number of German aeroplanes collected by the Royal Air Force is just over 500. It does not follow that anything like the whole of this number will be accepted as coming within the armistice definition of "in good condition." Only a small proportion are immediately flyable, and when it is established the Germans left defective machines they will not be accepted. About 170 of the total number were abandoned in open railway trucks and were, of course, left dismantled, a clear evasion of the terms. Both these and those machines which were left in the aerodromes suffered from exposure. In two cases the Germans handed over groups of machines to local municipal authorities, insisting on receipts and declarations that they were received complete, and the enormous work caused to the Royal Air Force by this haphazard manner of surrender will be realized.

Only at Nivelles were the German aeroplanes handed over in the regular manner. Nearly all these were of the newest Fokker type, though there were some Albatross scout, Pfalz, and two Junkers. These last are armored trench fighting machines with wings of corrugated aluminum, and have a pair of machine-guns which fire through the floor of the observer's cockpit.



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

THE plate showing Tail and Rudder surfaces accompanying this article was fully described in the January 20th issue of AERAL AGE and no more need be said about these parts, but it is well to stop here and consider what these parts do and how we arrive at the figures. For instance the tail is for the horizontal control of the machine and each movement of the elevator flaps causes the machine to go either up or down, as the case may be.

Now to anybody who has studied simple Physics of Elementary Mechanics, what is to follow will be easily understood, but I would like those who have not had the above-named studies in their school life to read this article carefully and to try to understand it. This will not be at all hard because I have made everything so simple that I will be surprised to hear that anyone has failed to grasp these fundamentals.

The body of an aetroplane is like a great lever, the fulcrum or balancing point is located on paper by the use of mathematics. Of course we could easily find the balancing point if the machine were built but we must draw up our machine and balance it before building it or we would not be able to locate our wings, landing chassis, tail, etc.

To locate the center of gravity of an aeroplane proceed as follows:

Draw a side view of the machine and for accuracy make it one inch to the foot. Locate a point one inch from the outside of the propeller. This is the point about which our figures will be drawn. Now we will say our propeller weighs 19 pounds and the center of gravity of it is on a line through the center. Now we assumed that one inch equalled a foot then the propeller is one foot from our point and we write:

$$19 \times 1 = 19$$

Again we have the radiator, 50 pounds, whose center of gravity is located 1½ feet from the point and we write directly under the above:

$$50 \times 1\tfrac{1}{2} = 75$$

The motor with ignition carbureter, etc., weighs 200 pounds and the center of gravity is located (owing to the magneto being connected to the rear) a trifle behind the vertical center line of the engine, then the C. G. of this body is located about 2½ feet from this point and we write:

$$200 \times 2\tfrac{1}{2} = 500$$

The landing chassis weighs 30 pounds, and is four (4) feet from our mark so we write:

$$30 \times 4 = 120$$

The C. G. of the body is 8 feet from the point and the weight is 65 pounds, so we write:

$$65 \times 8 = 520$$

The wings complete weigh 80 pounds and the C. G. is 5 feet back, so we write:

$$85 \times 4\tfrac{1}{2} = 382\tfrac{1}{2}$$

The pilot, 185 pounds, and located 7 feet from the mark:

$$185 \times 7 = 1{,}295$$

The tail and rudder works weigh approximately 20 pounds, the C. G. being 17 feet from the point

$$20 \times 17 = 340$$

Listing these we have as follows:

Propeller	$19 \times 1 =$	19
Radiator	$50 \times 1\tfrac{1}{2} =$	75
Engine	$200 \times 2\tfrac{1}{2} =$	500
Landing chassis	$30 \times 4 =$	120
Body	$60 \times 7 =$	420
Wings	$80 \times 4\tfrac{1}{2} =$	$382\tfrac{1}{2}$
Pilot	$175 \times 6 =$	1,050
Tail and rudder	$20 \times 17 =$	340
	634	$2{,}926\tfrac{1}{2}$

dividing the sum of the last column by the sum of the first column we have

$$2{,}926\tfrac{1}{2} \div 634 = 4.6 \text{ feet approximately.}$$

Then the center of gravity of the whole machine is located 4 feet 7 inches from the point or subtracting the one foot space between the propeller and the point, the C. G. of the whole machine is 3 feet 7 inches from the propeller.

Now that we have located the center of gravity we know where our center of lifts of the wings must be, and that is in line with the C. G., or a little behind it. We can then safely call the C. G. the balancing point, axis or fulcrum of the aeroplane. The lift of the wings acts on the aeroplane, like a string fastened to an object at its center of gravity. If no outside force is acting on the object it will remain in its original state, but if you wanted to move it some force must be applied to move it in the direction wanted and this is what the rudder, tail flaps, and ailerons do.

If the aeroplane is left alone it will hold a certain course (we will forget the action of the wind to simplify matters) because there is as much weight to the rear of the C. G. as there is to the front (not in actual weight but in moments) which causes the machine to remain balanced. To change this direction or to move the object, as it were, we move the ailerons, rudder, or tail flaps which causes a pressure on these parts and moves the machine.

The aspect ratio of our rudder is 1.5 because it has an average of 3 feet in height and is 2 feet wide. The table which I presented in an earlier article says that the Ky or lift coefficient for flat plates aspect ratio 1.5 at 30° (which is the furtherest point that our controls will go) is .00198.

Our rudder having approximately 6 square feet of surface it will have a force at 60 m.p.h. of

$$.00198 \times 6 \times 3{,}600 = 513 \text{ pounds}$$

Now this force acts at a distance of approximately 12 feet from the C. G. and the real force is

$$42.75 \times 12 = 513 \text{ pounds.}$$

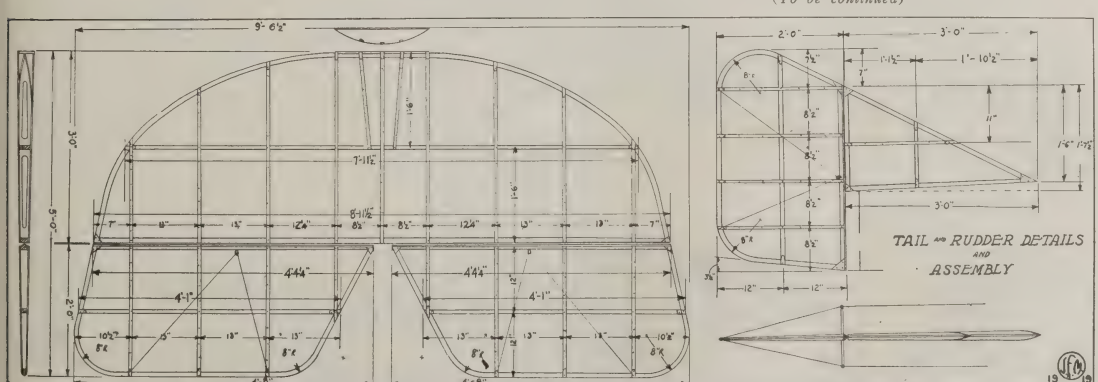
The 513 pounds is the force the rudder exerts when turning the machine.

To keep the machine from turning too sharply a damping effect is produced by placing a fixed fin just in front of the rudder which also holds the machine on a steady course.

The ailerons are figured the same way, only the moment arm is figured to the center of the ailerons instead of to the center of pressure as in the rudder. When an aeroplane is turning the outside wing gets more lift than the inside wing and causes the plane to bank heavily. This is because the outside wing is traveling faster and is covering more ground than the inside wing. By moving the aileron control so that the outer wing gets a negative action and the inner wing a positive, this banking effect is neutralized. The lateral balance of the machine is also taken care of by the ailerons.

The tail flaps are figured exactly as we figured the rudder, only we have two working instead of one. The horizontal stabilizer also acts as a damper much the same as the fin does and when the pilot pulls or pushes the control stick the machine answers surely but not too quick as would be the case if no stabilizer were used. The reader can readily see how the aeroplane body resembles a directional lever.

(To be continued)



Details of the stabilizer, elevators, fin and rudder for the Ford Motored Aeroplane



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

There was an old man of the Hague,
Whose ideas were excessively vague;
He built a balloon,
To sail to the moon,
And escape from the prevalent plague.

"Willie, we're saved," spoke the All-Highest. "I read that, according to Mr. J. A. Whitehead, it will be possible to fly to the Mid-Atlantic and alight on a floating station."

"Yes, but that's only for week-enders, All-Highest," replied the clown price, "and, anyway, I don't like the idea of water, water, all around, and not a drop to drink, as the ancient mariner hath it. Think of something better, Pa."

King of the Air

When I dance my little son on my knee,
I think of the wonders that he will see.
This bright-eyed baby just one year old,
With his sunny smile and his hair of gold.

Will my baby fly in the air one day?
Fly under the rainbow arch so gay?
Will the winds and the clouds no terrors hold,
In the age of aircraft, when all are bold?

Will he travel the world in years to be,
Swift journeying over the land and sea?
Will he laugh at time and the leagues of space,
As he drives his aeroplane on apace?

Will my baby fly in the air? Ah! yes,
And he'll see more wonders than I can guess—
My little baby, just one year old,
With his eyes of blue and his hair of gold.

I Doubt It

When a pair of red lips are upturned to your own,
With no one to gossip about it,
Do you pray for endurance to leave them alone?
Well, maybe you do—but I doubt it.

When a sly little hand you're permitted to seize,
With a velvety softness about it,
Do you think you can drop it with never a squeeze?
Well, maybe you can—but I doubt it.

When a dear little waist is in reach of your arm,
With a wonderful plumpness about it,
Do you argue the point, 'twixt the good and the harm?
Well, maybe you do—but I doubt it.

And if by these tricks you should capture a heart,
With a womanly sweetness about it,
Will you guard it, and keep it, and act the good part?
Well, maybe you will—but I doubt it.

Instructor to Cadet (after his usual wreck): "Why didn't you level off?"

Cadet: "Because the altimeter still showed one hundred feet."

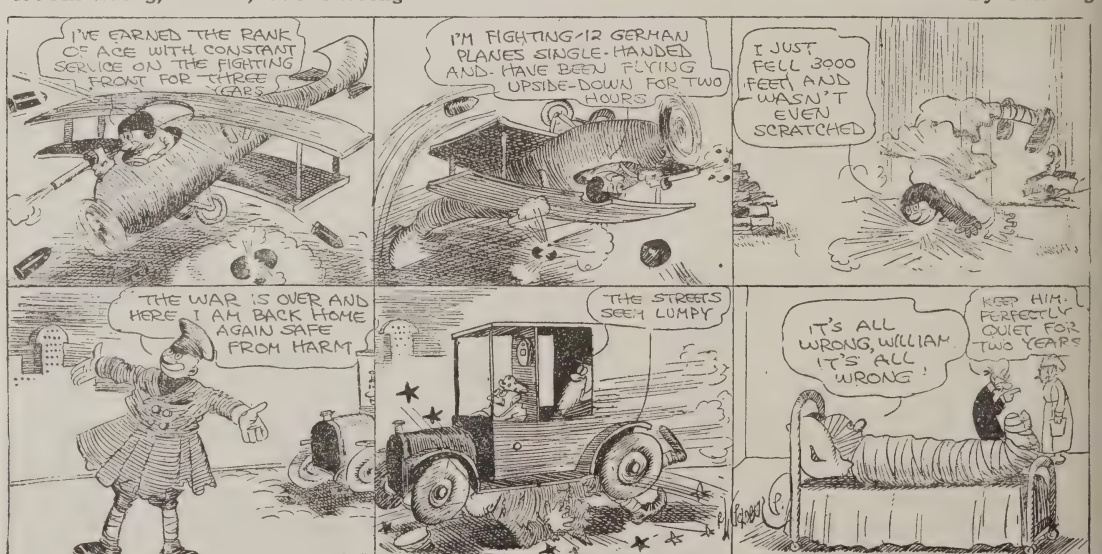
Girl friend to ground officer: "What is a Keewee?"

Ground officer: "An Australian bird that does less flying than any other, but gets there just as fast."

Radio Sergeant: "Can you stay behind me two letters?"

Class: "Yes, a whole hour, at least."

It's All Wrong, William, It's All Wrong **By Goldberg**



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(*Continued from page 997*)

financial interest in it a source of much embarrassment to him, as it was also a source of embarrassment to the officers of the Signal Corps to whom he had disclosed it. Col. Deeds discussed various plans by which he could divest himself of his interests in the company in such manner as to leave no ground for criticism. He felt that he was not justified in asking his associates to lease the ground for a nominal rental, because the largest stockholder, Mr. Schantz, represented not only his individual interest but that of the Schantz Estate, in which there was a large number of beneficiaries.

The matter was under discussion in the Department for several months and was finally referred to Mr. Montgomery of the Advisory and Consulting Committee, who, under date of June 28, 1918, wrote an opinion to the effect that if it were not for the criticisms and insinuations so extensively made with reference to the connection of Colonel Deeds with the operations at Dayton, there would be no objection to the form of lease which had been proposed, and that these criticisms suggested the advisability of unusual caution. His opinion continued with the statement that as the transaction was entirely outside the jurisdiction of Colonel Deeds and he would have no connection direct or indirect, with letting or recommending the contract, unless possibly in his capacity in connection with the Aircraft Board, Mr. Montgomery could see no legal reason why Col. Deeds' interest in the Moraine Development Co. should interfere with the transaction. Col. Deeds was not satisfied with this, however, as will appear from a letter written to Mr. Schantz by Mr. Montgomery under date of July 25, 1918, suggesting that in view of Colonel Deeds' sensitiveness to criticism, he would like to know from Mr. Schantz if a lease could not be made for a nominal consideration merely. It was shortly after this that the Hughes investigation commenced.

Returning now to the consideration of the transfer by Col. Deeds to his wife of the stock in the United Motors Co., it will be seen that what Col. Deeds really did with this stock and other stocks, is disclosed by the affidavit of George B. Smith, the financial representative of Col. Deeds, and Mr. Kettering. From this affidavit it appears that the facts, briefly recited, are these:

About August 16, 1917, Col. Deeds had stated to Mr. Smith that he had given all his interest in the United Motors Co. to his wife, and directed Smith to have it transferred to her. The certificates of stock were in Mr. Smith's custody in Dayton, and the transfer agent was the Guaranty Trust Company of New York. Not having time to give the matter his immediate attention, and because Col. Deeds was spending all his time in Washington, with the exception of week end visits every two or three weeks, the actual endorsements on the certificates were delayed until October 13, 1917, when they were endorsed by Deeds, and Smith then took them to New York and had them transferred to Mrs. Deeds on the books of the Corporation. While in New York he made demand for the pool stock referred to by Judge Hughes, which stock Smith had several times demanded in order that the stock might be transferred to Mrs. Deeds, but he was informed that the stock was not ready for delivery. Prior to going to New York on this occasion Smith notified Mrs. Deeds that he was going there to have the stock transferred to her name on the books of the corporation, and Smith stated that Mrs. Deeds appeared to know all about the transaction, and to understand that the transfer was to be made. After the transfer was made, Smith himself, who had previously been accustomed to looking after Mrs. Deeds' business affairs, kept the certificates for her, and Col. Deeds had no control over them. When the pool certificates were finally transferred to Mrs. Deed's name, Smith also kept them for her. The stock transferred to Mrs. Deeds was less than 2% of the capital stock of the United Motors Corporation.

The statement of assets made by Smith under date of August 31, submitted to Colonel Deeds, was intended to show and did show the condition of Colonel Deeds' interests as they appeared on the books of the various corporations concerned. As the stock had not been actually transferred on the books, the United Motors stock appeared on that statement to stand in the name of Colonel Deeds.

Judge McCann, the counsel for Colonel Deeds, who has been hereinbefore referred to, in an affidavit submitted herewith states that the plan of action for Colonel Deeds to pursue had been outlined by him (McCann); that McCann prepared all the documents in connection therewith, including the two letters to the Aircraft Production Board and the Secretary of War; that the language of the documents was his own; that the work was done under pressure, without opportunity for mature deliberation; that Colonel Deeds' appointment had been made; that there was apparently great need for haste in all departments of aircraft work, particularly the work of production; that Colonel Deeds' instructions were to take such steps promptly as might be necessary to carry into effect the plan decided upon; that on his return to Dayton Mr. McCann instructed Mr. Smith to make the formal transfer of the stocks as of the date of Colonel Deeds' resignation; that because of Colonel Deeds' incessant labors at Washington and his enforced absence from Dayton it took some weeks to carry this plan into effect; that the plan was fully carried out as originally intended, except as to the stock of the Domestic Building Company, which will be referred to later; that there was no reason for deceiving anyone, and no intention to deceive; that all the transactions had been in absolute good faith; that Colonel Deeds had lost heavily financially by reason thereof; and that the Government had profited greatly by the service Colonel Deeds had rendered.

The whole attitude of Col. Deeds from the time he was first approached with the request that he give the government the benefit of his services, up to the time when the investigation was commenced, taken in connection with his large financial sacrifices in relinquishing salaries aggregating $85,000 a year, as well as interests in the various companies with which he had been connected, precludes the thought that he was guilty of conduct unbecoming an officer and a gentleman in that "with intent to deceive" he officially stated to the Aircraft Production Board that he had made bona fide transfers of his stock in the United Motors Company, knowing this statement to be false. It will be observed that the "intent to deceive" is an essential element of the offense.

It is recommended that no court-martial proceedings be instituted against Col. Deeds based upon the statements in his letters to the Secretary of War and the Aircraft Production Board so far as they concerned the transfer of his stock in the United Motors Co., because: (1) Col Deeds at the date the letter was written had made an informal gift of the stock; (2) he had instructed Judge McCann to arrange promptly the necessary transfer; (3) the actual transfer was delayed because of Colonel Deeds' absence from Dayton, necessitated by his continuous and unremitting labor for the Government at Washington; (4) the formal transfer was subsequently made; (5) there was a total absence of intent to deceive

(*To be continued*)

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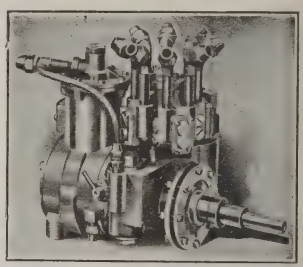
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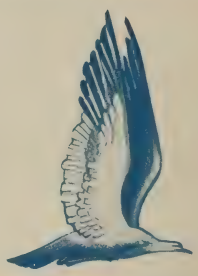
The Curtiss Model K-6 and K-12 Aviation Motors Described

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scription: Domestic, $4. Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

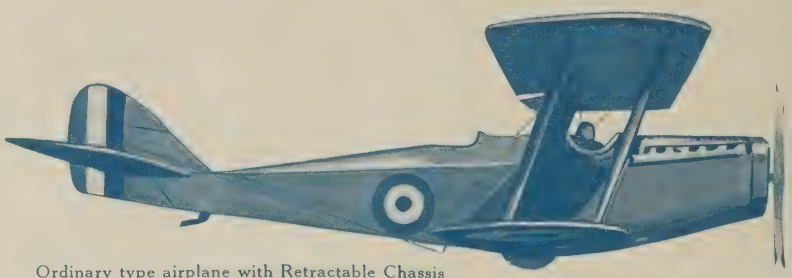
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5—It should automatically close the housing recesses so that the fuselage or wing skin forms a flush surface when chassis is retracted.
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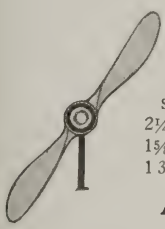
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VOL. VIII FEBRUARY 3, 1919 No. 21

TABLE OF CONTENTS

	PAGE
American Express Company Ready to Handle Aerial Express	1023
New York Police to Have Volunteer Aero Squadron	1024
Awaiting the Aerial Limited	1024
The News of the Week	1025
The Aircraft Trade Review	1027
U. S. Aerial Mail	1028
Instruments for Cross Country Flying	1029
The Curtiss Model K-6 and K-12 Aero Motors	1030
Citations for Bravery	1035
The Standard Model E-4 Mail Aeroplane	1036
Colonel Deeds Not to be Court-Martialed	1040
Naval and Military Aeronautics	1042
Foreign News	1044
Elementary Aeronautics and Model Notes	1045
Aeronitis	1046

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.

Foster Bldg., Madison Ave. and Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., February 3, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, FEBRUARY 3, 1919 NO. 21

AMERICAN EXPRESS COMPANY READY TO HANDLE AERIAL EXPRESS

MR. ALAN R. HAWLEY, the president of the Aero Club of America made public on January 28 a report of the Aerial Transportation Committee of the Club, announcing that the American Express Company is ready to handle aerial express and will do so as soon as aerial transportation lines are established throughout the country.

The American Express Company, the report states, believes that the great speed of the aeroplane makes it a valuable means of transportation, and that many people will be glad to pay extra to have their packages delivered in half or one third of the time required by other means of transportation.

It has been estimated that aerial express could be carried profitably at a charge of two dollars per pound for packages of a given size between New York and Chicago.

A twin motored aeroplane can make the New York-Chicago trip in about seven hours, without stopping, carrying over one thousands pounds of express matter.

Such an aeroplane, made to order, will cost about $20,000. In future, when they are built in large number, they will probably cost only $10,000.

The life of the motors, if run throttled down, is over 500 hours of flying. The life of the plane itself is greater.

A low compression Liberty motor burns about twenty gallons of gasolene an hour. Two Liberty motors on a plane would, therefore, consume about 280 gallons of gasolene for the New York-Chicago trip. The 300 h. p. Hispano-Suiza and the new 400 h. p. Curtiss motor, consume less gasolene than the Liberty.

It appears that it will be possible to get between four and seven miles to the gallon of gasolene in operating air lines.

Mr. Ralph E. Towle, the manager of the Travel Department of the American Express Company, has gone to Europe to investigate the plans and methods of aerial transportation in Europe. Mr. Albert R. Green, the assistant manager, is receiving the hearty co-operation of the Aerial Transportation Committee of the Club. Mr. Glenn H. Curtiss, the famous aeroplane manufacturer, who is a member of the Committee, took Mr. Green through the Curtiss aeroplane factory at Garden City to give him an opportunity to see the large aeroplanes under construction, and to see a 50-passenger air yacht.

"The action of the American Express Company is an epoch-making event in aeronautics," said Mr. Hawley.

"It will be a great inducement to the pioneer concerns that are planning to establish aerial transportation lines throughout the country to know that the American Express Company is ready to co-operate with them—and probably use the major part of the carrying capacity of their planes, no matter how large they may be."

The members of the Aerial Transportation Committee of the Aero Club of America are as follows: Rear-Admiral Robert E. Peary, Chairman; Col. Bion J. Arnold, Roger W. Babson, Sir F. W. Baillie, Major T. F. Baldwin, U. S. A., Bernard M. Baruch, Capt. R. A. Bartlett, Alexander Graham Bell, Major August Belmont, U. S. A., Laurence V. Benet, Walter Berry, Lieut. Commander P. N. L. Bellinger, U. S. N., Lieut. Commander W. Starling Burgess, U. S. N., James M. Beck, General Theodore A. Bingham, Lieut. Col. James A. Blair, Jr., William H. Bliss, Col. G. C. Brant, U. S. A., Rear Admiral Mark S. Bristol, Lieut. Col. A. R. Christie, Col. C. C. Culver, U. S. A., Lieut. Godfrey L. Cabot, U. S. N., Manuel Estrada Cabrera, President of Guatamala, Gianni M. E. Caproni, Col. Charles deF. Chandler, Edward B. Close, Alexander Smith Cochran, T. Jefferson Coolidge, J. Parke Channing, W. Redmond Cross, J. S. Cullinan, Glenn H. Curtiss, Capt. Bronson M. Cutting, Edgar B. Davis, Col. Milton F. Davis, U. S. A., H. P. Davison, James Deering, Charles Dickenson, Capt. Earl W. Dodge, Lieut. W. E. Doherty, U. S. N., Eben S. Draper, Irenee duPont, T. Coleman duPont, Brig.-Gen. Robert K. Evans, U. S. A., Rear-Admiral Bradley A. Fiske, Major Max Fleischmann, Col. A. F. Fuller, U. S. A., Major Robert Glendinning, Major Howard L. Goodhart, Major C. C. Goodrich, Major David M. Goodrich, Major Edwin Gould, Alan R. Hawley, William Hawley, John Hays Hammond, Jr., J. R. Harbeck, A. A. Harriman, Peter Cooper Hewett, Dr. A. L. Hipwell, W. S. Hogan, Lt. Col. F. L. V. Hoppin, Hon. Murray Hulbert, Col. H. B. Hersey, Prof. J. F. Haworth, Col. E. Lester Jones, Major-General W. A. Kenly, Major Fiorello H. La Guardia, Capt. B. B. Lipsner, Henry Lockhart, Jr., Capt. Pierre Lorrilard, Harold F. McCormick, Clarence H. Mackay, Emerson McMillan, Lord Northcliffe, Glenn L. Martin, Col. Archie Miller, U. S. A., Major J. C. McCoy, W. W. Miller, Harry Bowers Mingle, Wm. H. Page, Augustus Post, George W. Perkins, L. C. Phipps, Col. James Prentice, Major Cushman A. Rice, U. S. A., Prof. C. L. Poor, R. B. Price, N. G. Rost, Hon. William G. Sharp, Allan A. Ryan, Alberto Santos-Dumont, Herbert L. Satterlee, F. A. Seiberling, J. DeMont Thompson, Rodman Wanamaker, Lt. Col. Wm. Thaw, Brig. Gen. Cornelius Vanderbilt, W. K. Vanderbilt, G. Douglas Wardrop, Felix M. Warburg, Sidney B. Veit, Henry Woodhouse, Major Orville Wright, Harry Payne Whitney, John N. Willys, Evan J. David, K. M. Turner.

NEW YORK POLICE TO HAVE VOLUNTEER AERO SQUADRON

FOLLOWING a conference with Police Commissioner Enright, Special Deputy Police Commissioner Rodman Wanamaker, Inspector Dwyer, Special Deputy Police Commissioner Allan A. Ryan, Special Deputy Commissioner Wallis, Dr. John A. Hariss, Special Traffic Commissioner, and other high officials of the Police Department and the Aero Club of America officials, the chief of the Aviation Section of the New York Police Department, Colonel Jefferson De Mont Thompson, made public the plans to organize an aero squadron to be part of the New York Police Department.

Colonel Thompson also discussed the plans with Colonel William A. Bishop, the Canadian Ace, who has 72 enemy aeroplanes officially credited to him, at the Aero Club of America's reception to Colonel Bishop, and Colonel Bishop approved of the plan heartily.

Captain Arthur J. Coyle, commanding officer of the First Aero Squadron of the American Expeditionary Forces, who also was at the Aero Club of America, was enthusiastic over the plan and assured Colonel Thompson of his co-operation in organizing the Police Aero Squadron.

It has been decided that the Aviation Section of the New York Police shall be a volunteer body.

The formation will be the aero squadron formation as prescribed by the United States Government, which provides for 20 officers, including the executive, technical, medical, etc., and 12 pilots. As a rule there are 154 non-commissioned officers and enlisted men to an aero squadron. The number of officers and men per aero squadron have been changed from time to time, and in organizing the Police Aero Squadron, the Police authorities will comply with the latest United States Army formation requirements.

This will make the New York Police Aero Squadron of military value and will set the standard for police aviation sections, which other cities, no doubt, will organize in the near future.

An aero squadron consists of three aero companies. The aero company is the smallest aero tactical unit, and the Aero Club of America has suggested that smaller cities begin by organizing an aero company. Larger cities will be urged to organize aero companies.

Leading New York aces will be invited to join the Aero Squadron of the New York Police. Colonel Thompson stated today that he was asking the following American Aces, who are residents of New York, to join the New York Police Aero Squadron:

Captain Edward V. Rickenbacker, the foremost automobile driver, who is the premier ace of the American Air Forces, having 26 enemy planes to his credit.

Lieut. Col. William Thaw, the dean of American Aviators, who has 5 enemy planes to his credit.

Major James A. Meissner, who has 8 enemy planes to his credit.

Major Cushman A. Rice, who commanded 4 American Aero Squadrons which co-operated with the British forces and who was wounded and gassed at the second Somme battle.

1st Lieut. Lansing C. Holden, who has 7 enemy planes to his credit.

2nd Lieut. Howard Brodick, of Brooklyn, who has 6 enemy planes to his credit.

Lieut. F. M. Symonds, who has 5 enemy planes to his credit.

Three other aces—Lieut. E. P. Curtis, of Rochester, New York, who has 6 enemy planes to his credit; Lieut. E. M. Haight, of Astoria, New York, who has 5 enemy planes to his credit; and Lieut. H. H. George, of Niagara Falls, New York, who has 5 enemy planes to his credit, will be asked to join the New York Police Aero Squadron, if their respective cities do not need their services.

Colonel Thompson attended the reception given by the Aero Club of America to Colonel Bishop, the Canadian Ace, who has been credited officially with 72 enemy planes, and discussed the plan of the New York Police Aero Squadron with Colonel Bishop and the Aero Club of America officials.

Colonel Bishop was greatly interested in the project, which he approves heartily.

Colonel Bishop stated that the example of New York City will, no doubt, be followed by every progressive city in the world in the very near future.

AWAITING THE AERIAL LIMITED

AMERICA is falling behind England in aerial passenger transportation. Already two British companies are regularly operating air lines between London and Paris, carrying people for £15 a passenger each way and on schedule time, making the round trip between breakfast and dinner and allowing four hours in either city for transacting business. An aerial express is also flying a London-Manchester-Liverpool route. Another British company has sent out a bi-motored biplane with six civilians from London to Delhi, India, via Brindisi, Marseilles, Otranto, Cairo, Damascus, Bagdad, Bushire, Bandar Abbas and Karachi—a total distance of nearly 4,000 miles. Major General Salmon, in a bi-motored military machine of the same type, has already flown 3,950 miles from Cairo to Calcutta. This same biplane had previously negotiated the flight all the way from London to Cairo and had done extensive bombing of the Turks in Palestine.

In the United States only two aerial transportation companies have displayed any life. There are no machines in regular passenger service on schedule from city to city.

With regular aerodromes—even one hundred miles apart—passengers can be carried in standardized, bi-motored aeroplanes safely and on schedule time. If one motor stalls the other has sufficient power to fly the aircraft to its destination, with no greater loss of time than characterizes regular, long-distance train service in this country. Comfort against the cold is provided by electrically heated clothing, and, of course, no kind of earth travel compares with flying for breadth of view and exhilaration.

The greatest present need for popularizing American aeronautics is for the manufacturers of aircraft to put into operation at once a passenger-carrying air line and to transport passengers through the heavens from one city to another safely and on schedule time. This can easily be done by three or four types of bi-motored aeroplanes now completed in this country. 'Buses aerially navigating the distance between New York and Washington, via Philadelphia and Baltimore, could be put into operation any day, starting from Belmont Park and landing at the same aerodromes as the aero mail ships now use. Indeed, the aero mail between this city and the capital has already made an enviable record of 350 consecutive flights through all kinds of weather—from thunder to snow storms—with only three delays.

The Manufacturers' Aircraft Association is, perhaps, the most logical organization to start such an enterprise at once. Several of its members have constructed bi-motored aeroplanes which could carry a score of passengers between those four cities without danger and in great comfort. So many people are anxious to visit cloudland in a heavier,than-air machine that the line would soon pay for itself. By doing this they would greatly advance the glory of American aeronautics.—Editorial in the N. Y. *Tribune*.



THE NEWS OF THE WEEK



Senator Chamberlain Calls for Department of the Air

Washington, January 22nd.—Senator Chamberlain sounded a call for aerial preparedness for the next war before the Senate Military Committee. As a necessary foundation for a strong aeronautic policy Senator Chamberlain urged the establishment of a Department of the Air, with its head a Cabinet Member. The Senator said:

"The United States should profit by the experiences of the war with Germany and formulate a constructive programme accordingly. We ought to continue to manufacture aeroplanes in reasonable quantities, but more than all we should endeavor to develop mechanical flight so as to be able, should the emergency arise, to achieve and maintain control of the air.

"I do not think that this country should endeavor to keep up an air programme to the extent aimed at while we were at war, but developments in aeronautics more than in all other sciences bearing on intimate relationship to national defence is absolutely essential. Otherwise America cannot hope to attain that position of supremacy in aerial navigation which she should have attained during the war had our executive efforts been properly co-ordinated.

"The air problem in the future seems to rest on efficient co-ordination. It is for this reason that we—speaking for a majority of the members of the Senate Military Affairs Committee—recommend a unification of effort, and still urge such a policy. What I would like to see would be the creation of a separate air bureau or department, whose head shall sit in the Cabinet along with the Secretaries of War and Navy."

War Department Permits Publicity On War Contracts

Washington, January 19th.—According to an official statement issued by the Director of Purchase, Storage and Traffic, War Department, the revocation of the clause or clauses in War Department contracts, prohibiting the publication of information in respect to such contracts, having been approved by the Secretary of War, the provisions of such prohibitory clauses are revoked. Contractors are, therefore, authorized and permitted to furnish the public information concerning War Department contracts and orders received by them.

"Aeronautical Day" At Brooklyn Rotary Club

Brooklyn, N. Y., January 22nd.—Among the notables of Aeronautics who attended the luncheon meeting of the Brooklyn Rotary Club at Hotel Bossert was Mr. Alan R. Hawley, President of the Aero Club of America; Mr.. Augustus Post, Secretary of the Aerial League of America; Mr. Charles Jerome Edwards, Vice-President of the Aero Club of America and President of the Rotary Club; Captain Robert A. Bartlett, Captain of the S. S. *Theodore Roosevelt* when Admiral Peary discovered the North Pole, and who is planning a flight to the North Pole next summer.

Speaking of the projected aero flight to the Pole, Capt. Bartlett said: "People ask what is the use of making these explorations, but if the British Government had sat down and not explored the world the British flag would not today be flying from every quarter of the globe, and if we do not explore these white spots on the map and draw some lines in them some other nation will."

Department of Military Aeronautics Disposing of Surplus Material By Auction and Sealed Bids

New York, January 23rd.—The Aero Club of America has recently received a communication from the Department of Military Aeronautics requesting that attention be called to public auctions and sale under sealed bids of practically every item used on a flying field.

Communications requesting information on this subject should be addressed to Lieutenant H. G. Quirt, Supply Station, Salvage Branch, Department of Military Aeronautics, Washington, D. C.

Officers Can Collect Back Flying Pay

Washington, D. C., January 23rd.—According to reliable information, officers commissioned since July 1st, 1918, can collect 50% increase in pay for all the time they have been on flying duty as enlisted men since July 1, 1918. The procedure to be followed in obtaining back flying pay is to write to the Commanding Officer of the field at which training was received and request an order placing them on flying status on July 1st and taking them off on the date of this commission. This order, together with a statement of claim due, should be sent to the Auditor, War Department, Washington, D. C.

Flies 9 Hours 21 Minutes

Miami, Fla.—What is said to be a new aerial endurance record was established on January 23 by Ensign F. Dalrymple, of the local air naval station, who remained in the air continuously for nine hours and twenty-one minutes.

Driving a HF-2 machine and accompanied by a mechanic, Dalrymple left the air station here at 8:10 a.m. and remained in the air until 5:31 p.m., he made two trips to Key West and back before landing. The previous endurance record, it is said is for nine hours and one minute.

The machine used on the flight was specially constructed and equipped with a Liberty motor.

Col. Bishop Predicts Many Commercial Uses for Aeroplanes

New York, Jan. 25.—At a luncheon given in honor of returning war aviators by the Aero Club of America, Col. William A. Bishop, Canadian "ace," with seventy-two German planes to his credit, predicted confidently that both giant and one-engine planes will be making trans-atlantic flights within six months.

"Eight British firms are building planes to fly across the ocean," said Col. Bishop. "The Vickers Company will soon put out a machine of unprecedented size for that flight, but, for my part, I think the trip can be made in a single-engine plane. Such small machines are making regular trips between Montreal and Toronto.

"Three firms will have aerial garages in Canada within a year. Then one may call up a garage, a plane will call for him and he will be off on the fastest and most delightful journey he ever made. These machines will carry freight too.

"To encourage the building of planes for commercial purposes, laws governing aerial traffic must be made and obeyed," Col. Bishop went on. "There must be rules of the air, just as there are rules of the road. And the customs officers will have to be on the sharp lookout for aerial smugglers.

"In British Columbia aeroplanes are being used most successfully to detect forest fires and prevent their spread. The aviator either flies and gives the alarm in person or drops especially prepared chemical bombs. All Canada will adopt this system to protect her valuable forests, I think."

John Burroughs, the perennial naturalist, asked the Colonel if he would take him on a transatlantic air voyage. Col. Bishop smilingly promised that he would.

Aero Exposition Plans Maturing

New York, Jan. 27.—Owing to the large number of exhibits offered, the Manufacturers Aircraft Association has found it necessary to lease for its Annual Aeronautical Exposition not only Madison Square Garden but the 69th Regiment Armory as well. It was at first planned to hold the exposition late in February, but developments in co-operation with the Government made advisable a slight change in dates. As a result the



The Aero Club of America reception to Lieut. Col. William A. Bishop, R. A. F. and Captain Arthur J. Coyle, Commander First Aero Squadron, American Air Force. From left to right: Henry Woodhouse, Captain Arthur J. Coyle, U. S. A.; Colonel Bishop, R. A. F. (in civilian clothes); Rear Admiral Bradley A. Fiske, U. S. N.; Captain Roger B. Whitman, U. S. A.; Lieut. Horace B. Wells, Augustus Post, members of the U. S. Army and Navy Air Service; William Hawley, Lieut. Eytinge, Canadian Air Service; Lieut. W. D. Adams, and Lieut. Edwin C. Moore. About 200 people were present, including Robert A. Bartlett, famous explorer; John Burroughs, the famous naturalist; Dr. Terry, Mr. A. J. Marcuss, Mr. M. M. Marcuss, Major H. A. Bubb, Lieut. H. S. Koch, Lieut. James Crommery, Colonel J. DeMont Thompson, Robert Graves, Henry A. Wise Wood, Mr. J. C. Cullinan, Lieut. M. Gilbert Whitman, Lieut. DeWilder Atkinson, R. A. F.; Lieut. Nelson, A. S. A.; Lieut. N. W. Siberman, Lieut. K. M. Murray, G. Douglas Wardrop, managing editor of Aerial Age; Dr. C. A. Lawrence, Mr. E. A. Townley, Lieut. Beckwith Havens, U. S. N.; Evan J. David, business manager of Flying; Leroy B. Gulotta, editor of Air Power; Major Cushman A. Rice, etc.

exposition will be held from March 1 to March 15.

Arrangements for the exposition have brought the Show Committee of the Association into communication with an extensive range of industries. The exhibitors, it is predicted, will include not only the aeroplane and motor manufacturers but the makers of parts, accessories and subsidiary elements that enter into the construction of this most modern product of science and industry—the flying machine.

The members of the Manufacturers Aircraft Association are completing their show plans as rapidly as possible and the principal companies have already made definite plans for space, exhibits and the manner of display. It is planned to have all aeroplanes where they may be seen close at hand. In the case of the Army and Navy it is understood that soldiers and sailors trained in flying, gunnery or mechanics will be stationed at the various exhibits to explain to the people what each part means and how it functions.

It is not the aim to segregate the commercial, naval and military exhibits, but to distribute them throughout both the Garden and the armory. Visitors will have an opportunity to see not only the products of American aircraft industry but will be able to see examples of commercial and military construction from Great Britain, France and Italy. War trophies, of course, will represent Germany.

The Performance of the Christmas Bullet

In the description given of the Christmas Bullet in AERIAL AGE on January 20, the ceiling of the machine was given as 14,700 feet. This reference was to the climbing efficiency of the machine, and not the actual ceiling. The actual ceiling has been computed to be close to 34,700 feet.

The climbing efficiency is 1,700 feet per minute; that is to say, the machine is capable of climbing 1,700 feet per minute until an altitude of 14,700 feet is reached, from which point, the climbing rate naturally decreases until the actual ceiling has been reached.

National Special Aid Society to Aid Bartlett Air Polar Trip

Women are to have their part in the Roosevelt Memorial Arctic Expedition which is to start by aeroplane for the polar regions in June of this year. The Aviation Committee of the National Special Aid Society, Mrs. William Allen Bartlett, chairman, has just voted to contribute the complete hospital equipment and supplies for the expedition. This expedition will be financed by the Aerial League of America and be in charge of Captain Robert A. Bartlett, who was Captain of the S. S. *Roosevelt* in both of the Peary expeditions, and Commander of the McMillan Relief Expedition, etc.

The funds for this donation will come from the Treasurer and Trinket Fund of the society, which, working for the aviators of the United States Army, has raised nearly $100,000 to supply them with warm garments and other necessities and to aid their dependents in case of disaster. The women voted unanimously to make this gift to the expedition; it will be arranged with expert medical and surgical advice, and they may increase the gift when the cost of the equipment is learned.

Dirigible Made 1,200 Miles in 29½ Hours

The big navy dirigible, C-1, which recently sailed from Rockaway to Key West, covered the



D. G. Caywood, special field representative of the Black & Decker Co., of Baltimore, manufacturers of precision apparatus

1,200 miles in twenty-nine and on-half hours actual time in the air, according to its commander, Capt. Stanley V. Parker, who reported to Washington yesterday. He came back on a train, which required sixty hours.

Two other remarkable endurance flights by the Navy Dirigible A-236 from the naval air station at Key West, one lasting 32 hours and covering 750 miles, and the other 40 hours and 48 minutes, and covering about 850 miles, constituting a service record, were described in official reports made public recently.

Rising winds and threatening storm stopped the first flight November 24, although sufficient fuel and oil remained for 8 more hours. During the first 10 hours the ship was lightened 300 lb. by consumption of gasoline. Her crew brought her down to within 50 ft. of the sea and with buckets and line took up enough water to restore her propeller balance.

The second trip, made December 24-25, was made under overcast skies with a wind ranging from 20 to 36 miles an hour. The propelling motor was stopped only twice, for 3 minutes each time, to fill the oil reservoir.

Army Reorganization Bill Provides for Reduced Air Service

Washington.—Indications of the size of the future Air Service of the Army is given in a proposed bill drawn up by the War Department this week. The bill, which will probably be held in abeyance pending possible developments in Europe, calls for an Air Service of 1,923 officers and 21,853 enlisted men. The officers include one major general, one brigadier general, twenty-two colonels, forty-five lieutenant-colonels, 126 majors, 438 captains, 696 first lieutenants and 594 second lieutenants. An organization of this size would require approximately 2,000 aeroplanes in constant service.

New Air Service Insignia

Washington.—An insignia for fliers has been approved with certain changes as follows: (a) Military aviators, junior military aviators and reserve military aviators: a device of oxidized silver consisting of a pair of wings with the shield between; to measure 3 in. from tip to tip.

(b) Military aeronaut, junior military aeronaut and reserve military aeronaut: a device of oxidized silver consisting of a pair of wings with a balloon between; to measure 3⅛ in. from tip to tip.

(c) Observer: an oxidized silver single wing to the left of the letter "O" in bright silver; the "O" to encircle the letters "US" in oxidized silver in relief on an oxidized silver background; the device to measure 1⅞ in. in length.

Flying instructors: gilt insignia of the same design and size as the insignia for officers of the Air Service, omitting the propeller; to be worn just above the right cuff on all coats.

Conditions for Tests of Experimental Aeroplanes Announced

The following regulations were authorized by General Kenly, January 14, 1919:

1. The Chief of the Technical Section is charged with the responsibility for all tests of experimental aeroplanes at Air Service Fields.

2. Requests by private enterprise for permission to conduct *Unofficial Tests* of experimental aeroplanes at Air Service Fields may be granted under the following conditions:

(a) Such tests will be conducted at McCook Field, Dayton, Ohio, unless otherwise permitted by the Director of Military Aeronautics.

(b) Such tests will be entirely at the owner's risk and expense and he shall supply the pilot therefor. No Air Service pilot will be permitted to engage in these tests.

(c) Flight tests will be permitted only after a technical examination by a representative of the Technical Section. If, in the opinion of this officer, the aeroplane is unsafe to fly, no flight will be permitted at an Air Service Field.

3. *Official Tests* of experimental planes will be authorized only at McCook Field, Dayton, Ohio, and under the following conditions:

(a) The owners of such aeroplanes must submit two models—one for destruction test and one for performance test.

(b) Tests will be at Government expense and the flight test will be made by an Army pilot detailed by the Chief of the Technical Section.

(c) Flight tests will be permitted only after a technical examination and sand-test by a representative of the Technical Section. If, in the opinion of this officer, the aeroplane is unsafe to fly, no flight will be permitted at an Air Service Field.

4. Pilots inexperienced in flying experimental aeroplanes will not be permitted to fly such planes until after they have been placed "in production."

5. Commanding Officers at Flying Fields will be held strictly responsible that no flights are made at their fields in violation of the foregoing instructions.

1,000,000 Ship Tons Saved by Efficient Aeroplane Packing

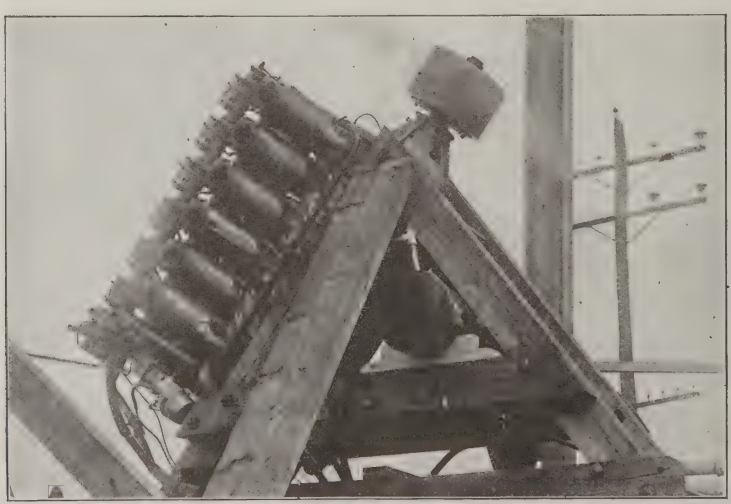
The studies carried on by Bureau of Industrial Research recount a saving of space in aeroplane shipment as follows.

The studies which were made in reduction of space necessary in which to ship aeroplanes resulted in the cutting of the size of the boxes needed for a single machine 50 per cent. This would mean that with limited transportation facilities double this number of planes could be shipped in a single trip across the ocean. In one instance alone 50 carloads of freight were so repacked as to require the space of only 15 with its proportionate saving in cargo space.

To the work of the Bureau of Industrial Research of the Purchase, Storage and Traffic Division is due the conservation of space in thousands of freight cars and at least a million ship tons. Credit is also due the bureau for reduction in losses due to faulty and defective packing. As a result of the efforts of its experts, millions of dollars were saved in packing materials and many more millions of invaluable tonnage and cargo space for the use of the Army.

Pioneer Military Air Heroes' Photos Sought

The Director of Military Aeronautics desires to have photographs of the officers named below, who were killed in aeroplane accidents, and for whom fields of the Air Service have been named. So far it has been impossible to get in touch with any relatives or friends of these men, all of whom died several years ago and whose records in the War Department are incomplete: Lieut. Moss L. Love (Cavalry), Lieut. Joseph D. Park (Cavalry), Lieut. Lewis C. Rockwell (Infantry), Lieut. Lewis W. Hazelhurst, Jr. (Signal Corps), and Lieut. Eric L. Ellington (Cavalry).



A Liberty Twelve "climbing" on the test block at the Trego Motors Corporation

The AIRCRAFT TRADE REVIEW

Packard Motor Co. to Market Two Passenger Biplane

Detroit.—The Packard Motor Car Co. is shortly to place on the market a two-seated biplane which is to be sold through Packard dealers at a figure close to $15,000. The Packard Company, therefore, becomes the first manufacturers of passenger cars and trucks to take up, in a commercial way, the production of aeroplanes for general use.

The decision of the company to enter this new field is not altogethr surprising in view of its experience in the development of an aeroplane engine of its own and of the intimate relationship betwen the Packard engineering force and the finished Liberty engine. It was largely through the efforts of Jesse G. Vincent, at that time vice-president of engineering of the Packard Company, that the Liberty engine was designed and brought to perfection.

Beyond the fact that the machine is to be a two-seated biplane, little regarding the design and construction has been permitted to become public. It is expected, according to "Automotive Industries," that the first machine will be ready in from thirty to sixty days, and it is planned to supply them to dealers as rapidly as possible. Already the Chicago dealer has ordered one and other dealer organizations see in the machine a potential market composed of well-to-do sportsmen.

That dealers will take readily to the sale of planes, and that they believe in the possibilities of selling such machines is indicated by the fact that in both Milwaukee and Philadelphia, dealers have recently arranged to handle aircraft. George W. Browne, Milwaukee distributer of Overlands, is to take on the distribution of Curtiss machines, which are made by the Overland interests; and in Philadelphia, Isenberg Brothers have prepared plans and shortly will erect a building to be used for the exhibition and sale of heavier-than-air machines. The company will sell both new and used machines.

U. S. Naval Aircraft Production

Washington, Jan. 20.—The U. S. Naval Aircraft factory at Philadelphia produced aircraft valued at $5,435,000 up to the time the armistice was signed, according to an announcement made recently. It had completed, ready for shipment, 183 twin-engine flying boats at an average cost of $25,000. It had also produced 4 experimental Liberty engine seaplanes carrying the Davis non-recoil gun, at a cost of $40,000 each, and 50 sets of twin-engine flying boat spare parts worth $10,000 per set. In addition, considerable minor experimental work and overhauling of machines from other stations was done.

Bosch Magneto Company Officially Becomes American Bosch Magneto Corporation

On December 7th, 1918, the Alien Property Custodian of the United States sold the entire property holdings, assets and patent rights of the Bosch Magneto Company to the highest bidder. The organization papers, drawn up for inspection as to the Simon Pure Americanism of the purchasers, reveal some interesting facts in connection with the successors, the American Bosch Magneto Corporation.

The Officers of the new company are: A. T. Murray, President; George A. MacDonald, Vice-President and Treasurer; A. H. D. Altree, Vice-President; Leon W. Rosenthal, Vice-President; J. A. MacMartin, Secretary and Assistant Treasurer. The Directors are: A. T. Murray, H. C. Dodge, Martin E. Kern, Duncan C. Holmes, George A. MacDonald, Philip L. Spalding, Henry N. Sweet, H. B. Benedict, C. H. Dwinnell.

Mr. Murray, President and Director of the new company, is also President of the Bethlehem Motors Corporation, of Allentown, Pa. Besides managing the Magneto Corporation, Mr. Murray will continue as the active head of the Motors Corporation.

Mr. MacDonald, Vice-President and Treasurer of the new company, is also President of the Chicopee National Bank, Springfield, Mass.

Mr. Kern is President of the Penn Counties Trust Company, Allentown, Pa., and is also Treasurer of the Bethlehem Motors Corporation.

Messrs. Sweet and Benedict are connected with Hornblower & Weeks, Bankers, of Boston and New York.

Mr. Dwinnell is Vice-President of the First National Bank of Boston, and Mr. Holmes is Vice-President of the Chase Securities Corporation, New York. Mr. Dodge is Chairman of the Board of Directors of the Gray & Davis Company, of Boston, and President of the H. A. Wood Company, also of Boston. Mr. Spalding is President of the New England Telephone and Telegraph Company, Boston, Mass.

The American Bosch Magneto Corporation has taken over the entire holdings and organization of the old company, including the great Bosch Works at Springfield, Mass., which comprises 250,000 sq. ft. in buildings alone and employs 1,500 operatives; also the complete service and selling system throughout the United States, and the entire ownership of all the United States and foreign patents and trade marks under which the old company operated. Ever since the Alien Property Custodian seized the company in May of 1918, the large plant was operated to supply, up to practically 100% of its capacity, the needs of various Departments of the United States Government in the prosecution of the war. That large output will now be devoted without interruption to the requirements of the American manufacturers and public. In addition, the American Bosch Magneto Corporation plans to greatly extend its scope of manufacture in the field of automotive industry.

From an early date, the Bosch Magneto Company manufactured electrical products of unusually high quality for the automobile and allied fields, including ignition devices such as Magnetos and Battery Systems, Lighting Generators, etc. In fact, the first Bosch Magneto dates back to 1886, although this form of ignition was not adopted by American manufacturers of automobiles until 1905. In the following year, Robert Bosch opened a New York office, and in 1908 a four-story building was acquired to meet the demands of the products then made. It is said that about 350 workmen produced eight to ten thousand magnetos a month at that time. The next important step in the growth of the Bosch Magneto Company, the title under which the German concern operated in the United States, was taken in 1911, when ground was broken in Springfield, Mass., for what is now recognized as the most modern and well-ordered factory in the motor industry.

In January, 1912, the extensive Springfield Works were completed, only to be found too small by 1914, when more than one-quarter of a million magnetos were turned out. Accordingly, the Rushmore Dynamo Works was purchased to increase the production of Starting and Lighting apparatus. Expansion still continued. Early in the fall of 1915, ground was again broken at Springfield for an addition of over 60,000 sq. ft. to the main works. The American Corporation now has in its possession all of these excellent buildings and their equipment, together with a recreation park and club house for the employees, across the street from the main factory. It is also the exclusive owner of more than 150 United States patents and a large number of United States patent applications, together with numerous foreign patents and applications. Also the well known Spark-Devil and other Bosch trade marks registered throughout the world belongs to it.

It is understood that the new organization intends to engage actively in establishing itself in a position of even greater prominence in the production of electrical apparatus for American automotive fields than the old company enjoyed before the war.

Ban On Civilian Flying Lifted

Washington, D. C., January 23rd.—According to an official announcement from the War Department, the Joint Army and Navy Board has removed restrictions on civilian flying and will issue permits upon application to all qualified civilians who have been denied the right to fly under the President's Proclamation of February 28, 1918.

Applications for permits should be addressed to the Joint Army and Navy Board on Aeronautic Cognizance, Building "D", 6th and B Streets, N. W., Washington, D. C. Attention of Lieut. L. G. Haugen.

In making an application for a flying license the civilian is requested to forward a copy of his or her certificate or license showing that the individual is qualified as a pilot.

The application must be supplemented with full information as to the nature of the aerial project contemplated; the financial backing; the means to be taken to insure the reliability of motors and the upkeep of planes; types and condition of planes, and the number of hours each has been flown. The number of mechanics to be employed should also be stated.

In short a complete detailed report is desired, and standard forms of application are furnished upon request to the Secretary, Lieut. L. G. Haugen, Division of Military Aeronautics.

It is anticipated that the lifting of this ban will result in the re-opening of various flying schools and increased activity on the part of manufacturers.



The jig for rib construction used by the Glenn L. Martin Company, of Cleveland

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service

PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

London-Buenos Aires Airship Trip Planned

London—Sir Woodman Burbridge announces that he has booked passage from London to Buenos Aires aboard the airship which it is proposed shall undertake the trip next August. He says the preparations are being made by the Vickers interests, and it is expected that the voyage will not take more than six days.

Sir Woodman is going to Buenos Aires on business, and considers that the saving of fourteen days on the journey will be worth the increase in fare, which he understands will be between $2,000 and $2,500 for one way. Aerial mail will be carried at special rates, and will be able to compete with cable communication in cheapness but in speed of transmission.

He will take his wife with him, and he believes that there will be other women passengers. The total number of passengers, he says, will be about fifteen.

As at present arranged there will be two stopping places—one in Spain and one in Brazil.

Postmarks On Air Mail

OFFICE FIRST ASSISTANT
POSTMASTER GENERAL,
Washington, January 17, 1919.

It has been brought to the attention of the department that many postmasters use ordinary rubber hand stamps and various colored inks in postmarking mail received for dispatch by Aeroplane Service. This practice will be discontinued immediately, and all aeroplane mail will be postmarked and the stamps thereon canceled by the use of canceling machines or the regular hand postmarking stamps, and the black canceling ink furnished by the department for such purpose.

J. C. KOONS,
First Assistant Postmaster General.



Second Assistant Postmaster Otto Praeger, in charge of the Aero Mail, who is doing excellent work in the development of this service

More R. M. A.'s

The following officers have been rated as Reserve Military Aviators: 1st Lieut. Carl B. Fry, A. S. A.; 2nd Lieut. William E. Vogelback, A. S. A.; 2nd Lieut. Frederick H. Winston, A. S. A.; 2nd Lieut. Francis J. Winter, A. S. A.; 2nd Lieut. Claude R. Conklin, A. S. (M. A.); 2nd Lieut. Douglas M. Fraser, A. S. (M. A.); 2nd Lieut. Francis Jordan Winter, A. S. (M. A.); 2nd Lieut. Walter Lee Isom, A. S. (M. A.); 2nd Lieut. J. O. Stoddart, A. S. (M. A.); Captain Sylvanus C. Coon, A. S. A.; 1st Lieut. Adam Truello, A. S. A.; 2nd Lieut. Marston Campbell, Jr., A. S. A.

Air Service Units En Route Home

The Battleship New Jersey sailed from Brest January 15th and is due at Newport News January 27th, with the following troops: 480th Aero Squadron, Camp Meade, 4 officers, 152 men; 481st Aero Squadron, Ft. Slocum, 3 officers, 154 men.

The Cruiser Frederick sailed from Brest January 17th and is due at New York January 29th with the following troops: 466th Aero Squadron, Regular Army, 4 officers, 153 men; 492nd Aero Squadron, Camp Meade, 2 officers, 152 men.

The Battleship Connecticut sailed from Brest January 20th and is due at Newport News February 1st with the following troops: 162nd Aero Squadron, Camp Meade, 2 officers, 148 men; 490th Aero Squadron, Camp Meade, 4 officers, 151 men.

Following organizations have been assigned to early convoy: 90th Aero Squadron, 24 officers, 148 men; 104th Aero Squadron, 10 officers, 176 men; 17th Balloon Co., 9 officers, 174 men; 18th Balloon Co., 8 officers, 174 men; 11th Aero Squadron, 20th Aero Squadron, 161st Aero Squadron, 169th Aero Squadron, 248th Aero Squadron, 655th Aero Squadron, 656th Aero Squadron, 487th Aero Squadron, 494th Aero Squadron, and Air Service Casual Co. No. 3.

UNITED STATES POST OFFICE AIR MAIL SERVICE

Monthly Report of Operation and Maintenance

NOVEMBER 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone, and Water	Miscellaneous	Pilots	Mechanics and Helpers	Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST					
													Gallon of Gasoline	Total Time Run	Total Miles Run	Miles Run Per Gallon of Gasoline	Cost per Hour	Cost per Mile
														hr. min.				
1	$75.60	$14.27	$40.58	$28.37	$33.41	$97.29	$125.90	$149.11	$50.75	$74.78	$83.23	$773.29	258	16 07	1504	5.82	$47.98	$.5141
2	62.32	7.83	40.58	28.37	33.41	97.29	98.50	188.00	90.11	74.78	83.23	804.42	204	12 35	992	4.86	63.92	.8109
3	9.15	.81	9.09	28.37	33.41	97.29	13.68	1.70	.35	74.78	83.23	351.86	30	1 45	128	4.26	201.06	2.7488
4	89.94	19.02	40.58	28.37	33.41	97.29	141.53	187.02	7.20	74.78	83.22	802.36	296	18 07	1308	4.41	44.29	.6134
5	111.78	24.40	40.58	28.37	33.42	97.29	206.76	174.88	236.50	74.78	83.22	1111.98	400	26 28	1796	4.49	42.01	.6191
6	88.02	21.41	40.58	28.37	33.42	97.29	149.21	214.22	63.05	74.78	83.22	893.57	289	19 06	1616	5.59	46.78	.5529
38262	50.02	8.67	40.58	28.36	33.42	97.29	106.24	151.20	6.86	74.78	83.22	680.64	164	13 36	860	5.24	50.05	.7914
38274	97.70	21.18	40.58	28.36	33.42	97.29	225.12	166.39	265.10	74.78	83.22	1133.14	321	28 49	2047	6.37	39.32	.5535
38275	80.77	16.47	40.58	28.36	33.42	97.29	153.38	157.65	63.78	74.78	83.22	829.70	265	19 38	1384	5.22	42.26	.5994
38278	124.97	19.51	40.58	28.36	33.42	97.29	219.13	184.59	18.55	74.78	83.22	924.40	411	28 03	2034	4.94	32.95	.4544
39362	6.10	.....	20.38	28.36	33.42	97.29	.....	94.35	4.50	74.79	83.22	442.41	.....	.....	.....	.....	.....	.....
39363	9.15	.....	20.38	28.36	33.42	97.29	.....	94.35	5.50	74.79	83.22	446.46	.....	.....	.....	.....	.....	.....
39364	.....	.....	20.38	28.36	33.42	97.29	.....	94.35	1.20	74.79	83.22	433.01	.....	.....	.....	.....	.....	.....
39365	21.35	5.21	20.38	28.36	33.42	97.29	.....	94.35	2.95	74.79	83.22	461.32	.....	.....	.....	.....	.....	.....
14872	.....	.....	9.09	28.36	33.42	97.29	.....	255.75	3.20	74.79	83.22	585.12	.....	.....	.....	.....	.....	.....
Totals	$826.87	$158.78	$464.92	$425.46	$501.26	$1459.35	$1439.45	$2207.91	$819.60	$1121.75	$1248.33	$10673.68	2638	184 14	13689	5.18	$57.93	$.7797

Cost per mile, overhead, $.2746; cost per mile, flying, $.1771; cost per mile, maintenance, $.4007.

OTTO PRAEGER, Second Assistant Postmaster General.



Instruments and knowledge of how to use them are absolutely necessary to success in cross-country flying

INSTRUMENTS FOR CROSS COUNTRY FLYING

By T. A. MORGAN, Sperry Gyroscope Co.

THE first essential for a long cross country flight such as is now being attempted by the Mail Service is an accurate compass. Such an instrument has been developed for the U. S. Navy and is known as the Navy Standard No. 1 Aircraft Compass. Quantities of these are available at the present moment.

To be of value the compass must be properly installed and properly compensated. It must be mounted so that it is free from violent vibration. The Navy Standard No. 1 compass is designed to be held down securely. If mounted rigidly to a part of the aeroplane it will function properly. A machine recently flew from Akron, Ohio, to Washington, D. C., entirely by this compass with a final error of only 8 miles.

The compensation of a compass is of great importance. The motor and other masses of metal disturb the earth's magnetic field, so that magnets must be placed near the compass to restore it to the North position. The compensation of the compass must be checked at frequent intervals as the magnetism of the plane is continually changing. If the compass is mounted near a Liberty engine ignition switch (which should always be avoided, if possible) it must be compensated with the ignition circuit closed.

It is seldom possible to completely compensate a compass and resulting errors should be noted on a chart beside the compass. An error of 5 or 6 degrees will often remain on some headings, and this error, if not taken into account, would take a man 40 miles off his course on a 500 mile flight.

In navigation by compass, account must be taken of the variation of the compass. This is the amount that the needle points east or west of true north. As variation varies for different parts of the country it is especially necessary to figure on it on long flights. For instance, the variation at Chicago is 2½° East and at New York is 10½° West. If a man flying from New York to Chicago should neglect this error he would miss Chicago by 50 miles.

Another factor which must be carefully considered in navigating the air is drift. That is, the difference between the heading of a machine and the course actually travelled, the difference being due to the wind.

A pilot flying from New York to Chicago failing to take account of a North wind of only 10 miles an hour intensity would be blown 60 miles off his course, even if he used a 120 mile an hour De Haviland 4 aeroplane. The "drift" must therefore be carefully taken into account. There are instruments on the market which enable the pilot to automatically correct for it.

An air speed indicator must be used to enable the pilot to tell how fast he is going, and knowing this, to judge his distance. As many air speed indicators in common use are found to be from 10 to 30 miles an hour wrong, the calibration of this instrument must also be taken into account. The use of an air distance recorder which, independently of the air speed indicator, shows the pilot the exact number of air miles travelled, is a great assistance.

In fog or clouds the difficulties of aerial navigation are tremendously multiplied and as much flying, such as in the Mail Service, must go on regardless of weather, other instruments are necessary. When it is not possible to see the earth it is very difficult to keep a plane on a straight course, even with the aid of a compass, as all pilots know who have done any flying in bad weather. Once a turn is started the compass is of no value, and much time is lost in straightening out again, if more serious trouble is not encountered. A turn indicator is therefore necessary to advise the pilot instantly of any divergence from his course.

For long flights under bad conditions, a directional stabilizer becomes a necessity as the mental and physical strain on the pilot is completely removed by this apparatus, which takes complete automatic control of the ship's rudder.

A complete automatic aeroplane control is also entirely practical and should be used on large planes.

The Air Mail Service, judging from the lack of results, so far, on the Chicago-New York route, is failing to appreciate the necessity of the instruments and of the proper care of those in use.

THE CURTISS MODEL K-6 AND K-12 AERO MOTORS

IN the design of Curtiss K-6 and K-12 motors, the form of construction adopted gives a minimum centre distance between cylinders, together with careful placing of the accessories, makes the motor compact and easily placed in the fuselage, at the same time the accessibility of the varions parts is such that sub-unit may be readily inspected or overhauled without disturbing the motor in the aeroplane.

Gear Reduction

The gear reduction of the Model K-12 raises the centre of thrust to a point near the centre of gravity, and close to the centre of projected area. This enables the design of the nacelle or fuselage to be reduced in size, with consequent lower head resistance.

Efficiency

This gear reduction enables high piston speeds to be maintained, which, with the motor's normal high mean effective pressure, increases the power output without increasing the propeller R. P. M. above a normal figure. As a slow speed propeller is 5 per cent to 7 per cent more efficient than a high speed propeller, the geared down motor will deliver a greater net power per pound of gasoline, consequently the overall efficiency is greater.

Crank Case

The design of the crank case, coat of alloy aluminum is such that, due to the cylinder water jackets being integral, extreme rigidity and absolute alignment of parts are maintained, as well as an appreciable saving in lightness gained. The lower half, containing the oil pan is securely bolted to the flange on the centre line of the crank shaft, which also adds to the stiffness of the assembly.

Reduction Gears

The reduction gears of the K-12 are forged from alloy steel. These are rough lanked and cut. The teeth are 5-7 pitch, Fellow's stub tooth form, the teeth staggered, one inch width of face per side. After heat reatment, the centres and faces are ground, and the gears are then recut to insure accuracy and high mechanical efficiency in operations. The standard reduction is from five revolutions of the engine to three of the propeller shaft.

Propeller Shaft

The propeller shaft of the K-12 is made of the same material, and with the same care as the crankshaft. It carries the reduction gear, and the ample grooved plate type thrust bearings, which are mounted to take thrust in both directions.

The front flange for the propeller is machined integrally with this shaft, the flange is drilled for eight bolts, the bolts themselves remaining in the propeller, and are centered by conical split washers. By this system of mounting the propeller is at all times held firmly in place, but the disadvantages of the taper fit hub are done away with and greater lightness secured.

Cylinders

The cylinders are rough machined from a special analysis hydraulic steel forging, heat treated and finished machined all over, with the cylinder head forged integral. This type of cylinder insures maximum strength with minimum weight, the water being in direct contact gives uniform efficient cooling with minimum cylinder distortion.

Connecting Rods

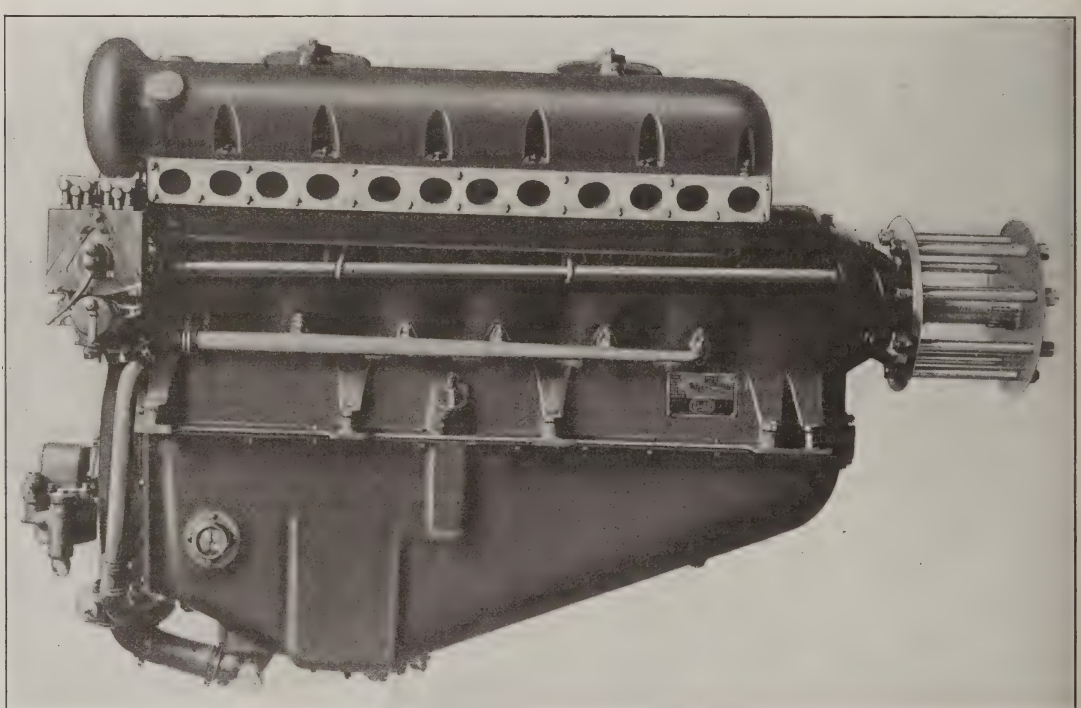
The connecting rods are forged from specially selected steel and are carefully heat treated. The rods are machined all over, and are held to the most accurate limits possible as to size. The finished rods are carefully balanced as to weight, not only with each other as a whole, but as to each end.

Crank Shaft

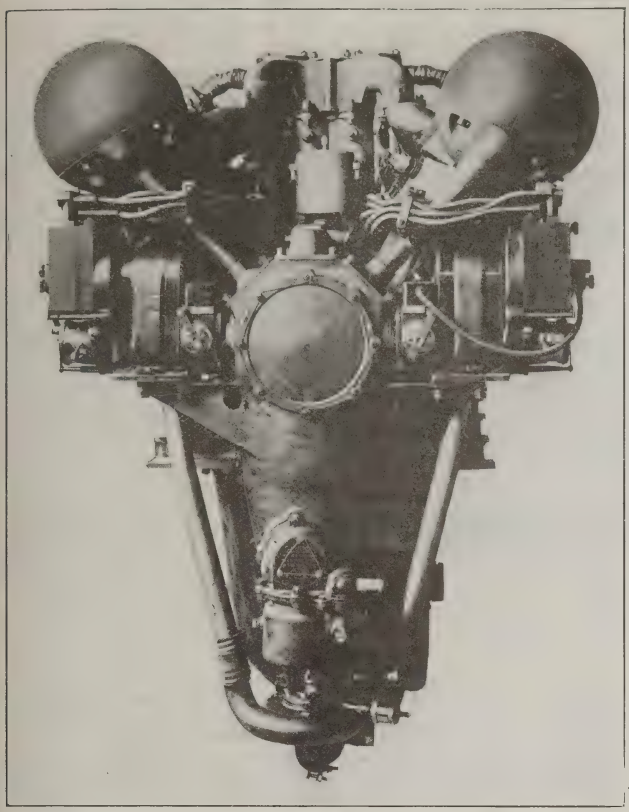
Each crank-shaft has a test piece taken off which goes to the Curtiss laboratories, where all its characteristics are determined to insure that each forging is up to specifications before any machining is started. The inspection of the finished shaft comprises a a minute inspection for checks or surface flaws, a static balance test and finally a running balance test. This care, in producing the shafts coupled with the high grade steel used, and the large dimensions of the shaft itself, insure a product which will stand up indefinitely under the severest strains. The crank-shaft is tapered and keyed to receive the propeller hub, which is drawn tight with a differential thread nut at end of shaft.

Bearings

The Curtiss practice of reaming instead of hand scraping the crank-shaft and connecting rod bearings eliminates the variations that are unavoidable when this is done by hand, and permits replacements without any fitting, as both the inside and the outside diameters of the bearings are held so close in manufacture that new ones will drop more accurately in place than would be possible to fit them by hand.



Side view of the Curtiss Model K-12 aviation motor



Anti-propeller end of the Curtiss Model K-12 aviation motor

Valve Gear

The new valve gear used on the K-12 motor is a distinct advance over previous motors. The light cam follower relieves the valves of any side strains due to cam action, and provides means of easy adjustment of clearance. As the cam shafts are directly over the valves, all rocker arms, push rods, etc., are done away with and the whole assembly is absolutely oil tight.

Ignition

Double ignition, from the two separte magnetos gives a more instantaneous explosion, which at high engine speed is necessary to develop high mean effective pressures. The spark plugs are located near the intake valves, on the upper side, to guard against fouling and insure absolute ignition. The wire assemblies are enclosed in insulating covers of micarta, which guard against short circuit and injury.

Carburetion

A duplex carbureter (K-12 is provided with two carburetors), each tube supplying one set of three cylinders, assures a more satisfactory charge than a single carbureter equipment, due to the separate manifolds which prevent starving and eddying, and the better vaporizing properties of two small carburetors over one large one. In addition, hot water jackets are provided on the manifolds to assist in vaporizing the gasoline.

Lubrication

Pressure feed through crank shaft, propeller shaft and cam shafts, insures a continual film of clean oil on all bearings. Separate return pump with double intake absolutely prevents accumulation of oil in either end of pan, and consequent flooding of cylinders when machine is climbing or gliding. Pressure adjustment permits of individual adequacy of oil feed on each motor, and change for wear and varying conditions of service.

Bolts and Nuts

All bolts and nuts on Curtiss Motors are made from special steel, must be of specified hardness according to sclerescope test, all threads must be accurate to standard gauge. Every nut is either cotter pinned, lock washered, or safety wired in series.

Inspection

Thirteen percent of the labor expense in the Curtiss motor plant is for inspection. Inspection that starts with the composition of raw materials, and follows intimately through all the stages of heat treating, machining, assembling, testing and even shipping.

Type of Motor

K-6 is a six-cylinder water cooled—cylinders en bloc—aluminum construction. K-12 is a 12-cylinder motor with a 5 : 3 gear reduction to propeller shaft.

Horse Power

K-6 rated at 150 H.P. at 1,700 R.P.M. K-12 rated at 375 H.P. at 2,250 R.P.M. at crankshaft.

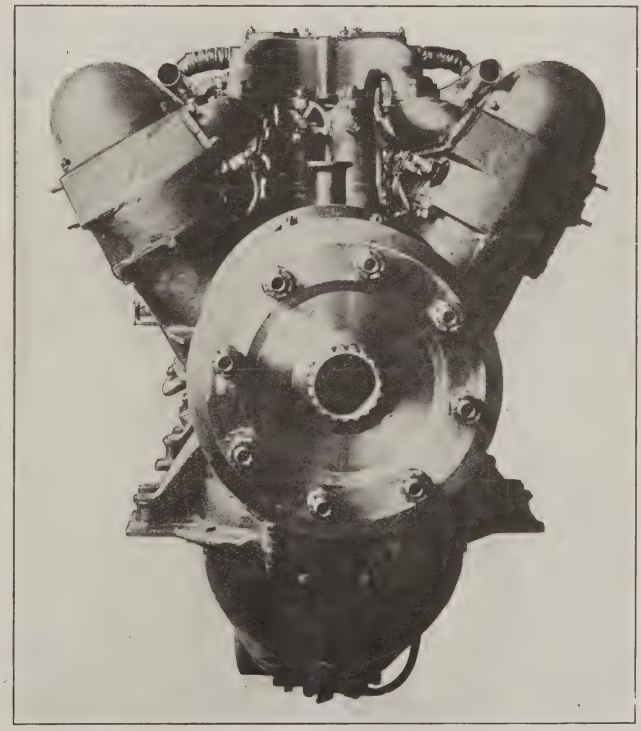
Bore and Stroke

4½″ x 6″.

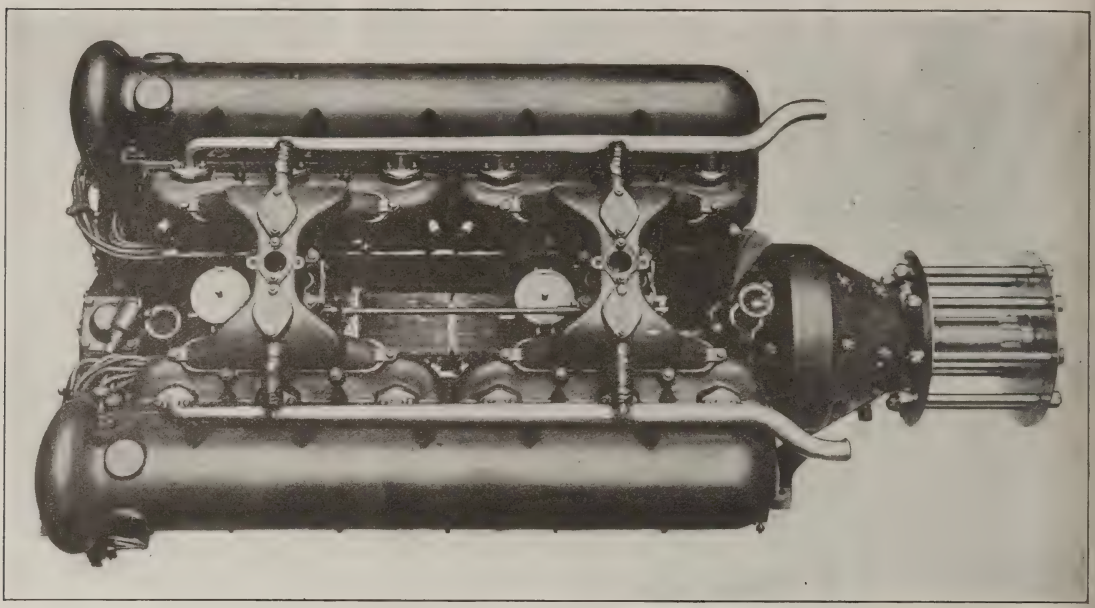
Weights (Lbs.)	Model K6	Model K12
Cooling Water in Motor	—	38
Basic Motor	346	589
Carburetor and Intake Manifold	18	37
Ignition Equipment	32	37
Water Inlet Lines	4	4
Exhaust Manifold	14	28
Hand Starting Crank	3	—

Gasoline Consumption

Fifty-five lbs. per H.P. Hour.



Propeller end of the Curtiss Model K-12 aviation motor



Top view of the Curtiss Model K-12 aviation motor

Ignition

Two high tension six cylinder magnetos complete with spark plugs and wire assembly. Magnetos are located at front end of motor, and driven by bevel gears from vertical shaft through flexible couplings.

Carburetion

Duplex type automatic carburetor located right hand side of cylinder group. K-12 equipped with two duplex carburetors located between the cylinder groups. Auxiliary altitude air valve, hand controlled. Non-backfiring screen connecting air horns.

Lubrication

Adjustable pressure feed—the oil is forced from reservoir in bottom of crank case by gear pump to oil distributing tube, from whence it is fed to each main bearing on the crank shaft, hence through tubes to each connecting rod bearing.

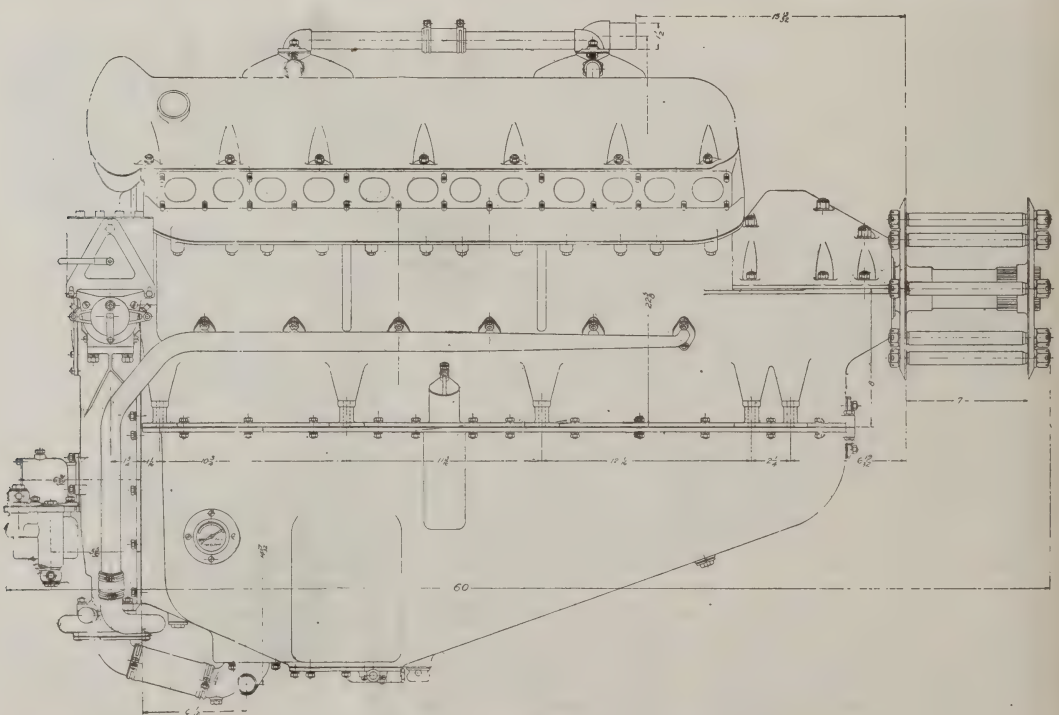


Diagram side view of the Curtiss Model K-12 aviation motor

The pistons and piston pins are fed by spray from connecting rod bearings. At the front main bearings the oil is led up to the hollow cam shafts, circulating through them, and lubricating all the bearings, followers, etc. Gravity return to imperforate splash pan. Return to reservoir by a duplex gear pump with oil leads to both ends of oil pan which prevents flooding when motor is out of horizontal position. Both oil pumps are located inside a large screen on plate on bottom of crank case, removable for inspection and cleaning purposes, and are driven by bevel and helical gears from the vertical shaft. Oil pressure adjustment valve located on outside of removable plate.

Water Circulation

Centrifugal pump. Water is introduced at bottom of each cylinder, is forced through cylinders and intake manifold, thence back to radiator. Water pump is bolted to lower end of gear case at front of motor, and is driven by flexible coupling from vertical shaft.

Cylinders

Steel forgings, machined all over. Top of cylinder threaded and screwed into cylinder head casting, six forming a complete assembly. Cylinder wall ribbed for strength. Cylinder head assembly bolted to crank case which forms water jacket around cylinder sleeves.

Valves

Poppet type in head, two intake and two exhaust per cylinder valves—Tungsten steel. All valves 1⅝" diameter at throat.

Valve Springs

Concentric coil type, alloy steel.

Cam Followers

Tee type, having valve clearance adjustments at ends, bearing surface in center working in cast iron bushing. Wearing surfaces case hardened and ground.

Camshafts

Drop forged with interal cams, separate shafts for inlet and exhaust valves, each pair of valves having one cam, cams case hardened. Six bearings. Finish ground all over.

Camshaft Bearing

Bracket and cap type aluminum bolted to top of cylinder head.

Pistons

Aluminum alloy castings, flat head type. Piston pin bearings in piston without bushings. Three concentric cast iron rings.

Piston Pins

Alloy steel, drilled hollow, case hardened and ground. Pins float in pistons and connecting rods and constrained from end motion by two snap rings in piston.

Connecting Rods

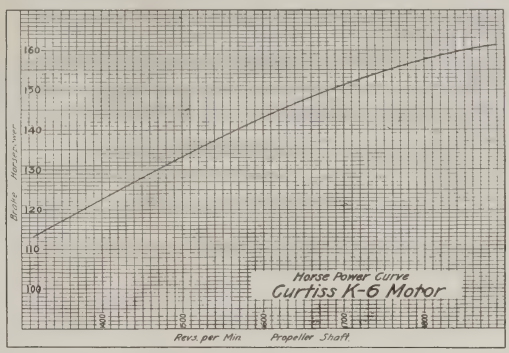
Alloy steel, I-Beam type forgings machined all over.

Connecting Rod Bearings

Main special bearing metal—bronze backed, reamed to running clearance of exact size of crank pin. Held in rod by four brass screws. Ribbed formation at sides to retain oil. Steel cap bolted to rod with four bolts. Piston pin bushings, Non-Gran bronze, drive fit in rods.

Crankshaft

Highest grade alloy steel, finished all over and drilled hollow. All bearings ground. Pins and main bearings 2½" dia. 6 throw, 5 main bearings. End of shaft tapered and fitted with key for propeller hub.



Crankshaft Bearings

Special bearing metal—bronze backed. Reamed to running clearance of exact size of crank shaft.

Propeller Shaft

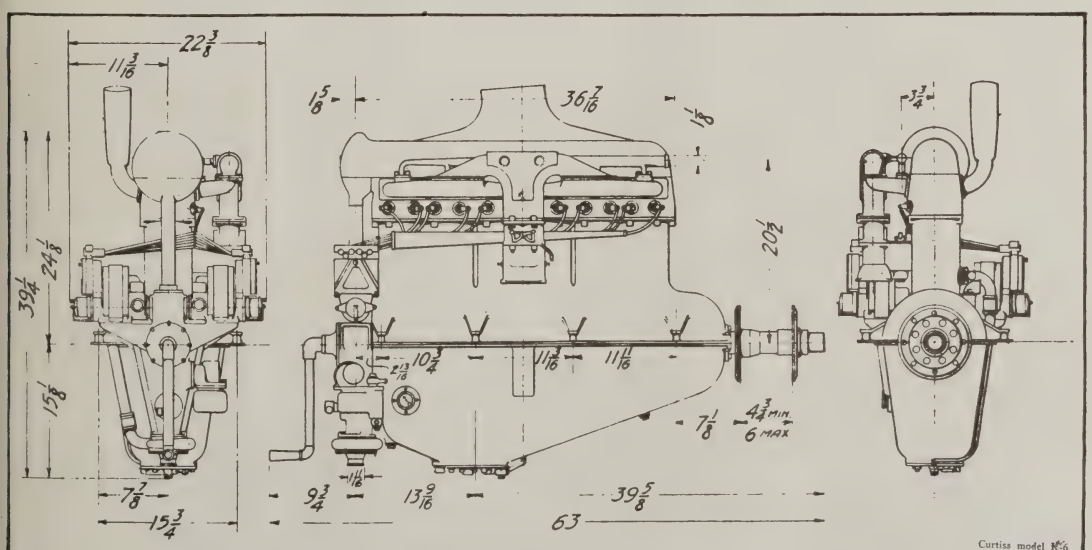
On the K-12 the propeller shaft is of the highest grade alloy steel—finished all over, drilled through. Rear flange of propeller integral with shaft. Flanged for reduction gear. Large isze ball thrust bearings to take thrust as tractor or pusher without change. Propeller shaft mounted in ribbed cap taking thrust bearings and special bearing metal bushings.

Reduction Gears

Reduction gears on the K-12 are forged from alloy steel. Cut 5-7 staggered herring bone, standard reduction 5 to 3. Gears bolted to flanges with alloy steel bolts.

Propeller Thrust Bearing

On the K-6, large deep race annual rbearings arranged to take thrust in either direction mounted between two rear crankshaft bearings.



Anti-propeller end, side, propeller end diagrams of the Curtiss K-6 aero motor

Crank Case

Aluminum alloy castings—bearings in heavily ribbed diaphragms. Eight motor supporting arms—casting extends up to form water cylinder jackets integrally with crank case.

Timing Gears

Cam shafts and accessories driven from vertical shaft by bevels. Bevel drive between crank shaft and vertical shaft. All bevel gears alloy steel, heat treated, and flanged, splined, or integral to shafts.

Magneto Drive

Bevel drive from vertical shaft, running in Annular S.K.F. Bearings contained in removable housing. Flexible coupling between magnetos and gears.

Water Pump

Centrifugal type—cast aluminum housing and blades, coupled to vertical shaft. Bolted to lower face of front gear case.

Tachometer Drive

Shaft gear in aluminum housing driven vertical shaft.

Intake Manifold

Aluminum castings—water jacketed.

Exhaust Manifold

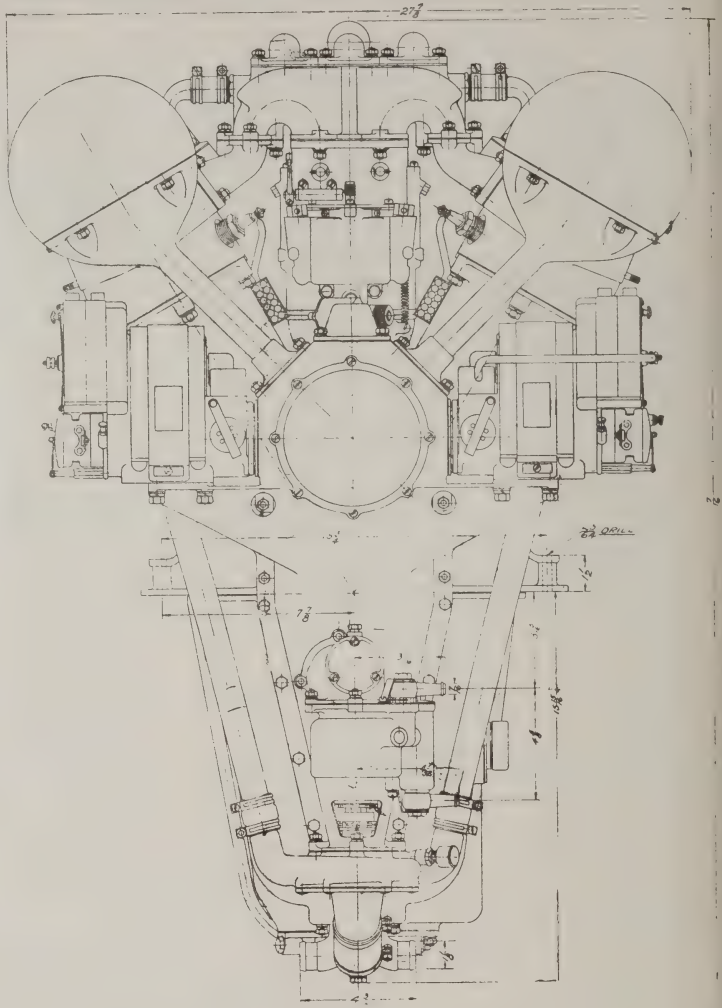
Shee steel, collector type, carrying exhaust gases upward.

Water Piping

Steel tubing, nickel plated inside and out. Rubber hose connections. All cylinder nipples flanged and bolted.

Bolts, Nuts, Etc.

All bolts and nuts alloy steel. Heat treated. All locked with cotter pins on interior, lockwashers on exterior.



Section design Curtiss Model K-12 aviation motor

Appointments in Bureau of Aircraft Production

Washington, Jan. 17.—Lt. Col. R. M. Jones, A. S., A. P., has been appointed Assistant and Executive Officer to the Acting Director of Aircraft Production. In addition to his present duties as Executive Officer, he will also be charged with such activities as pertain to liaison, correspondence with the War Department and other departments or bureaus of the government.

Lt. Col. H. C. Clark, A. S., A. P., in addition to his other duties, will take over the duties of adviser and assistant to the Acting Director on matters pertaining to personnel for the bureau.

Lt. Col. O. Westover, A. S., A. P., is appointed assistant to the Acting Director of Aircraft Production.

Major George F. Lyons, A. S., A. P., is appointed assistant to the Acting Director of Aircraft Production.

Personal Pars

C. H. Smith has recently joined the A. B. C. Casting Co., Cleveland, to take charge of its aluminum forging development work. He was formerly with the Driggs-Seabury Ordnance Corp. and later with the Ladish Forge Co., Cudahy.

F. W. Sutton, formerly production manager of the Continental Motors Corp., and later general superintendent of the Dayton-Wright Airplane Co., is now the chief engineer of the Charles E. Dedeaux Co., industrial engineers, with headquarters in Cleveland.

Peace Delegates' Planes Carry Radiophones

London, Jan. 25.—The aeroplanes which are carrying the Peace Conference delegates and important documents between London and Paris are equipped with wireless telephone apparatus. This enables the pilots to speak to one another while in the air and also enables them to receive frequent weather reports and instructions from the ground.

The Standard Mail Aeroplane

(*Continued from page* 1036)

both wings, 5.2, when overhang section is not used.

Tops of center section struts are spaced 32¾" from center to center. Middle struts 5'–8" from center section struts; outer struts 6'–3" from middle struts. This leaves an overhang of 33½".

When overhang section is used, top of inclined struts are centered 4'–8½" from outer struts, leaving an overhang of 22½".

The "Spad" truss is used between the planes, having a steel tube compression member between front and rear middle struts, where flying and landing cables cross.

Fuselage

The engine is carried on a pyramid type support.

Mail is carried in a compartment situated at the center of gravity, just forward of the pilot's cockpit.

When the machine is at rest, the propeller axis is 6'-0" above ground; in flying position it is 5'–0" above ground. In flying position, a line from wheel base to center of gravity makes a 14° angle with a vertical line.

Angie between line joining wheel base and skid to a horizontal line, 11 degrees—30 minutes.

The stabilizer is fixed at a neutral angle.

Landing Gear

The usual two-wheel landing gear is used, but provision is made for the attachment of a third wheel, as shown in the drawing, which adds 25 lbs. to the weight.

Steel tube is used for chassis members, faired with spruce streamline stiffening pieces.

Engine Group

The engine is a Wright-Martin Model I Hispano-Suiza, giving 150 H.P. at 1,500 r.p.m. and 170 H.P. at 1,700 r.p.m. A detailed description of the Hispano-Suiza appeared in the December 30, 1918, issue of Aerial Age.

The model I is an 8 cylinder V type with a bore of 120 mm (4.724") and a stroke of 130 mm (5.118"). Zenith Carburetor and magneto ignition are used.

Engine weight, with propeller, 455 lbs. Propeller, 9'-0" in diameter.

Fuel consumption, 0.51 lbs. per h. p. per hour; oil consumption, 0.03 lbs. per h. p. per hour. Fuel tanks are located at the center of gravity; their capacity is 60 gallons. Oil tanks located underneath the engine; capacity, 4 gallons.

The nose radiator is of the Livingston type. Water capacity, 9 gallons.

CITATIONS FOR BRAVERY

SECOND LIEUTENANT CHARLES P. PORTER, pilot, Air Service, 147th Aero Squadron. For extraordinary heroism in action in the region of Epips, France, July 16, 1918. While on patrol Lieutenant Porter observed two enemy planes (Fokker type) about 1,000 metres above him. He immediately manœuvred to obtain height and a position for attack. The enemy turned and Lieutenant Porter gave chase and attacked from below, destroying one and forcing the other to retire. A bronze oak leaf for extraordinary heroism in action in the region of Forest de Fere, France, July 24, 1918. Lieutenant Porter, while leading a patrol, attached an enemy formation of twelve planes (Fokker type). He engaged one enemy and sent it down out of control. One of Lieutenant Porter's guns jammed, and while he was repairing the gun two of the enemy planes got behind him. Unable to repair the gun and only to fire a single shot, he turned to attack, destroying a second plane and remained in the fight until the enemy retired. Home address: Charles S. Porter, father, 121 to 131 West Twenty-seventh street, New York City, N. Y.

First Lieutenant Leslie J. Rummell, Air Service, Ninety-third Aero Squadron. For extraordinary heroism in action in the region of Mosery, France, September 29, 1918. Lieutenant Rummell, leading a patrol of three planes, sighted an enemy biplane, which was protected by seven machines (Fokker type). Despite the tremendous odds he led his patrol to the attack and destroyed the Di Nash plane. By his superior manœuvring and leadership four more of the enemy planes were destroyed and the remaining three retired. Home address: Alfred T. Rummell, brother, Pennington and Johnson streets, Newark, N. J.

First Lieutenant William H. Stovall, pilot, Air Service, Thirteenth Aero Squadron. For extraordinary heroism in action in the region of Etain, France, September 26, 1918. While leading a protection patrol over a day-bombing formation, Lieutenant Stovall's patrol became reduced, through motor trouble, to himself and one other pilot. When the bombing patrol was attacked by seven enemy planes, Lieutenant Stovall in turn attacked the enemy and destroyed one plane. Home address: Mrs. William H. Stovall, mother, Stovall, Miss.

First Lieutenant Alfred B. Patterson, Jr., pilot, Air Service, Ninety-third Aero Squadron (deceased). For extraordinary heroism in action in the region of Moiery, France, September 29, 1918. Lieutenant Patterson, while on a patrol with two other machines, attacked an enemy formation of seven planes (Fokker type) that were protecting a biplace plane. They destroyed the biplane and four of the Fokkers, forcing the remaining three to retire. A bronze oak leaf for extraordinary heroism in action in the region of Moiery, France, October 23, 1918. Lieutenant Patterson led a formation for the purpose of protecting our bombing planes, the accompanying planes being obliged to return, due to engine trouble. Despite this fact, Lieutenant Patterson proceeded on the mission alone. He sighted an enemy patrol of nine machines (Fokker type) and attacked them, driving one down. Home address: A. B. Patterson, father, 438 Franklin avenue, Wilkinsburg, Pa.

First Lieutenant Charles E. Wright, pilot, Air Service, Ninety-third Aero Squadron. For extraordinary heroism in action near Keffu, France, in October, 1918. Lientenant Wright attacked an enemy observation balloon protected by four enemy planes and, despite numerical superiority, he forced the planes to withdraw and destroyed the enemy balloon. A bronze oak leaf, for extraordinary heroism in action near Bantheville, France, October 23, 1918. Lieutenant Wright, accompanied by one other machine, attacked and sent down in flames an enemy plane (Fokker type) that was attacking an Allied plane. He was in turn attacked by three enemy planes. His companion was forced to withdraw on account of motor trouble. Lieutenant Wright continued the combat and succeeded in bringing down one of the enemy planes and forced the remaining two into their own territory. Home address: Mrs. R. W. Wright, mother, 131 Southerland road, Brookline, Mass.

Major Lewis H. Brereton, pilot, corps observation wing. For extraordinary heroism in action over Thiaucourt, France. Major Brereton, together with an observer, voluntarily, and pursuant to a request for special mission, left his airdrome, crossed the enemy lines over Lironville, and proceeded to Thiaucourt. In spite of poor visibility, which forced them to fly at a very low altitude, and in spite of intense and accurate antiaircraft fire they thaintained their flight along their course and obtained valuable information. Over Thiaucourt they were suddenly attacked by four enemy monoplane Fokkers. Maneuvering his machine so that his observer could obtain a good field of fire, he entered into combat. His observer's guns becoming jammed, he withdrew until the jam was cleared, when he returned to the combat. His observer then becoming wounded, he cooly made a landing within friendly lines, although followed down by the enemy to within 25 meters of the ground. By this act he made himself an inspiration and example to all the members of his command. Home address, Mrs. Lewis H. Brereton, wife, Ontario Apartments, Washington, D. C.

Second Lieutenant Elmer K. McKay, Air Service, observer, 96th Aero Squadron. For extraordinary heroism in action near Dun-Sur-Meuse, France, October 23, 1918. Lieutenant McKay, with First Lieutenant Harry O. McDougall, pilot, while on a bombing mission displayed exceptional courage by leaving a comparatively secure position in the center of the formation during a combat with five enemy planes and going to the protection of two other officers whose planes had been disabled and forced out of the formation. While his pilot skilfully maneuvered the machine, Lieutenant McKay shot down one of the adversaries and fought off the others, thereby saving the lives of the officers in the disabled American plane. Home, address, James D. McKay, father, 817 Eleventh Street N. E., Washington, D. C.

First Lieutenant Harry O. McDougall, Air Service, pilot, 96th Aero Squadron. For extraordinary heroism in action near Dun-Sur-Meuse, France, October 23, 1918. Lieutenant McDougall, with Second Lieutenant Elmer McKay, observer, while on a bombing mission, displayed exceptional courage by leaving a comparatively secure position in the center of the formation during a combat with five enemy planes and going to the protection of two other officers whose planes had been disabled and forced out of the formation. Lieutenant McDougall skilfully maneuvered his machine so as to enable Lieutenant McKay to shoot down one of the adversaries and fight off the others. Home address, D. C. DcDougall, father, 132 South Hayes Street, Pocatello, Idaho.

Lieutenant Kingman Douglass, Air Service, pilot, 91th Aero Squadron. For extraordinary heroism in action near Longuyon, October 31, 1918. While on a photographic mission Lieutenant Douglass encountered a superior number of enemy pursuit planes. Notwithstanding the odds against him, he turned and dived on the hostile formation, destroying one plane and damaging another. He then continued on his mission and returned photographs of great military value. Home address, W. A. Douglass, 317 North Kenilworth Avenue, Oak Park, Ill.

First Lieutenant Ora R. McMurry, American Expeditionary Forces, 49th Aero Squadron. For extraordinary heroism in action near Ormagne, France, October 4, 1918. Lieutenant McMurry was a member of a patrol of 7 machines which attacked 17 enemy Fokkers. After shooting down one of the enemy, this officer returned to the fight and shot down another. Home address, Mrs. J. C. McMurry, mother, Evansville, Wis.

First Lieutenant Lewis C. Plush, Air Service, 49th Aero Squadron. For extraordinary heroism in action near Romagne, France, October 4, 1918. Lieutenant Plush was a member of a patrol of 7 machines which attacked 17 enemy Fokkers. After shooting down one of the enemy, this officer returned to the fight and shot down another. Home address, William Plush, father, 440 East Phillips Boulevard, Pomona, Cal.

Captain Walter R. Lanson, Air Service, observer, 91st Aero Squadron. For repeated acts of extraordinary heroism in action near St. Mihiel, France, July 30 and September 13, 1918. This officer showed rare courage on a reconnaissance far over the enemy lines, when he continued on his mission after being seriously wounded by anti-aircraft fire. On September 13, although he was still convalescing from his wound, he volunteered for a particularly dangerous mission requiring a flight of 75 kilometers within the enemy lines. Because of weather conditions he was forced to fly at a dangerously low altitude and was repeatedly fired on by anti-aircraft and machine guns. He successfully accomplished his mission and returned with important information. Home address, Mrs. W. R. Lasson, wife, Birmingham, Ala.

First Lieutenant Harvey Conover, Air Service, pilot, 3d Observation group. Deceased. For extraordinary heroism in action near Consenvoye, France, October 27, 1918. Flying at an altitude of less than 50 meters over enemy artillery and machine guns, which were constantly firing on him, Lieutenant Conover and his observer staked the American front lines and gave valuable information and assistance to the advancing infantry. Although suffering from two severe wounds, and with a seriously damaged plane, he delivered a harassing fire on six enemy machine-gun nests which were checking the advance of the ground troops, and successfully drove off the crews of four guns and silenced the other two. He then made a safe landing and forwarded his information to division headquarters before seeking medical aid. Home address, L. P. Conover, father, Hinsdale, Ill.

First Lieutenant Benjamin P. Harwood, Field Artillery, Air Service. For extraordinary heroism in action near Chateau-Thierry, France, July 5, 1918. Lieutenant Harwood volunteered with another plane to protect a photograph plane. In the course of their mission they were attacked by seven enemy planes (Fokker type). Lieutenant Harwood accepted the combat and kept the enemy engaged while the photographic plane completed its mission. His guns jammed and he himself was seriously wounded. After skilfully clearing his guns, with his plane badly damaged, he fought off the hostile planes and enabled the photographic plane to return to our lines with valuable information. Home address, E. N. Harwood, father, Billings, Mont.

First Lieutenant Leo C. Ferrenbach, Air Service. For extraordinary heroism in action near Ansauville, France, July 22, 1918. Lieutenant Ferrenbach, a balloon observer, was conducting an important surveillance of his sector when at an altitude of 800 meters successive attacks were made upon the balloon by enemy planes. This officer refused to leave his post and continued his work with strong enemy patrols hovering above him until one of the hostil machines dived and set fire to the balloon. After he had jumped in his parachute, the burning balloon fell and barely missed him. Lieutenant Ferrenbach immediately reascended while enemy patrols were still in the vicinity. Home address, Edward J. Ferrenbach, father, 5441 Bartmer Avenue, St. Louis, Mo.

First Lieutenant J. A. Higgs, Air Service. For repeated acts of extraordinary heroism in action near Pont-a-Mousson, France, July 31 and August 21, 1918, near Gesnes, France, October 29, 1918. On July 31, near Pont-a-Mousson, Lieutenant Higgs was carrying on a general surveillance of his sector from his balloon with a French soldier, when an enemy plane dived from a cloud and opened fire on the balloon. In imminent danger he remained in basket until he had helped his French comrade, after whom he himself jumped. On August 21, in the same sector, Lieutenant Higgs was performing an important mission regulating artillery fire. Enemy planes attacked, and with great gallantry Lieut. Higgs remained in the basket until his assistant had jumped. On October 29, near Gesnes, Lieutenant Higgs was conducting a reglage from the basket with a student observer. Attacked by enemy planes, after his balloon was burning, Lieutenant Higgs would not quit his post until he had assisted his companion to escape. In each of the foregoing instances, Lieutenant Higgs at once reascended in a new balloon. Home address, Mrs. James A. Higgs, wife, Lathrop, Pickens County, Ala.

Second Lieutenant Cleveland W. McDermott, Air Service, 147th Aero Squadron. For extraordinary heroism in action near Bantheville, France, October 18, 1918. In starting on a patrol mission Lieutenant McDermott was delayed by motor trouble. Unable to overtake the other machines, he continued on alone. Sighting an enemy Fokker, he immediately gave chase, and despite its effort to escape, succeeded in shooting it down. Six Fokkers then suddenly attacked him, and though he was outnumbered and blinded by the sun, he shot down one of them and scattered the others. In the midst of this combat his motor stopped, and he was forced to glide into friendly territory. Home address, John McDermott, father, 209 Jackson Street, Syracuse, N. Y.

First Lieutenant Cleo J. Ross, deceased, Air Service, for extraordinary heroism in action near Brabant, France, September 26, 1918. Lieutenant Ross was engaged in an important observation, regulating artillery fire, when his balloon was attacked by enemy planes. One of the planes dived from a cloud and fired at the balloon, setting fire to it, and though he could have jumped from the basket at once he refused to leave until his companion, a student observer, had jumped. Lieutenant Ross then leaped, but it was too late, for the burning balloon dropped on his parachute. He was dashed to the ground from a height of 300 meters and killed instantly. Next of kin, E. M. Ross, father, Titusville, Pa.

First Lieutenant Ralph O'Neill, Air Service, pilot, 147th Aero Squadron, for the following act of extraordinary heroism in action near Fresned, France, July 24, 1918. A bronze oak loaf is awarded to Lieutenant O'Neill, to be worn on the distinguished service cross awarded to him October 12, 1918. Lieutenant O'Neill, with four other pilots, engaged 12 enemy planes discovered hiding in the sun. Leading the way to an advantageous position by a series of bold and skillful maneuvers, Lieutenant O'Neill shot down the leader of the hostile formation. The other German planes then closed in on him, but he climbed to a position of vantage above them and returned to the fight and drove down another plane. In this encounter he not only defeated his opponents in spite of overwhelming odds against him, but also enabled the reconnaissance plane to carry on its work unmolested. Home address, Mrs. R. L. O'Neill, mother, 218 Sonoita Street, Nogales, Ariz.

THE STANDARD MODEL E-4 MAIL AEROPLANE



MAIL is now carried between New York and Washington in the specially built "E-4" mail machine brought out by the Standard Aero Corporation. Other air mail routes contemplate the use of the "E-4", because of the special features of its design, and particular adaptability to the work.

For winter flying, overhang extensions are attached to the ends of upper wings, increasing the span from 31'-4¾" to 39'-8¾".



Compartment for carrying mail on the "Standard" Mail Aeroplane

General Dimensions

Span, upper plane	31'-4¾"
(Span, upper plane with overhang)	39'-8¾"
Span, lower plane	31'-4¾"
Chord, both planes	6'-0"
Gap between planes	5'-6"
Stagger	5¾"
Length overall	26'-2"
Height overall	10'-10-3/16"

Areas

Upper plane	174.9
(Upper plane with overhang)	220.3
Ailerons (2 upper and 2 lower)	48.
(Ailerons with overhang)	56.
Lower plane	162.1
Total wing area with ailerons	337.0
(Total wing area, with overhang)	382.4
Stabilizer	23.7
Elevator	22.0
Fin	4.6
Rudder	10.1

Weights, General

Machine empty	1566
(Machine empty, with overhang)	1616
Fuel and oil	390
Useful load	444
Total weight, loaded	2400
(Total weight, loaded, with overhang)	2450
Weight per H.P.	14.1
Weight per sq. ft.	7.12
(With overhang; weight per H.P.)	14.4
(With overhang; weight per sq. ft.)	6.4

Summation of Weights

	Weight (lbs.)	Percentage of Gross Weight
Power Plant	778.5	32.4
Fuel and Oil	390.	16.2
Pilot & miscel. equip.	364.3	11.0
Mail	180.0	7.5
Body Structure	288.1	12.0
Tail surfaces with brac'g	75.5	3.2
Wing structure	324.0	13.5
Chassis	100.0	4.2
Total	2400.0	100.0%

WEIGHT SCHEDULE

Power Plant

	Pounds
Engine complete with carburetor and ignition system	455
Radiator	74.5
Water	75
Fuel and Oil Tanks empty	50
Propeller and Hubs	27.5
Cowling	61.5
Pipes, etc.	35
Total	778.5

Fuel and Oil

Fuel (60 gallons)	360
Oil (4 gallons)	30
Total	390

Pilot and Equipment

Pilot and clothing	170
Dashboard Instruments	32.25
Miscellaneous	62
Total	264.3

Mail

Mail	180
Total	180

Body

Body frame	219
Engine bed	14
Seats and floor	31.3
Front and rear control	23.75
Total	288.1

Tail Surfaces with Bracing

Stabilizer	24.0
Elevators	17.5
Fin	3.0
Rudder	9.5
T.B., fittings, wires, etc.	21.5
Total	75.5

Wing Structure

Upper wing with fittings and ailerons	143.5
Lower wing with fittings and ailerons	129.5
Interplane Struts and cables	51.
Total	324.0

Chassis

Wheels complete; Axle; Shock Absorber, and Parts	96
3 Wheel Type Landing Gear	25
Total	121

Performances

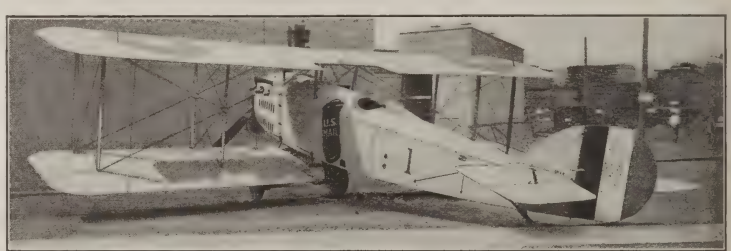
Height (ft.)	Speed (M.P.H.)	Time of Climb (min.)	Rate of Climb (ft. per min.)
0	100	0	700
5,300	...	10	...
10,000	...	24	...

Stalling Speed	50 m.p.h.
Gliding Angle	1 to 8
Maximum Range	280 miles
Hours flight, full speed at 5,000 feet	3 hours

Main Planes

Both planes are swept back at a 5° angle, and both have a 3% or 1¼° dihedral. There is no decalage; the incidence or angle of the wing chord to the propeller axis, is 2½°. Wing section, R.A.F. 15. Aspect ratio of

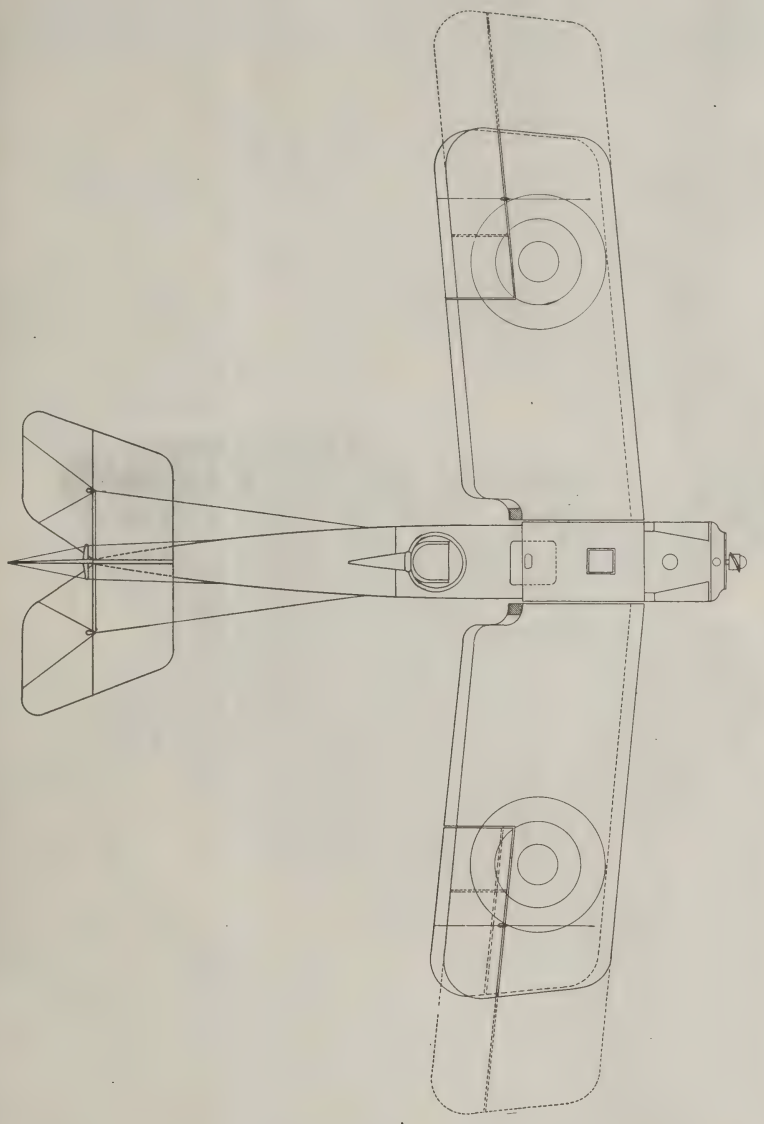
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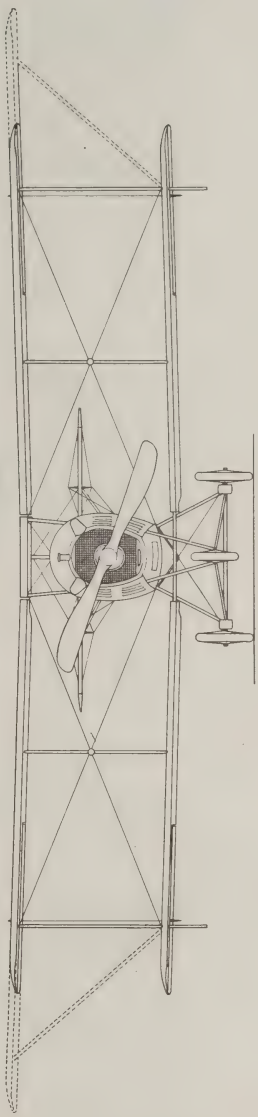


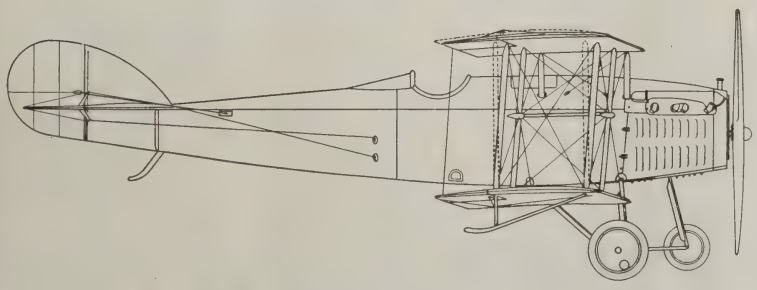
Three-quarter rear view of the Standard Model E-4 Mail Aeroplane



A group of Standard E-4 Aeroplanes at one of the air mail stations







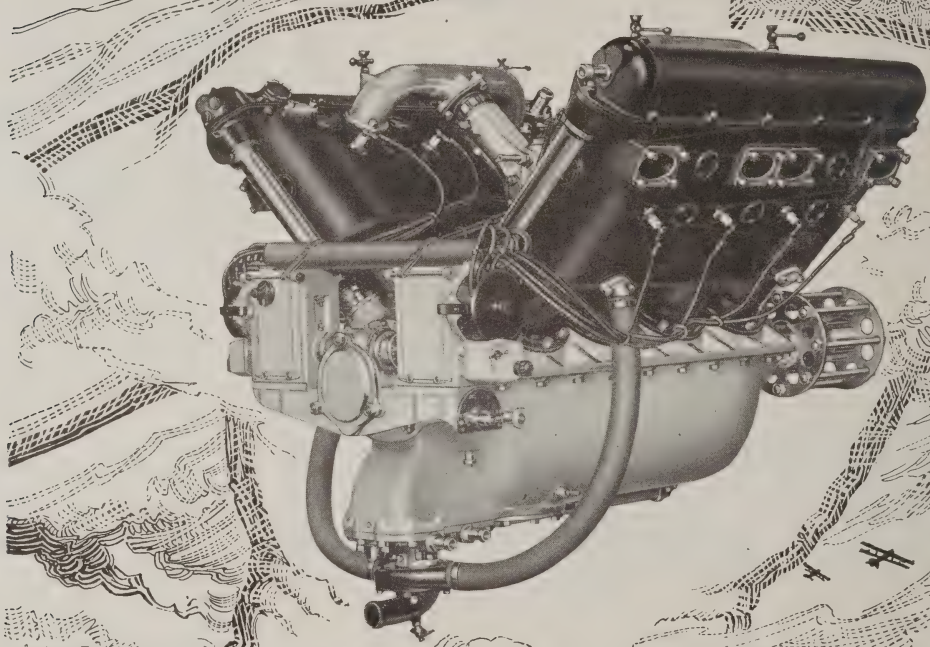
'STANDARD' MODEL E-4
150 HP HISPANO-SUIZA
MAIL MACHINE

Scale of Feet

1 2 3 4 5 6 7 8 9

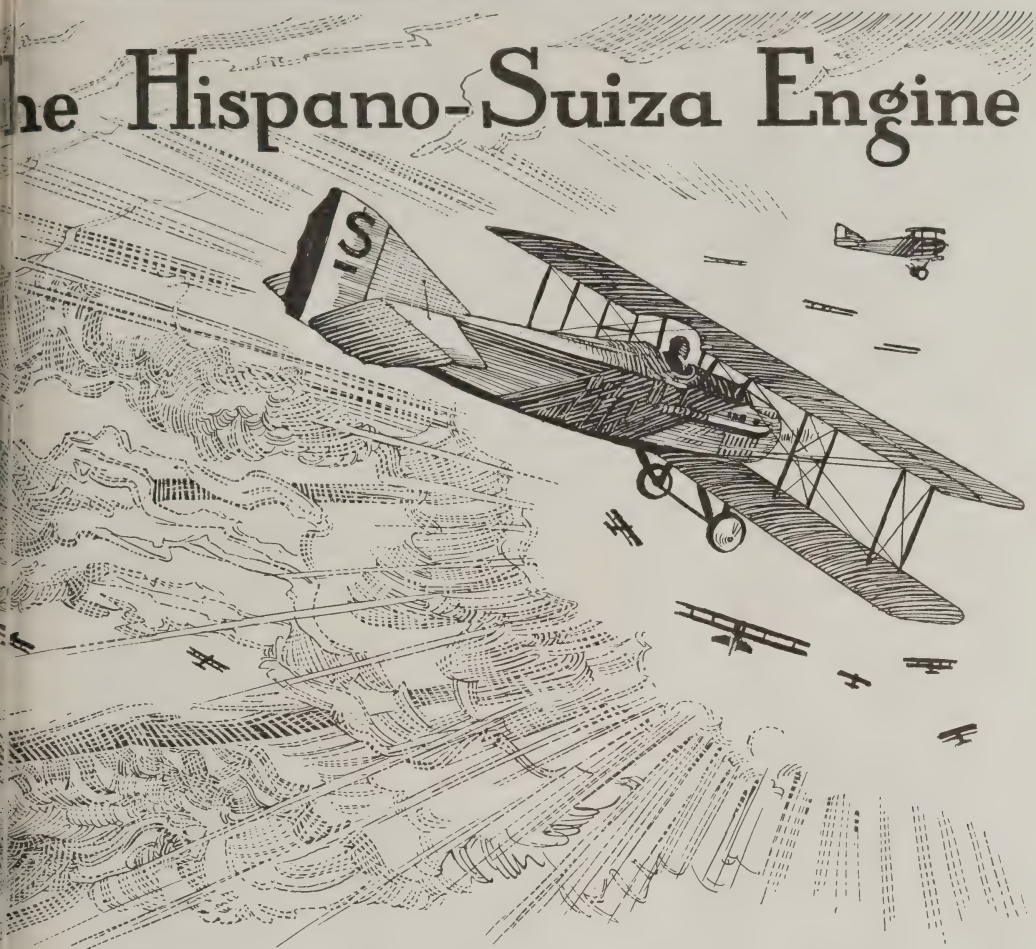
McLaughlin

MASTER OF THE AI



WRIGHT-MARTIN

he Hispano-Suiza Engine



HISPANO-SUIZA developed its world-wide reputation during the early stages of the Great War.

The very peak of its efficiency was ached when the Air Forces of France id England were gaining that now well- derstood "Air Supremacy" at the end of e second year of the Struggle. It was en that France's most noted aces, Guy- mer, Fonck, Herteaux and others were tablishing their marvelous records in the nall, swift, deadly one-seater planes— e "Spads"—which were made possible ly because of the speed, flexibility and rsatility of the Hispano-Suiza Engine.

Since then, in the powering of the one aters, the two and three seaters, and the eavier bombing machines and hydro-planes, Hispano-Suiza has kept pace with the development of the aeronautical activities of several nations. Hispano-Suiza has reached that point of efficiency which would have been impossible, except where a fundamentally great engine had been developed by the most progressive brains of the industry.

These are the reasons for the mastership of Hispano-Suiza.

Wright-Martin Aircraft Corporation
NEW BRUNSWICK, N. J., U. S. A.

See The Hispano-Suiza Exhibit at the Aero Show March 1-15, 1919

IRCRAFT CORP'N.

COLONEL DEEDS NOT TO BE COURT-MARTIALED

(*Concluded from last issue*)

III

Statement Regarding Transfer of Stock in Domestic Building Company

The affidavit of Judge McCann, Colonel Deeds' attorney, which was submitted to this office, shows that the Domestic Building Company was a corporation created for the development of certain real property near Dayton, Ohio, including the erection and leasing of factory buildings. The company had, at the time Col. Deeds was commissioned, about completed a large factory building for the use of the Domestic Engineering Company, which was engaged in manufacturing Delco light plants. It was contemplated that this property was to be leased to the Dayton Wright Airplane Company for the manufacture of aeroplanes. At the time when Judge McCann went to Washington at the request of Col. Deeds when the latter was commissioned, he prepared, and Col. Deeds signed and forwarded a resignation as President and Director of the Domestic Building Company. At the same time he prepared the letters to the Aircraft Production Board and to the Secretary of War heretofore discussed. In the letter to the Aircraft Production Board he stated that he had made a bona fide transfer of all his stock in the Domestic Building Company.

Col. Deeds' instructions to Judge McCann had been to promptly take all steps necessary to carry into legal effect the various transfers mentioned in the letter. On Judge McCann's return to Dayton he found that the Dayton Wright Airplane Company had determined to purchase outright the plant erected by the Domestic Building Company, instead of carrying the property by lease. Under these circumstances Judge McCann stopped action on the resignation of Colonel Deeds from that company, and advised that the transfer of his stock was not necessary; and as a matter of fact the transfer was never made.

It appears from Colonel Deeds' testimony taken by Judge Hughes, that prior to writing the letter of August 28th, Mr. Kettering had agreed to take this stock off of Colonel Deeds' hands at whatever the books showed its value to be, should it become necessary to make the transfer, though the agreement was not in writing which would not be unnatural in view of the close relations existing between these gentlemen.

Upon th evidence now before this office it is of opinion that court-martial proceedings against Col. Deeds, based upon his statement regarding his stock in the Domestic Building Company, should not be instituted, because (1) at the time the statement was made an arrangement had been entered into for the sale of this stock at its book value; (2) it took time to ascertain the book value and close the details of the transaction; (3) it was the *bona fide* intention of Col. Deeds to make the formal transfer, and he had given instructions to have this done; (4) the reason why it was not done was that through a legitimate change of plan, the occasion for the transfer was obviated, and both parties to the contemplated transfer were willing that the agreement for transfer should be cancelled; (5) the whole proceeding was conducted in good faith and under the advice of counsel.

IV

Publication Regarding Aircraft

The following is contained in the original memorandum from this office, the statements having been based solely upon the report made by Judge Hughes of his investigation of the aircraft situation:

"The report of Judge Hughes also finds that Col. Deeds authorized and sanctioned issuance for publication of a false and misleading statement by the Committee on Public Information, concerning the shipment of American-built battle planes to France. The official statement by the Committee on Public Information released for publication in the newspaper on February 21, 1918, contained the following:

" 'The first American-built battle planes are today en route to the front in France. This first shipment, though in itself not large marks the final overcoming of many difficulties met in building up this new and intricate industry.' (P. 116.)

"It is found that this statement had its origin in a conversation between Colonel Deeds and a representative of the Committe on Public Information a week or two before the completed statement was issued. A draft was first prepared and submitted to Colonel Deeds, who examined it and made some corrections. The statement contained in the paragraph above quoted was not only left unchanged, but was the subject of special inquiry by the representative of representatives of the Committee. Col. Deeds was asked what was mant by the 'fisrt shipment,' and he replied: 'They are on the water now, on the way to France.' He was then asked: 'How many?' and he answered, 'I do not know, but I do not think more than ten.' The statement, in its final form, was then presented to the Secretary of War, who permitted it to be issued upon the understanding that it had been verified by General Squier and Col. Deeds. At the time this statement was issued, February 20th, only one plane had been delivered for shipment to the American Expeditionary Forces, and while this had been shipped from the factory on February 5th, it did not leave the United States until

March 22d. No additional shipments of aeroplanes for the use of our forces abroad were made until April 3, 1918. The report states that Colonel Deeds admitted that this statement was brought to him before its publication, and that he went through it. He examined it minutely enough to correct with his own hands one of the paragraphs following that above quoted, which gave the number of men required on the ground for every plane in the air, his correction making it 46 instead of 45. Col. Deeds denied, however, that he said in response to the inquiry upon the point that the battle planes were 'on the water now, on the way to France.' That he did make this statement, it is found, was testified to directly and unequivocally by John W. McConaughy and Marlen E. Pew, representing the Committee on Public Information."

Since the matter has been re-referred to this office for examination based upon all facts known to the Department and for further report after examining the testimony taken by Judge Hughes, careful consideration has been given to the testimony on the subject. An intellignt understanding of the facts can only be obtained after a somewhat detailed statement of the evidence, which will involve a description of three exhibits filed with Judge Hughes, labeled respectively, "McConaughy Ex. 1," "McConaughy Ex. 2," and "McConaughy Ex. 3."

What was known as "McConaughy Ex. 2" was a typewritten statement consisting of three pages, the first page containing at the top two paragraphs, of which the paragraph quoted in the Hughes report was the *second*. These two paragraphs of this exhibit were pasted upon a page, immediately below which appeared two other paragraphs, the first of which had been stricken out with lead pencil, and had superimposed upon it another pasted paragraph. It will be observed that the first page of "McConaughy Ex. 2" therefore was considerably mutilated. The second page consisted of a blank page upon which was pasted a sheet of paper containing three paragraphs. The third page was typewritten without anything having been pasted upon it.

"McConaughy Ex. 3" was practically a copy of "McConaughy Ex. 2" as it appears in its present condition, this copy having been prepared in the office of Mr. J. W. McConaughy, an employee of the Committee on Public Information. It was prepared with the object of having it mimeographed for publication by the press of the country. "McConaughy Ex. 1" was a mimeographed copy of "McConaughy Ex. 3."

Although the evidence clearly establishes that Colonel Deeds never saw either the papers marked "McConaughty Ex. 1" or "McConaughy Ex. 3," yet, when he was called as a witness during the prosecution of the inquiry, he was handed "McConaughy Ex. 1" and asked if he had ever seen it before, to which he responded that he had and that he had seen it before its publication, although he had read it only in a very general way. As the fact clearly demonstrated by McConaughy's testimony is that Col. Deeds had never seen "McConaughy Ex. 1," it is necessary to consider what he actually did see in the general way he mentioned. McConaughy could not throw any light on this subject. He testified that he was not present at any interview when any paper was submitted to Col. Deeds. The only persons present at such an interview were Captain Sweetser, an officer of the Signal Corps, and Marlen E. Pew, an employee of the Committee on Public Information. Capt. Sweetser testified that he had written up "McConaughy Ex. 2" sometime before, with the exception of the paragraph relating to the Liberty Motor (which was the third paragraph on "McConaughy x.2," being a paragraph which had been pasted over the original third paragraph thereof); that "McConaughy Ex. 2" had been written up after a chance talk with Col. Deeds during the course of which the latter had stated that we were "over the bump" and "the planes had actually begun going or something of that sort," something which Sweetser interpreted to mean that the planes were actually *en route*, although Sweetser would not swear that Col. Deeds told him that the battle planes were actually *en route* to France; that he had subsequently presented this statement to Colonel Deeds and that Deeds had told him that he had decided not to give it out at that time; that later on Sweetser went over to the Committee on Public Information and saw McConaughy and Pew and suggested to them that the story should be written up stating that the first battle planes were going across; that he returned with Pew to the Department and wrote up a paragraph to the effect that the planes as equipped with the first Liberty motors were being shipped; that he and Pew then went in to see Col. Deeds and submitted 'the story" to him and that Col. Deeds sat on the desk and read it through; but that the statement submitted to Deeds was not "McConaughy Ex. 2" at all, but that the paper submitted to him contained a statement that the Liberty motor had 450 horse power, and that Col. Deeds instructed Sweetser not to make that feature public. Capt. Sweetser said, however, that the paper that was submitted to Deeds did contain a statement that the first American-built planes "are today *en route* to the front in France." The particular paper which Sweetser said Col. Deeds saw was not identified nor produced.

Mr. Pew testified definitely that the paper submitted to Col. Deeds on this occasion was "McConaughy Ex. 2" *without the first two paragraphs* on page 1. This statement is important because it is the *second* paragraph on page 1 which is the subject of the criticism against Col. Deeds. They both agree, therefore, that Col. Deeds never saw the second paragraph of "McConaughy Ex. 2," unless the testimony of Pew is correct to the effect that after the first interview with Col. Deeds at which he and Captain Sweetser were present, they rewrote paragraphs 1 and 2 of page 1 of "McConaughy Ex. 2" and then took it back to Col. Deeds, who read it over carefully and changed the figures "47" to "46" as they appear in the 4th paragraph of the first page of that exhibit, and at the same time Capt. Sweetser made several pencil changes on the first page of that exhibit in Col. Deeds' presence. The fact should be borne in mind that paragraphs 1 and 2 of page 1 of that exhibit are pasted on to the page containing paragraphs 3 and 4.

In this connection it is noteworthy that Captain Sweetser testified that these paragraphs land 2 on page 1 had been written long *before* the interview with Col. Deeds about which he testified, and not *afterwards*, and that the pencil changes made by him were made *before* the paper was submitted and not *afterwards*, Capt. Sweetser made no mention of a second interview with Col. Deeds, and says that at the conclusion of the interview about which he testified, he and Pew separated and that Pew went back to his office.

It is also important to observe that, whereas Pew testified that Col. Deeds stated at the second interview that the planes referrrd to in the second paragraph of "McConaughy Ex. 2" were on the water, Capt. Sweetser testified that Col. Deeds said nothing specific about that but he (Sweetser) gathered that impression from the fact that Col. Deeds had stated that the planes had been shipped, "because the question of shipment from Dayton to Hoboken had not come into his mind." McConaughy testified that before Capt. Sweetser and Pew had the conversation referred to, he himself had a conversation with Col. Deeds in which the latter had told him that the planes were on the water, and that he (McConaughy) repeated this statement to Pew and suggested that Pew interview Col. Deeds and write an article on the subject.

Th evidence plainly establishes that McConaughy was anxious to get a news item about the planes which would tend to allay the public dissatisfaction with the lack of progress apparently being made. But no mention was made in the article which was written for publication of that feature which if true would have been the most important piece of news of all, to wit: that the planes were on the ocean. The omission of this item in "McConaughy Ex. 1," "McConaughy Ex. 2" and "McConaughy Ex. 3" is a pertinent fact to be considered in connection with the testimony of McConaughy and Pew, as contrasted with the testimony of Captain Sweetser, above recited, and that of Col. Deeds to the effect that he did not tell either McConaughy or Pew that the planes were on the ocean. Col. Deeds also denied having mntioned any particular number of planes in referring to those which were being shipped, although McConaughy and Pew testified that he mentioned the number 10 or 12 in this connection. That number was not referred to in the report as written up.

It may well be doubted whether Col. Deeds ever made any statement as to any particular number of planes or that any of them were actually on the water. It is possible that Pew, when he gave his testimony before Judge Hughes, had in mind what he had been told by McConaughy as coming from Col. Deeds on this subject.

The very unsatisfactory testimony in the case also leaves in the mind of the careful reader a very considerable degree of doubt whether Col. Deeds ever saw the second of paragraph of "McConaughy Ex. 2" which contained the language criticized by Judge Hughes in his report.

But if he did see it, and if he authorized it to be submitted to the Secretary of War for publication as claimed, it by no means follows that it was not believed by him to be true. McConaughy fixes the date of the interview between Captain Swcetser, Pew and Col. Deeds, as somewhere between the 10th and 14th of February. Pew says it was the 14th or 15th of February. Col. Deeds says that his information at the time of that interview was that four planes were then on the cars on their way to France; and that is as far as the information set forth in the second paragraph of the "McConaughy Ex. 2," "McConaughy Ex. 1" and "McConaughy Ex. 3" extends. There is nothing contained in the testimony taken at the inquiry or in any facts known to this office, to indicate that Colonel Deeds had any different information. The testimony shows that at least one plane had been shipped from Dayton on February 5th intended for foreign service, and that it reached Hoboken in two parts on February 26th and 28th. The telegram asking that it be recalled was not dated until February 14th. It must be remembered that while the statement was not published until February 21st, the conference with Col. Deeds had been held at least a week before its publication and perhaps more. Whatever statements Col. Deeds made were obviously made based upon his understanding of the condition of things as of that date, and could not have related to a changed situation which developed during the week or ten days succeeding.

In the affidavit submitted by Colonel Deeds which is forwarded herewith he says:

> "The facts are that the Dayton Wright Airplane Company, up to February 16, 1918, shipped four battle planes. Col. Deeds was informed and believed that those machines had been shipped from the factory to go to France. They are the machines referred to in the above statement. In his explanation before Judge Hughes, October 3, 1918, he made the following explanation:
>
> "'I have only the explanation of the four planes about which I have just spoken. I had very definitely in my mind that there were a total of four planes that had been shipped, but I learned later that three of these had been diverted to Gerstner Field, but I did not know that at the time I looked over this. I made no statement that they were on the water, but that they were shipped.'"

It is recommended that no court-martial proceedings be instituted against Col. Deeds based upon this publication because: (1) it is doubtful whether he ever saw the paragraph which has been adversely criticized; and (2) the statements contained in it are in accord with what Col. Deeds apparently believed and had reasonable cause to believe to be the facts.

V

Testimony Before Senate Military Committee

It was stated further in the report of Judge Hughes that when Colonel Deeds was examined as a witness before the Committee on Military Affairs in the Senate on April 2, 1918, he was asked this question and gave this answer:

"Senator Wadsworth: Did you see or did you know whether any other responsible officers in your aviation section of the Signal Corps saw the statement given out by Secretary Baker on February 21, before it was published?

"Colonel Deeds: No, sir, I did not see it. I do not know of anybody seeing it." (P. 117.)

The report states that Colonel Deeds admitted giving this testimony, and that he testified that he did not then recall the paper in question. Judge Hughes, in his report, failed to set forth the remainder of Colonel Deeds' testimony as given by him before the Senate Committee.

Further consideration has been given the matter in the light of all the testimony of Colonel Deeds on the occasion in question.

The question that was asked Colonel Deeds by Senators Wadsworth referred to a statement given out by Secretary Baker on February 21, without particularly identifying the statement. Inasmuch as Colonel Deeds (as the record of the Hughes inquiry shows) had never seen Secretary Baker in regard to any statement which was to be given out on February 21, it is very natural that he should have replied that he did not see the statement. Up to that moment it does not appear that the particular statement in the mind of Senator Wadsworth had been called to Colonel Deeds' attention. Further questioning, however, elicited from Colonel Deeds information which showed that his negative answer to Senator Wadsworth's question had been given in perfectly good faith. When immediately following the question referred to, he was asked by Senator Wadsworth whether he or any other officer of the Department consulted with Secretary Baker or with Mr. Creel before the Secretary authorized the statement, Colonel Deeds answered:

"No, sir, I did not see Mr. Creel. I did not see Mr. Creel until a few weeks ago. I had not met Mr. Creel up to that time. I knew that some one from the Bureau of Information came into the Chief Signal Officers' office and asked some questions, and the statement was made that we were behind production, but that according to the original arrangement, our planes were to be supplied up until July 1 from abroad, by France and Italy, and our planes were to follow, that while we were behind our schedule, at the same time we saw no reason why Pershing's forces would not be equipped because of this delay.

"Senator Wadsworth: You were present and overheard that conversation.

"Colonel Deeds: I remember a conversation just about like that that I had myself with someone from the Bureau of Public Information who came into the General's office along about that time.

"Senators Wadsworth: It was not Mr. Creel?

"Colonel Deeds: No, sir.

"Senator Wadsworth: Was it Mr. Rubel?

"Colonel Deeds: No, sir.

"Senator Wadsworth: Was it Mr. Strunsky?

"Colonel Deeds: I do not know him.

"Senator Wadsworth: You cannot remember who it was?

"Colonel Deeds: I do not know.

"Senator Wadsworth: Was there anything to justify the statement that we were five months ahead of the program.

"Colonel Deeds: No, sir, not in what I said.

"Senator Wadsworth: Did any officer say anything to justify the statement?

"Colonel Deeds: No, sir."

None of the testimony quoted above appears in the Hughes report. It indicates that Coionel Deeds informed Senator Wadsworth at that hearing regarding the conversation with Mr. Pew the, details of which appear to have escaped his mind at the time. If, as a matter of fact, Colonel Deeds had not seen the second paragraph of "McConaughy Ex. 2" before publication, and did not state that the planes were then on the water, it is quite conceivable that without intending to make any false statement, he may have given the testimony he did in perfectly good faith, more especially as the statement itself, which was exhibited to him at the Sweetser-Pew interview, or was claimed to have been exhibited to him in typewritten form at that time, was not before him at the Senate investigation, as it subsequently was during the Hughes inquiry.

The following explanation by Colonel Deeds appears in his affidavit hereinabove referred to:

"As to Colonel Deeds testimony before the Committee on Military Affairs of the Senate on April 2, 1918, Colonel Deeds admitted giving that testimony, and explained at the time of his examination by Judge Hughes, and still asserts, that at the time he testified before the Senate Committee, he did not recall having seen the statement before the newspaper publication. The submission of the statement to him was only an incident in the rush of business, and at the time of the testimony before the Senate Committee, he had in mind publications in the newspapers, which had considerably elaborated upon the facts contained in the original decument. Between that time and the giving of his testimony in the Aircraft Inquiry, his recollection was refreshed by an investigation he made upon hearing that a witness who preceded him had been examined as to what extent Deeds was responsible for the statement. His testimony on each occasion, though there is a conflict, was entirely truthful, according to the recollection he had at the respective times. With the information that Colonel Deeds had at the time the statement was made, and which he believed to be true, there was nothing improper in the purpose or purport of the statement itself.

"The information Deeds had was not inconsistent with Talbott's telegram of February 14, 1918 (P. 117). The information was that the shipments had been made, one on February 11 and three on February 15. So the telegraphic reference on February 14 to one plane shipped was according to information. Talbott's reference to the first hundred remaining in this country was not official, nor did that happen."

In the light of the information now before this office, it is recommended that no proceedings before court-martial be instituted because of the statement made by Colonel Deeds before the Senate Committee, because the evidence does not show that he made a wilful false statement before that committee.

VI.

Packard Company Vouchers

The last transaction with which Colonel Deeds was connected, discussed in the memorandum submitted by this office on November 11, 1918, is the irregularity charged against him in approving two out of four vouchers in favor of the Packard Motor Car Company, these four vouchers aggregating $249,159.10. These acts of Colonel Deeds were not made the basis of any recommendation by Judge Hughes in his report, but were noticed by this office which made the statement in its previous memorandum that from the facts stated in the Hughes report it was impossible to say whether Colonel Deeds' act in this connection constituted a violation of any of the Army Regulations relating to money vouchers or such other breach of his official duty as to furnish the basis for charges against him.

Consideration to this subject has again been given in the light of the evidence disclosed upon the record of testimony taken before Judge Hughes and additional facts brought to the attention of this office.

One of the criticisms directed by Judge Hughes against this transaction is that there was no contract in writing with the Packard Motor Company covering this work. It is to be noted that the work was originally ordered at a time when Colonel Deeds was not in the Army; and the first voucher for payment on account which was approved by him was approved while he was acting as a civilian employee of the Government, for a yearly compensation of one dollar. The omission of a formal written contract, if Mr. Deeds was to blame for this at all, which is not clear from the record, is not attributable to him as an army officer. When he was called upon to approve the vouchers for payment the work was already in progress. With respect to Judge Hughes' criticism that no price had been fixed in advance, attention is invited to the following statements taken from a memorandum submitted to this office by Major E. A. Coleman, disbursing officer of the Bureau of Aircraft Production. The statements contained in that memorandum are supported by evidence taken before Judge Hughes:

"It is my understanding that the Aircraft Production Board secured the services of the Packard Motor Car Company to conduct certain experimental work in connection with the development of an airplane engine and to produce certain standardized engines, and that the Packard Company could not state in advance the cost of such experimental work, and that it was orally understood that the Signal Corps would reimburse the Packard Company their actual cost, plus a reasonable amount to cover administrative expenses, profits, etc. Before the delivery of the engines aforesaid covered by voucher No. 7228, it was agreed that certain definite unit prices would be paid therefor.

"These prices were arrived at, as I understand it, from estimates furnished by the Packard Company. In any event, the amount to be paid for such engines had been agreed upon by the Packard Company and by the representative of the Government, prior to the certification of the voucher.

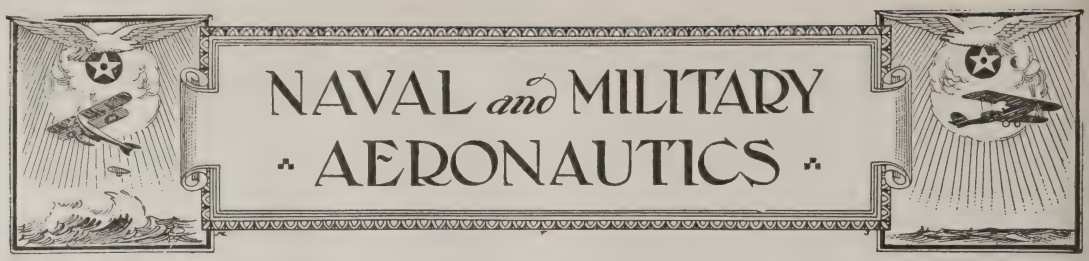
"It is also my understanding that services of the Packard Motor Car Company were secured because it was considered that they were better equipped to handle this character of experimental work than other firms available for the purpose, under an emergency and stress of urgent public necessity that did not permit of delay, and that the methods employed to secure the services of this firm are authorized under orders dated April 12, 1917, signed by the Secretary of War. If I correctly understand the facts in this matter, the certificate executed by E. A. Deeds, Col. Signal Corps, on voucher No. 7228 of December, 1917, Captain H. Elliott's accounts, is regular and executed in conformity with the requirements of the regulations of the Signal Corps, literally true in all its essentials and justified by the facts."

The Aircraft Production Board set aside an appropriation of $250,000.00 to cover the cost of the work. As the work progressed the Packard Company required money on account. Estimates were made of the amounts earned from time to time and four separate vouchers were made to cover all the payments to the Packard Company on this account. Only the third of this series was approved by Colonel Deeds while an officer of the army. That was dated December 6th, and was for $60,000.00. Up to that time two vouchers for $104,500 and $73,194.72 respectively, had been paid on account. The Packard Company had a complete record of all the transactions, and this record, while it does not appear to have been filed with the War Department, was gone over by Lieut. Colonel Vincent and used as the basis for payment. The Packard Company complained that it had lost money on the work.

Captain Oscar R. Ewing, of the contract section of the Bureau of Aircraft Production, testified that it was the custom of the service, on experimental work, sometimes to pay vouchers on a mere allotment of funds and an order, either verbal or in writing, against that allotment; but that these cases usually involved only small amounts.

Major General George O. Squier, Chief Signal Officer, testified that

(*Continued on page* 1050)



Key to Abbreviations

AAD—Assigned to active duty.
ABC—Report to Army Balloon School, Arcadia, Cal.
ABC—Report to Army Balloon School, Arcadia, Cal.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AIR—Transferred to the Air Service, National Army, without change in rank or date of commission.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPA—Commissioned as Captain Air Service, National Army.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLA—Commissioned as First Lieutenant Air Service, National Army.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJA—Commissioned as Major Air Service, National Army.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OBS—Attached to the Aeronautical Service as Observers.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAC—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLA—Commissioned as Second Lieutenant Air Service, National Army.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMA—Report to School of Military Aeronautics, Cambridge, Mass.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.

Note 2—Report to Chicago, Ill., in connection with the aviation section of the Army.

Note 3—Report to Chicago, Ill., to District Manager Aircraft Finance.

Note 4—Report to Camp McClellan, Anniston, Ala, for duty with Balloon Detachment.

Note 5—Report to Middletown, Pa., to Aviation General Supply Depot.

Note 6—Report to 360 Madison Avenue, N. Y., to Dist. Mgr. Aircraft Finance.

Note 7—Report to Little Rock, Arkansas, and wire D. M. A.—Wash.

Note 8—Report to District Manager, Aircraft Finance, Buffalo, N. Y.

Note 9—Report to Akron, Ohio, and assume command as officer in charge of airship training and construction, and wire D. M. A.—Washington.

Note 10—Report to Pittsburgh, Pa., to Detach. No. 5, Bureau of Aircraft Production, Keenan Building, and wire D. A. P.—Washington.

Note 11—Report to Speedway, Indianapolis, Ind., to Aviation Repair Depot.

Note 12—Report to Cooperstown, N. Y., to commanding officer military hospital.

Note 13—Report to Boston, Mass., to Dist. Mgr. Finance, wire D. A. P.—Wash.

Note 14—Report to Army Balloon School, Lee Hall, Va.

Special Orders Nos. 13 to 20 Inclusive

A

Amos, Frank H.....Note 2
Atwater, Allen R.....Note 6
Anable, Samuel .....DMA
Archer, Cecil E.....UTA
Argo, Edwin Y.....PFO

B

Bruton, Phillip G.....Note 10
Buchanan, Lester C.....UTA
Barry, John V.....DMA
Boyd, William P.....DMA
Beers, Donald .....BFT
Brush, Oliver G.....PFO
Butts, John W.....SAG
Brockman, Ervin .....BFT
Bingham, Hiram .....DMA
Baker, Earle F.....LDT
Bulmer, Robert A.....EOT
Brelsford, William F.....EOT
Barber, Charles E.....Note 14
Brown, Sidney F.....RSD
Bennett, John James, Jr.....DIS
Blaney, John .....BFT
Beverley, George H.....PMT
Benner, Harry M.....LDT
Barrett, Thomas A.....DMA
Bonham, John A.....SAG
Brooks, John B.....BFT

C

Cohen, Harry R.....PFO
Corner, Paul R.....RSD
Cato, John H., Jr.....PFO
Collins, Lorin Cone.....MIA
Creeden, Jeremiah J.....CAF
Church, Rollin S., Jr.....RSD
Clancy, John F.....KST
Coon, Sylvanus C.....RSD
Crissy, Dana H.....DMA
Carusi, Joseph S.....EOT
Cheston, Daniel M., Jr.....DMA
Cook, Philip P.....DMA
Caldwell, Ralph C.....ABC
Clevette, Charles F.....EOT
Cox, Gilbert H.....PMT
Connell, J. Weed.....PMT
Clark, Harold L.....LDT
Claiborne, Harry C.....BFT
Collier, Herbert K.....KST

D

Day, Clarence R.....Note 7
Duncan, Thomas .....CAF
Deuel, Thorne .....CAF
Doyle, Benton Arthur.....BFT
Decker, Harold J.....PMT
Deere, Gilbert D.....DMA
Davies, Ward J.....RSD
Doane, Samuel E.....EOT

E

Eubank, Eugene L.....EOT
Eidson, Charles G.....MDO

F

Force, Ernest W.....EOT
Fournier, Paul .....LHV

Foster, James H. ..... RSD
Fickel, Jacob E. ..... DMA
Fleet, Reuben H. ..... MDO
Felt, Lee W. ..... PFO

G

Goldblatt, Benni ..... Note 6
Garrison, William H., Jr. ..... Note 5
Given, Richard Alexander ..... Note 3
Gribble, Frederick C. ..... Note 8
Gunn, James L. ..... CAF
Greenwalt, Henry S. ..... CAF
Gardner, William A. ..... BFT
Gunn, Malcolm B. ..... FRF
Goddard, George W., Jr. ..... CAF
Graham, Harry ..... DMA
Godfrey, John S. ..... ARV
Galt, John M. ..... DMA

H

Hoskins, Cedric ..... EOT
Harding, Claude L. ..... KST
Hamor, Bert L. ..... Note 5
Hensley, William N. ..... Note 9
Hines, Carter E. ..... KST
Horton, Clarence F. ..... DMA
Humphreys, Frederic ..... MDO
Hiller, Melvin E. ..... BFT
Horning, Clare A. ..... MAC
Haynes, Grissom E. ..... CGC
Hochreiter, Charles J. ..... KST
Hyndshaw, Silas C. ..... KST
Howeth, Woodin Grady ..... LDT
Hunter, Thomas O. ..... LDT
Hine, William H. ..... BFT
Hillery, Edward A. ..... EOT
Holland, Park ..... KST
House, Taylor N. ..... RSD
Hickey, Doyle O. ..... PFO
Huston, Paul W. ..... BFT
Hearne, Francis H. ..... CAF

I

Ison, Nathaniel B. ..... EOT
Ilgenfritz, Frank W. ..... KST
Immel, Paul P. ..... DMA

J

Johnson, Frederick A. ..... CAF
Johnston, Samuel ..... Note 13
Johnson, Luther H. ..... DMA

K

Kokjer, Thomas E. ..... KST
Kalis, Samuel H. ..... SAG
Knode, Thomas E. ..... BFT
Kohn, Edwin R. ..... RSD
Krause, James W. ..... BFT

L

Largent, Ralph N. ..... RSD
Lewis, James O. ..... PMT
Londrigan, Joseph A. ..... KST
Lokey, Thomas E. ..... KST
Little, James C. ..... KST

M

Moore, James F. ..... Note 12
Mowry, James B. ..... EOT
Matthews, Chauncey W. ..... RSD
Mann, Asa O. ..... PMT
Manzelman, Earle H. ..... PMT
Marsh, Ian D. ..... BFT
Metcalf, Herbert E. ..... DMA
Minter, Hugh C. ..... KST
Masson, Charles A. ..... BFT

Mc

McRae, John ..... PMT
McInerney, John ..... DMA
McLaurin, King H. ..... DMA
McDowell, Lamont A. ..... EOT
McGregor, Kenneth C. ..... BFT
McHenry, Lorin H. ..... EOT
McDowall, John ..... PFO

N

Nixon, John F. ..... PFO
Newton, Littleton Alexander ..... BFT
Newbold, Edwin E. ..... PMT
Nolde, Fred F. ..... DMA

P

Peyton, Tom L. ..... PFO
Pitts, J. E. ..... PFO
Pinkham, William D. ..... RSD
Page, Frank H. ..... EOT
Palmer, Claude N. ..... Note 3
Powell, John W. ..... CAF
Potts, Thomas R. ..... CAF
Pollock, Gordon B. ..... MAC
Puryear, George W. ..... RSD

Q

Queal, William N. ..... AGC
Quarles, Robert E. ..... PFO

R

Roddy, Norman L. ..... KST
Ravenscroft, Charles F. ..... DMA
Rogers, George H. ..... RSD
Rossell, John E. ..... MAC
Rogers, George Washington ..... PMT
Ridgely, Arthur O. ..... Note 4
Roup, Glenn M. ..... KST

S

Shovlin, Hubert A. ..... KST
Sillars, Alexander Graham ..... KST
Simon, Harry E. ..... EOT
Stiven, Charles E. ..... EOT
Sizer, Theodore ..... DMA
Spencer, Raymond C. ..... EOT
Spicer, John H. ..... KST
Snow, Lorenzo L. ..... MDO
Stewart, James E. ..... DMA
Sohm, Elbert G. ..... KST
Schumacher, Edward ..... AGC
Stimson, George W. ..... Note 11
Rogers, Oscar L. ..... RSD
Slate, Everett J., Jr. ..... KST
Scott, James Marvin ..... Note 8
Sundeen, Martin A. ..... KST

T

Taylor, Lloyd W. ..... CAF
Taylor, Robert D. ..... KST
Taylor, Charles R. ..... PFO
Towle, Francis B. ..... RSD
Thomas, Harold S. ..... CGC
Tate, Bertram B. ..... RSD

V

Vickers, Edward W. ..... Note 12
Vollmer, William H. ..... DMA
VanMeter, Solomon L., Jr. ..... KST
Van Pittman, Wayne ..... EOT
Van Horn, Harry A. ..... DMA

W

Wilbur, Jesse B. ..... KST
Wuest, Jacob W. S. ..... JMA
Williams, Paul L. ..... RSD
Williams, Rogers Q. ..... CAF
Welsh, William J. ..... CAF
Watson, Arthur G. ..... KST
Willcox, Albert M. ..... BFT
Wolfe, Kenneth B. ..... PMT
Wright, Wilbur A. ..... RSD
Westall, William H. ..... BFT
Wood, Glen E. ..... KST
Wiggins, Frederick C. ..... DMA
Wing, Charles R. ..... RSD

General Lee Returns Home

Brigadier General Charles Frederick Lee, R. A. F., Chief of the British Aviation Mission, sails for England on the "Adriatic," February 8th. Following his service with the British Expeditionary Force in 1914, 1915 and 1916, General Lee returned to England to command the Training Brigade, R. F. C. He joined the British Mission to the United States on November 30, 1917, as officer commanding the Aviation Mission. His home is Grove Hall, Knottingley, Yorks, England.

Italian Service Ribbons to American Airmen

Forty-eight officers of the Air Service and one officer of the Medical Reserve Corps detailed to the Air Service have been authorized by the Italian Minister of War to wear the Italian Service Ribbon, instituted by Royal Decree 641 May 21, 1918, according to a communication from the Chief of the Air Service, A. E. F. The officers named have returned to the United States and so their official certificates from the Italian Government have been sent to the Division of Military Aeronautics for distribution.

The names and home addresses of the officers follow: Captains: Edmund A. Kruss, San Diego, Calif.; Oliver B. Kiel, (Medical Reserve Corps) no address. First Lieutenants: Lawrence N. Campbell, Owatorma, Minn.; Wallace H. Carpenter, Duluth, Minn.; Robert P. Clarke, Jr., Sewickley, Pa.; Lenan O. Conley, Penn Yan, N. Y.; Frederick G. Dodge, Genesee, N. Y.; Ross R. Dunn, Noblesville, Indiana; Horace Drever, Philadelphia, Pa.; Thomas F. Fielder, Spartansburg, S. C.; Bicknell Hall, Jr., Taunton, Mass.; George S. McKey, (MacKey) Chicago, Ill.; Edward B. Mayer, Iowa City, Iowa; Edward M. Malley, Greensburg, Pa.; Willard S. McKay, Plainfield, N. J.; Edward M. Ogden, Rochester, N. Y.; Charles P. Penney, Buffalo, N. Y.; David S. Pruitt, Bethany Beach, Del.; Earl D. Ranck, Overbrook, Pa.; Samuel S. Robinson, no address; Lawrence G. Sherman, Brattleboro, Vt.; Horace L. Stevenson, 157 U St., Washington, D. C.; Oliver H. Stout, Indianapolis, Ind.; Verlie Van Zele, Genesse, Ill.; Paul J. Wedel, Jersey City, N. J.; George O. Wright, Fort Valley, Ga.; Linus V. Windnagle, Portland, Oregon; William P. Young, Clearfield, Pa.; Clarence M. Young, Des Moines, Iowa; Walter T. Mayer (Meyer), Columbus, Ohio; Walter M. Boadway, Princeton, N. J.; Lester B. Cowgill, no address; Hugh D. Stier (Stark), Pittsburgh, Pa.; George N. Nyland (Hyland), Philadelphia, Pa.; John N. Devoe, no address; Frank C. Cox, no address. Second Lieutenants: Paul H. Cresswell, Cedarville, Ohio; William J. Flynn, Detroit, Mich.; Hugh J. Gaffney, Jersey City, N. J.; Richard Goodman, Philadelphia, Pa.; William M. Malcolm, Hartford, Conn.; Thomas J. Mitchie, no address; Raymond W. T. Ricker, New Durham, N. H.; Herman Schmidt, 2813 N. Cap., Washington, D. C.; Horace S. Stevens, no address; John A. Posy, no address; Lawrence D. Messner, Wilkinsburg, no address; Lawrence J. Joseph, Galveston, Texas; John W. Canon, no address.

Official Publications for Flight Surgeons

Three interesting and instructive publications on the medical side of flying prepared by members of the Air Service, Medical, are now in press.

The first of these pamphlets will appear under the title "The Air Service, Medical Manual." It will comprise four chapters concerning the conservation of human material, as well as the conservation of machines as developed in practice in the U. S. Air Service. The development of the "Trouble-shooter" of the flier as compared to the trouble-shooter of engines and machines was developed in the person of the "flight surgeon."

The second publication is more general in character and also more extensive. It is issued under the title, "Air Service, Medical," and comprises 500 pages of text with 275 full-page illustrations. It is a story on the general standpoint of the medical aspect of aviation from Langley's experiments to the Aeronautical achievements of the present day. It is the doctor who makes flying safer, through selection, classification and maintenance of the fliers. Under the last sub-division are explained the duties of the physical director and nutrition officer.

The third publication is more technical and deals with the internal working of the medical research laboratory established for the Air Service at Mineola, L. I.



A group of aeronautic enthusiasts at Wilbur Wright Field. Second from the right, standing, is Col. J. G. Vincent, and kneeling at the right, Walter E. Lees, pioneer aviator

FOREIGN NEWS

Polish Air Service

In its stand against the Bolsheviki Poland is handicapped by lack of adequate air service, there being only fourteen old training planes available. Efforts are being made to purchase planes in Vienna and it is reported that the United States Government has dispatched several planes for the use of the Polish Army.

British Lift Experiment Ban

The Ministry of Munitions has suspended the regulation prohibiting the experimental manufacture without license of any aeroplane, seaplane, or any aero engine or part thereof. This order prohibited even the making of detail drawings. Lumber may again be bought and sold without license.

The priority for many uncompleted war contracts has been lifted, permitting firms to accept orders for peace business and give them priority over war contracts.

The whole industry will welcome this return to peace conditions and development of commercial aircraft can proceed unhindered by Government regulation. The commendable foresight of the Ministry of Munitions in restoring peace conditions as rapidly as possible may tend to influence American policy.

French Distribute Food By Aeroplane

In certain districts in Northern France the Germans, in their retreat, so thoroughly destroyed the bridges and railways as to render the delivery of food supply highly difficult. The French Government has decided to use aeroplanes for the purpose.

Germany Plans to Dominate Swedish Aircraft Market

German aircraft companies, immediately following the signing of the armistice, sent several of the latest type of twin-motored planes to Stockholm, with a view to capturing the Swedish market. Trial flights are frequently made and the machines offered at tempting prices.

It is suggested that Allied and American manufacturers make an effort to secure a part of this prospective trade, as the opportunities are excellent. Sheltered by numerous islands and inlets, there should be a lively demand for seaplanes.

Air Transportation in China

Owing to the difficulty which would be encountered in the transportation of materials for the erection of three commercial wireless stations in remote parts of China, the Marconi Company has arranged with Mr. Handley Page for their delivery by aeroplanes. No part of the machinery to be used will weigh more than 300 pounds. By ordinary methods of transportation it would take two to three months to convey the radio instruments across China as against the same number of days by aircraft.

British Seek Air Route Concession in Brazil

Rio de Janeiro, January 21.—A British aeronautic concern has requested a concession to establish an air route between Rio de Janeiro and Pernambuco. It is intended to extend the system to Buenos Ayres.

Royal Air Force Lose Polo Championship

By sustaining a 13½ to 8 defeat on January 22nd at the hands of the White Owls the Royal Air Force lost its chance of winning the Victory Cup for the Canadian polo championship.

British Companies to Insure Aviators

According to a statement of an important official of a large British insurance company, it is quite probable that insurance companies will write life insurance for aviators. At the present time insurance is not unobtainable, but companies will not pay on policies or return premiums paid if the flying accident occurs within three years of issuance of policy.



A French Nieuport Scout

Canada Plans Aerial Development

Coincident with the announcement of the British civil committee of the Air Board proposing interimperial aerial scheme, the Canadian civil authorities have also taken up the matter along national lines. With this object in view representatives from the various centres of the Dominion have already consulted the Federal Cabinet, with the result that earnest consideration will be given to the question of future aviation in Canada. One of the suggestions discussed at the Ottawa conference was the establishment of a national aeronautical advisory committee for the purpose of going into the whole matter exhaustively. E. W. Beatty, president of the Canadian Pacific Railway, was named president of the committee. Mr. Beatty, who is only 41 years of age, recently succeeded Baron Shaughnessy as president of the C. P. R. Mr. Beatty is a King's Counsel and reached his present high position after seventeen years of hard work with the railway.

International Laws of the Air

An Inter-Allied Aeronautical Conference will be held at Paris in the spring of 1919 for the purpose of establishing International Law for aircraft. It is probable that pilots will be required to carry passports, and when crossing from one country to another will be obliged to stop at designated fields for identification and customs inspection.

Arrivals at the International Aerodromes will be entitled to the latest meteorological information and directions regarding the cross-country air routes.

Certain areas will be banned for the aerial traveller for military reasons.

Lord Weir On Commercial Aeronautics

Manchester.—In discussing the future of commercial aeronautics, Lord Weir, Secretary of State for the Royal Air Force, stated that its success would be largely dependent upon the development of the science of aerial navigation; the careful and thorough training of aerial navigators; the perfection of navigating instruments; the organization of an extensive meteorological service; the adoption of standardized night and day marking of landing fields, and the employment of radio telegraphy and telephony for communications. These factors will contribute to the safety and reliability of commercial navigation and their development has not kept pace with that of design and construction of commercial aeroplanes.

Lord Weir is opposed to government monopoly of aerial transport. He urged the permanent acquisition of all military aviation fields in order that they may be made available for commercial travel.

Air Route to Far East

Melbourne, Australia, January 22.—The Australian Government, it is announced, has sanctioned the formation of a company to survey an aerial route between Australia and the Far East.

British Air Force Had 294,000 Officers and Men

London, Jan. 23.—Great Britain was pre-eminent in aviation at the close of the war, when her air force was the largest in the world, according to a report made public recently. It fought on more fronts than the air service of any other nation in the war.

In August, 1914, the British naval and military air services together mustered only 285 officers and 1,853 men of other ranks. In November, 1918, there were 30,000 officers and 264,000 men. At the outbreak of the war Great Britain had 166 aeroplanes, forty-five seaplanes, and seven airships, while at the close of hostilities she had 21,000 aeroplanes, 1,300 seaplanes, and 103 airships. Besides this there were 25,000 aeroplanes and seaplanes being built and 55,000 aeroplane engines under contract.

The Women's Royal Air Force, which was not in existence in 1914, numbered at the close of the hostilities 23,000.

New Italian Speed Record

Rome, Jan. 24.—A new Italian biplane, the Marchetti Vickers Terni, piloted by Sergeant Elia Lint, has attained under official trials an average certified speed of 160 miles an hour.

The trials were conducted at a height of nearly a hundred feet from the ground, so the controls were flattened in flight, and the flights were made both with and against the wind.

The motor was of the 200 horsepower Spa type. The average speed attained exceeds by sixteen miles the previous record under similar conditions.

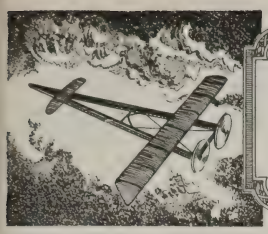
Italian "White Eagle" for Ocean Flight

London.—The correspondent of *The Daily Telegraph* at Milan reports that Signor Caproni has nearly finished the gigantic machine in which it is intended to fly from Italy to America. The machine is a huge triplane with engines of 3,000 horsepower and ample accommodation for a certain number of passengers, for whom cabins and sleeping berths will be available.

The Caproni transatlantic flier is to be named the White Eagle, in allusion to a curious prophecy printed here in 1916 and attributed to an English friar of the seventeen century. The prophecy announced that there would be a great world war in the twentieth century, which would be started by the evil genius of an Emperor in Luther's country in league with another Emperor, both of whom had black eagles on their coats of arms, but that civilization would eventually crush the barbarians, whose empires would be divided up into twenty-two States.

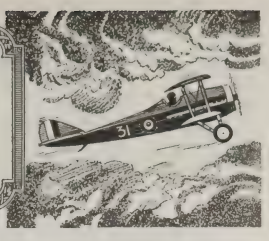
The white eagle in phophecy is interpreted to be the American eagle. Verses on the subject, written by a local poet, W. Lewis, and set to music, were presented, with a beautiful design drawn by two Italian artists in gold and colors, to President Wilson when he was in Milan. It was on seeing this design and poem that Caproni decided on the name for his machine.

It is proposed that the aviators take the same route as Columbus did, flying from Italy to Cadiz and the Azores and thence to the American coast and landing near Washington.



ELEMENTARY AERONAUTICS
and
MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

WE will now proceed to check up the possible performances of our machine.

Our first problem is to correctly ascertain the wing resistance at the different speeds. Now the reader will notice that the wing resistance is high at low speeds due to the larger angle of incidence necessary to fly at low speeds. (The reader will remember that to fly at certain speeds we can alter the area, speed, or angle of the planes.) We cannot change the area in flight and we wish to fly at a low speed so we simply alter the incidence by pulling back the control stick and lowering the tail until the correct angle for minimum speed is reached. For the R. A. F. 6 section this occurs at 16 degrees when the lift coefficient is highest.

By consulting the accompanying chart we will see that the resistance is also high due to the greater area presented to the wind. When checking up the performance of a machine the parasite or non-lifting resistance is figured separate to the wing resistance and you will notice that at low speeds the parasite resistance is small and gradually increases with the speed, while the wing resistance is high at low speeds owing to the large angle of incidence and as the speed increases the angle becomes less and of course the resistance comes down and then it starts to climb again as the aeroplane begins to get into high speed.

The resistance coefficient at 16 derees is .000446 then our wings will have a resistance of

coefficient surface M.P.H.

$.000446 \times 206 \times 37^2 = 126$ lbs. approx.

But as the speed increases the angle grows less and we find that at the maximum speed of 60 M.P.H. we will use an angle at which the wings are set on the aeroplane which is 4½ degrees.

The resistance coefficient at 4½ degrees is about .000102 then at 60 M.P.H. our wings will have a resistance of only

coefficient surface M.P.H.

$.000102 \times 206 \times 60^2 = 75$ lbs. approx.

The reader will see that the resistance of the wing is much higher at the lower speed than at the higher.

Now the coefficient of resistance of a radiator is .00173 and we have approximately 2 sq. ft.

$.00173 \times 2 \times 37^2 = 4.7$ lbs.
$.00173 \times 2 \times 60^2 = 12.46$ lbs.

Now the skin friction of a body is regarded as .03 per sq. ft. at 60 M.P.H. and .0114 at 37 M.P.H. We have a surface on the body of approximately 90 sq. ft., then the skin friction at 37 M.P.H. will be $.0114 \times 90 = 1.03$ lbs. and at 60 M.P.H. it is $.03 \times 90 = 2.7$ lbs. this, of course, is neglecting the hole in the cockpit and the aviator's head. It would be fair to add 2 lbs. at 37 M.P.H. and 5 lbs. at 60 M.P.H. for this which would bring the body resistance up to

	37 M.P.H.	60 M.P.H.
Radiator	4.7	12.46
Skin Friction	1.03	2.7
Resistance of Cockpit and head	2.00	5.00
Total	7.73 lbs.	20.16 lbs.

This resistance due to the slip stream of the propeller is increased 25% which makes these resistances 9.66 lbs. and 25.2 lbs.

We have 42 feet of struts and the resistance 12.8 lbs. per 100 feet of strut at 60 M.P.H. The struts then have a resistance of $\frac{42 \times 128}{100} = 5.38$ lbs. at 60 M.P.H. and 2.05 lbs. at 37 M.P.H.

Wheels have a resistance of about 1½ lbs. each at 60 M.P.H. that is if they are covered with cloth or metal to make a streamline shape. Two wheels would be 3 lbs.

The landing chassis, struts, axle, etc., have a resistance of 5 lbs. at 60 M.P.H.

The rudder, tail, etc., have a resistance of 3 lbs. at 60 M.P.H. This is increased 25% owing to the slip stream of the propeller which increases this to 3.75 lbs. at 60 M.P.H.

The wires, control arms, fittings, etc., add another 3 lbs.

Our parasite resistance is then

Body	25.2 lbs.
Struts	5.38
Wheels	3.
Landing Chassis	5.
Rudder, etc.	3.75
Incidentals	3.
Total	45.33 lbs. for the body at 60 M.P.H.

At 37 M.P.H. this resistance would be

$37^2 : \times :: 60^2 : 45.33$ lb. = 13 lbs. approx.

Our total resistance is then

Wings	37 M.P.H.	126 lbs.
Parasite	37 M.P.H.	13 lbs.
		139 lbs.

Horsepower required is

$\frac{139 \times 37}{375} = 13.7$ Horse Power required

Wings	60 M.P.H.	75 lbs.
Parasite	60 M.P.H.	45.33 lbs.
		120.33 lbs.

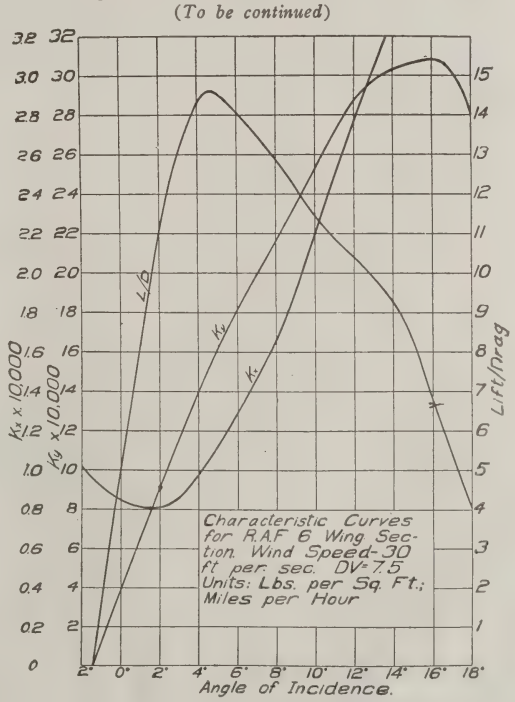
Horse Power required

$\frac{120\text{-}1/3 \times 60}{375} = 19¼$ horse power required approx.

Of course this is the actual horse power. The propeller slips 25% so we must develop 25% more horse power to give the horse power required at the propeller. This will increase our figures to 17.1 H.P. and 24.06 H.P.

A re-designed Ford motor will develop from 30 to 35 horse power so the reader will readily see that we will have a reserve horse power of from 5 to 10 for climbing.

(To be continued)



Characteristic curves for R.A.F. 6 wing section



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Says Wifey to Hubby

Harry, how I used to kid you
On our fleeting honeymoon;
When I asked you, sweetheart, did you
Have another girl to spoon.

How my habit was to tease you,
Saying "when away from home
Will some other woman squeeze you,
And will yours o'er strange lips roam?"

How I tossed my foolish banter,
Saying that I'd trust you,
Boy, forget it, please don't canter,
O'er green fields and pastures new.

Husband, dear, I have but just you,
Even if I did, in fun,
Say abroad I would not trust you
If you met a pretty one.

Now I lie awake and wonder
What you're doing over there,
Hoping, dear, that you won't blunder
From the Straight Path is my prayer.

Harry, dear, I worry daily
While you're there among the French,
Wondering if you're playing gaily
With some charming brunette wench.

Lonesome! Sweetheart, how I miss you,
But, with patience, wait I must
For the day when I can kiss you,
Seems as though my heart would bust.

Says Hubby to Wifey

Dearest, all your prayers and wishes
I have pasted in my hat;
I'll not taste forbidden dishes,
And we'll let it go at that.

But, dear, whilst you're moralizing
On my conduct over here,
Save your brown eyes tantalizing,
Glances for your husband dear.

All my days are full and busy,
While my sweetheart sadly waits;
Sometimes, dear, my brain grows dizzy,
Wond'ring if you're making dates.

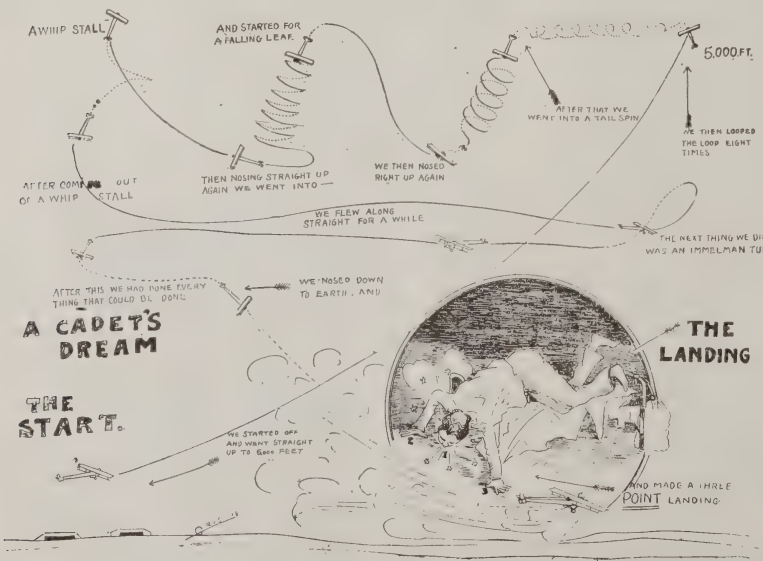
And while you're praying and pleading
For my welfare over here,
Don't let anyone be leading
You from the straight and narrow, dear

Satan always finds employment
For small hands with nought to do;
If you brood o'er my enjoyment
He may find a job for you.

You have asked me not to frolic
In green fields and pastures new;
To abstain from sports bucolic,
Likewise, love, is good for you.

And dear heart, until I meet you,
When I step down from the ship.
And with loving kiss I greet you,
Look out, dear, YOUR foot don't slip.

—Bard of Beaumont.



—*From The Fly Leaf.*

A Marine's Ride

(From the "Globe and Anchor," Galveston.)

THE OTHER DAY
I WENT UP
TO ELLINGTON FIELD
TO GIVE THE PLACE THE O. O.
AND THEY WERE AWFULLY POLITE
AND ASKED ME
IF I WANTED TO GO UP
AND I TOLD THEM I DID
SO THEY GAVE ME
ONE OF THESE
CUTE LITTLE COATS
THAT ALL THE HEROES
ON THE MAGAZINE COVERS
WEAR
AND ONE OF THESE
HELMETS
TO KEEP MY HAIR
AND EARS
FROM BLOWING OFF
AND SOME GOGGLES
AND THEY STRAPPED ME IN
WITH A SIX-INCH STRAP
AND I WONDERED
AT THE TIME
WHY IT WAS SO WIDE
AND LATER
I FOUND OUT.
WELL
THE PILOT
WHO WAS HELPING ME
TO NEED MY INSURANCE
WAS LIEUTENANT EDDIE PACK
AND BEFORE WE STARTED
THEY TOLD HIM
TO GO EASY
AND SO DID I
AND HE SAID HE WOULD.
AND WE STARTED
AND THE NEXT THING
I KNEW
THE GROUND WAS FAR AWAY
THAT IT WAS
A NEGLIGIBLE QUANTITY
AND PRETTY SOON
I NOTICED A LITTLE DIAL
IN FRONT OF ME
AND ON IT
IT SAID
"8 THOUSANDS OF FEET."
BUT THAT
WAS SUPERFLUOUS
I KNEW IT.
AND OF A SUDDEN
WE WERE HEADED
FOR THE GROUND
AT A COUPLE OF MILLION
MILES PER HOUR
AND THEN WE WERE
HEADED FOR HEAVEN
AT THE SAME RATE
AND WHEN I LOOKED UP
TO SEE IF WE HAD HIT
THE SKY YET
INSTEAD OF THE SKY
I SAW THE GROUND
AND WHEN I LOOKED DOWN
I SAW THE SKY
AND IT WAS THEN
THAT I OFFERED UP
A SILENT PRAYER
FOR THE STRAP
ABOUT MY MIDDLE,
AND ABOUT THAT TIME
WE PASSED A CROW
AND HE HAD
AN ENVIOUS LOOK
IN HIS EYE
BECAUSE EVEN HE
COULDN'T FLY
WITH HIS FEET
POINTED HEAVENWARD
AND ALL I CAN SAY
IS
IF LIEUTENANT PACK THINKS
WHAT HE DID
WAS "GOING EASY"
I WANT TO BE
ANCHORED TO THE GROUND
WHEN HE
EXERTS HIMSELF.
FINIS.



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The Secret of Being a Convincing Talker

How I Learned It in One Evening

By GEORGE RAYMOND

"HAVE you heard the news about Frank Jordan?"

This question quickly brought me to the little group which had gathered in the center of the office. Jordan and I had started with the Great Eastern Machinery Co., within a month of each other, four years ago. A year ago Jordan was taken into the accounting division and I was sent out as salesman. Neither of us was blessed with an unusual degree of brilliancy, but we "got by" in our new jobs well enough to hold them.

Imagine my amazement, then, when I heard:

"Jordan's just been made Treasurer of the Company!"

I could hardly believe my ears. But there was the "Notice to Employees" on the bulletin board, telling about Jordan's good fortune.

Now I knew that Jordan was a capable fellow, quiet, and unassuming, but I never would have picked him for any such sudden rise. I knew too that the Treasurer of the Great Eastern had to be a big man, and I wondered how in the world Jordan landed the place.

The first chance I got, I walked into Jordan's new office, and after congratulating him warmly, I asked him to let me "in" on the details of how he jumped ahead so quickly. His story is so intensely interesting that I am going to repeat it as closely as I remember:



FREDERICK HOUK LAW

As educator, lecturer, executive, traveler and author few men are so well equipped by experience and training as Dr. Law to teach the art of effective speaking. His "Mastery of Speech" is the fruit of 20 years active lecturing and instruction in Eastern schools and colleges preceded by an education at Oxford Academy, Amherst College, Columbia University, The Teachers' College, Brown University and New York University. He holds the degrees of A.B., A.M. and Ph.D.

Dr. Law is the author of two novels, two books of poetry, and editor of six school textbooks. At present he is lecturer in English in New York University. Lecturer in Pedagogy in the Extension Work of the College of the City of New York, Head of the Dept. of English in the Stuyvesant High School and writer of the Weekly Lesson Plans for The Independent.

"I'll tell you just how it happened, George, because you may pick up a pointer or two that will help *you*.

"You remember how scared I used to be whenever I had to talk to the chief? You remember how you used to tell me that every time I opened my mouth I put my foot into it, meaning of course that every time I spoke I got into trouble? You remember when Ralph Sinton left to take charge of the Western office and I was asked to present him with the loving cup the boys gave him, how flustered I was and how I couldn't say a word because there were people around? You remember how confused I used to be every time I met new people? I couldn't say what I wanted to say when I wanted to say it; and I determined that if there was any possible chance to learn how to talk I was going to do it.

"The first thing I did was to buy a number of books on public speaking, but they seemed to be meant for those who wanted to become orators, whereas what I wanted to learn was not only how to speak in public but how to speak to individuals under various conditions in business and social life.

"A few weeks later, just as I was about to give up hope of ever learning how to talk interestingly, I read an announcement stating that Dr. Frederick Houk Law of New York University had just completed a new course in business talking and public speaking entitled 'Mastery of Speech.' The course was offered on approval without money in advance, so since I had nothing whatever to lose by examining the lessons, I sent for them and in a few days they arrived. I glanced through the entire eight lessons, reading the headings and a few paragraphs here and there, and in about an hour the whole secret of effective speaking was opened to me.

"For example, I learned why I had always lacked confidence, why talking had always seemed something to be dreaded whereas it is really the simplest thing in the world to 'get up and talk.' I learned how to secure complete attention to what I was saying and how to make everything I said interesting, forceful and convincing. I learned the art of listening, the value of silence, and the power of brevity. Instead of being funny at the wrong time, I learned how and when to use humor with telling effect.

"But perhaps the most wonderful thing about the lessons were the actual examples of what things to say and when to say them to meet every condition. I found that there was a knack in making oral reports to my superiors. I found that there was a right way and a wrong way to present complaints, to give estimates, and to issue orders.

"I picked up some wonderful pointers about how to give my opinions, about how to answer complaints, about how to ask the bank for a loan, about how to ask for extensions. Another thing that struck me forcibly was that, instead of antagonizing people when I didn't agree with them, I learned how to bring them around to my way of thinking in the most pleasant sort of way. Then, of course, along with those lessons there were chapters on speaking before large audiences, how to find material for talking and speaking, how to talk to friends, how to talk to servants, and how to talk to children.

"Why, I got the secret the very first evening and it was only a short time before I was able to apply all of the principles and found that my words were beginning to have an almost magical effect upon everybody to whom I spoke. It seemed that I got things done instantly, where formerly, as you know, what I said went 'in one ear and out the other.' I began to acquire an executive ability that surprised me. I smoothed out difficulties like a true diplomat. In my talks with the chief I spoke clearly, simply, convincingly. Then came my first promotion since I entered the accounting department. I was given the job of answering complaints, and I made good. From that I was given the job of making collections. When Mr. Buckley joined the Officers' Training Camp, I was made Treasurer. Between you and me, George, my salary is now $7500 a year and I expect it will be more from the first of the year.

"And I want to tell you sincerely, that I attribute my success solely to the fact that I learned how to talk to people."

******

When Jordan finished, I asked him for the address of the publishers of Dr. Law's Course and he gave it to me. I sent for it and found it to be exactly as he had stated. After studying the eight simple lessons I began to sell to people who had previously refused to listen to me at all. After four months of record breaking sales during the dullest season of the year, I received a wire from the chief asking me to return to the home office. We had quite a long talk in which I explained how I was able to break sales records—and I was appointed Sales Manager at almost twice my former salary. I know that there was nothing in me that had changed except that I had acquired the ability to talk where formerly I simply used "words without reason." I can never thank Jordan enough for telling me about Dr. Law's Course in Business Talking and Public Speaking. Jordan and I are both spending all our spare time making public speeches on war subjects and Jordan is being talked about now as Mayor of our little Town.

So confident is the Independent Corporation, publishers of "Mastery of Speech," Dr. Law's Course in Business Talking and Public Speaking, that once you have an opportunity to see in your own home how you can, in one hour, learn the secret of speaking and how you can apply the principles of effective speech under all conditions, that they are willing to send you the Course on free examination.

Don't send any money. Merely mail the coupon or write a letter and the complete Course will be sent, all charges prepaid, at once. If you are not entirely satisfied send it back any time within five days after you receive it and you will owe nothing.

On the other hand, if you are as pleased as are the thousands of other men and women who have used the Course, send only $5 in full payment. You take no risk and you have everything to gain, so mail the coupon now before this remarkable offer is withdrawn.

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Contractors to the United States Government

(*Continued from page* 1041)

while the contract should not have been made verbally, it was so made probably because the people who made it did not know what the regulations were, that the service had been obliged to call in many people without military experience to assist in this work; and that the contract which had been made with the Packard Company was a perfectly regular contract but now drawn up in the regular way.

Major Howard Elliott, Disbursing Officer of the Aviation Section of the Signal Corps, testified that while Section 653 of the Army Regulations provides that:

> "Every order issued by any military authority which may cause an expenditure of money in a Staff Department will be given in writing."

The memorandum consisting of the resolution passed by the Aircraft Production Board setting aside $250,000.00 for this work, was construed as an order because of an erroneous practice that had sprung up.

Major Coleman (from whose written memorandum a quotation has been made) testified at the Hughes inquiry that the resolution referred to was considered authority for the payment of the money mentioned in it; that there were other cases in which money had been set aside in that manner; and that while the regular practice requires that the Bureau should place written orders, that was not considered necessary.

Lieutenant Colonel A. C. Downey, of the Signal Corps, testified that while it was a bad practice to pay out money in cases where there had been no written orders, it was the practice in vogue at that time in jobs "where they wanted to rush things through," simply to request that a given amount of money be set aside, and when set aside, no written orders were placed; and when the vouchers were paid, these vouchers, under the practice, took the place of written orders, that this had been done in hundreds of cases, but that he did not remember any case in which it had been done where a large amount of money was involved.

Under these conditions it is not the opinion of this office that an officer entering the Army from civil life, as did Colonel Deeds, following a practice which he found in vogue in the office, should be court-martialed for an act of the character here involved, which, as found by Judge Hughes in his report, did not defraud the Government, and was not intended so to do.

This office therefore recommends that court-martial proceedings should not be instituted against Colonel Deeds on account of this transaction because: (1) the approval of the voucher in question did not involve any attempt to defraud the Government; (2) as found by Judge Hughes, it did not defraud the Government; (3) the verbal agreement upon which the voucher was paid, as found by Judge Hughes, was fair from the standpoint of the Government.

Conclusion

6. The conclusion of this office is, therefore that Colonel Edward A. Deeds should not be tried by court-martial on account of any of the transactions discussed in this memorandum.

The justice of the conclusion thus reached by this office finds confirmation in the following language taken from a letter from Hon. John D. Ryan, Director of the Air Service, addressed to the Secretary of War under date of November 13, 1918:

"I feel, as I stated in a former letter to you, that Colonel Deeds performed a great service in expediting the work on the Liberty motor. If he had followed strict regulations and kept within them in the expenditure of money for the production of the first of these model engines we would probably not have had any quantity production yet. I feel that the patriotic service rendered to the Government and the sacrifice made in connection therewith by Colonel Deeds outweighed any technical violations that might have occurred, and considering the conditions under which this work had to be done, if the aircraft was to take any part in the war within a reasonable time, I think commendation instead of court-martial should be Colonel Deeds' reward."

7. There are attached here to the following papers: (a) the memorandum from the Secretary of War referring the matter to this office for report and recommendation, together with the papers attached thereto, (b) endorsement from this office dated November —, 1918, returning to the Adjutant General a memorandum from the Inspector General's Department, dated November 2, 1918, and the accompanying papers; (c) memorandum submitted by this office under date of November 11, 1918, expressing its conclusion based upon the Hughes report; (d) memorandum for Honorable John D. Ryan, Director of Air Service, signed W. W. Montgomery, Chief Advisory and Consulting Department, dated November 11, 1918; (e) memorandum submitted to this office under oath and signed B. F. McCann, attorney for Colonel Edward A. Deeds; (f) affidavit of H. E. Talcott, former business associate of Colonel Deeds; (g) memorandum submitted to the Secretary of War by John D. Ryan under date of November 13, 1918; (h) letter from Major E. A. Coleman, Disbursing Officer, Bureau of Aircraft Production, to this office under dated of November 25, 1918, with exhibits; (i) copy of the official Bulletin, dated February 21, 1918, containing the newspaper article criticized by Judge Hughes in his report; and (j) affidavit of Edward A. Deeds, dated November 20, 1918, together with chronology and copies of correspondence submitted by Colonel Deeds; (k) letter to the Secretary of War from Hon. John D. Ryan, dated November 6, 1918.

(Signed) S. T. Ansell,
S. T. Ansell,
Acting Judge Advocate General.
B. A. A.

OCT 20 1919

AERIAL AGE WEEKLY

Vol. 8, No. 22 FEBRUARY 10, 1919 10 CENTS A COPY



A fleet of 212 Curtiss J. N. training planes on a two-hour flight over San Diego, California, from Rockwell Field

Future Air Traffic and the Necessary Regulations to Govern It

The King-Bugatti Aviation Engine Described

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AERIAL AGE WEEKLY

Vol. VIII FEBRUARY 10, 1919 No. 22

TABLE OF CONTENTS

	PAGE
Future Air Traffic and the Necessary Regulations to Govern Same	1067
The News of the Week	1069
The Aircraft Trade Review	1071
U. S. Aerial Mail	1072
The Bijur Electric Starter for Aero Engines	1073
The King-Bugatti Aviation Engine	1074
The Miessner Airfone	1081
The Handley Page Type O-400 Bomber	1082
The 450-H.P. Napier "Lion" Engine	1084
Cited for Bravery	1084
Civilian Flying Officially Sanctioned	1085
Naval and Military Aeronautics	1086
Foreign News	1088
Elementary Aeronautics and Model Notes	1089
Aeronitis	1090

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., February 10, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, FEBRUARY 10, 1919 NO. 22

FUTURE AIR TRAFFIC AND NECESSARY REGULATIONS TO GOVERN SAME

Address delivered by Alan R. Hawley, President of the Aero Club of America, at the Convention of the National Rivers and Harbors Congress, held at Washington, D. C., February 5th, 6th and 7th, 1919

AIR traffic will be with us during the coming year, partly as a result of the establishing of aerial transportation lines by private interests and greatly as a means of salvaging the billion dollars' worth of Army and Navy equipment, and employing the 28,000 pilots and 300,000 men being discharged by the U. S. Army and Navy Air Service.

There are three leading aeronautic problems of national importance to be solved, as follows:

(1) The U. S. Army, according to the Senate report, spent in the last two years $1,672,000,000 in aircraft, parts, aerodromes and aeronautic equipment of different kinds. The Navy spent approximately $250,000,000 for aeronautics. Since these figures were made public the figures may have changed somewhat through cancellations of orders. But it is a fact that the Army Air Service has thousands of aeroplanes, about 20,000 Liberty motors, about 7,000,000 yards of aeroplane linen, 30,000,000 feet of aeroplane spruce and general equipment and accessories for sale, for which the Government has paid about $800,000,000. The Air Service has, besides, thirty aerodromes and aviation and balloon depots, two-thirds of which, according to reports, will have to be abandoned at a loss of tens of millions of dollars. The Navy, also, has a substantial lot of aeronautic equipment to dispose of.

(2) The Army and Navy have a total of about 30,000 aviators and balloon pilots in service, each of whom cost not less than $10,000 to train, and about 300,000 motor and plane skilled mechanics and other trained assistants. A few thousands of the pilots have already been demobilized—and they are looking for positions. The first few thousand mechanics who were demobilized found positions elsewhere. The rest are also looking for positions. The Aero Club of America and the Aerial League of America and the aeronautic publications, *Flying*, AERIAL AGE WEEKLY and *Air Power* are flooded with applications for positions. The Peace Program of the Army and Navy plans to use only less than 2,500 pilots and less than 15,000 men. The Army Bill, now before Congress, limits the Air Service to less than 2,000 commissioned officers. The Navy Bill, now before Congress, provides for the retention of only 350 aviators in the Navy, out of the present 10,000 aviators in service.

(3) Now that we have aeroplanes capable of carrying fifty passengers and dirigibles capable of carrying 80 tons of useful load, and it is a common occurrence for aircraft to fly 600 or 800 miles across country between sunrise and sunset, it is necessary to draft regulations to govern aerial navigation and air traffic.

Possible and Logical Solutions of These Problems

Solution to Problems Nos. 1 and 2

There are two solutions to the first problem. The first solution, which does not seem to be the best for the interest of the Government or the country, is to sell the aeroplanes, motors and equipment for whatever sum can be realized, and to abandon the aerodromes. It is doubtful whether this plan would bring back to the Government ten per cent of what it has paid for this equipment.

The worst feature of this plan would be that the dumping on the market of all this equipment will practically kill the aeronautic industry for years and will not solve the problem of finding positions for the 28,000 aviators and 300,000 trained personnel being discharged by the Army and Navy Air Service.

Another bad feature of this plan would be that in case of emergency the Government would find itself without anything, because the personnel would have been disbanded, and the aeroplanes and motors would have been scattered all over the world, and would be out of reach or in bad condition, unfit for service.

The second and best solution to this problem is to organize a Government Aerial Transport Corporation, similar to the Grain Corporation, which shall take over and use for aerial transportation all the aeroplanes, motors and equipment not needed by the War and Navy Departments. The Grain Corporation, it will be recalled, was capitalized at $50,000,000, all the stock being owned by the Government. It was operated by a civilian board of directors, who knew their business and were not hampered in any way by official red tape. This board purchased, distributed and transported all grain during the period of the war and was successful in every way and met with general approval.

This Aerial Transport Corporation would undertake to utilize the aeroplanes, motors, equipment and aerodromes to the best advantage and to the best interests of the Government.

There are 380 cities in the United States that have asked the co-operation of the Aero Club of America and the Aerial League of America to establish air lines to carry passengers, express and mail. This can be considered as public demand for aerial transportation.

It would be a great advantage and would relieve railroad congestion, if all first class mail could be carried by aeroplanes. The Post Office is ready to establish aerial mail lines throughout the country and needs hundreds of twin motored aeroplanes to carry this plan into effect.

Aerial ferries could be established on waterways throughout the United States. Aerial ferries across Long Island Sound, from Newport to Block Island, Cape Charles to Norfolk, Key West to Havana, across the Mississippi, etc., and air lines could, in fact, be established wherever there are waterways, as well as between cities on land. These lines would only be established where there are no such lines operated by private interests and, if it is thought best, the lines once in operation, or the equipment for operating the lines, can be sold to private interests. Likewise, the 30,000,000 feet of spruce and 7,000,000 yards of aeroplane linen, and the tons of castor beans could be sold when the opportunity occurs. It would be wiser to use this material rather than sell it at a fraction of its cost which would create industrial or labor problems by swamping the market.

To establish these air lines or to supply suitable planes to the Post Office, it would probably be necessary to get larger or special aeroplanes. These could be manufactured by established manufacturers, using the Liberty motors, the aeroplane spruce, lines, wheels, wire, turnbuckles, instruments, etc., which the Government has on hand.

In other words, this corporation would be the clearing house in charge of utilizing the $800,000,000 of idle aeronautic equipment to the best advantage and best interest to the country.

By establishing an Aerial Transport Corporation and investing $50,000,000 the Government can;

(a) Salvage a good percentage of the $800,000,000 of idle aeronautic equipment which it has on hand.

(b) Solve the problem of employing a large number of the aviators and trained personnel that are thrown in idleness by demobilization.

(c) Will utilize the military and naval aerodromes and depots which otherwise must be abandoned, at a great loss. If kept in use these aerodromes and hangars may later be sold at fair prices to private concerns, which will, no doubt, be formed during the coming year, to operate aerial transportation lines.

(d) It will keep all this aeronautic equipment and trained personnel under control, so it can be taken over by the Army and Navy in case of emergency.

(e) The Corporation can undertake, if found advisable, to arrange to establish air lines in South and Central American countries, the governments of which are anxious to have aerial transportation to solve their problems of transportation and intercommunication and would welcome some arrangement which would supply them with these air lines in the near future.

(f) It would preclude the possibility of all this aeronautic equipment deteriorating in storehouses while the Government has to pay rental for storing it.

(g) It will also eliminate the huge economic waste that will follow if special materials such as aeroplane spruce and linen must be used for purposes for which ordinary materials would do.

Regulations to Govern Air Traffic

The third problem, that of drafting regulations to govern air traffic, is complex, mainly because the subject is new.

Air traffic is all interstate and international traffic. Aerial transportation is very fast transportation. Aviators carry the mail between New York and Washington daily in a little over two hours. The first trips have shown that the mail will be carried between New York and Chicago in about seven hours. By a system of relays of planes, going at 120 miles an hour, it would be possible to send mail from New York to San Francisco within one day's daylight. This is made possible by the fact that Pacific coast time is three hours slower than Eastern time.

Three classes of regulations will be necessary to regulate aerial navigation, as follows:

(1) International regulations, which will regulate international aerial navigation and will determine whether there shall be freedom of the air or not. These regulations will be decided by international agreement.

(2) National regulations to govern interstate air traffic, based on the regulations which govern railroad, marine and highway interstate traffic. This will involve the registration of aircraft under the rules of the Department of Commerce, just as vessels are registered by the Steamboat Inspection Service under the rules of the Department of Commerce.

Aircraft are really ships navigating in a sea of air. As soon as permanent air routes are established, aircraft will operate between stations like ships operate between ports or trains operate between stations. Hence the possibility of applying the interstate traffic regulations and the Steamboat Inspection Service's rules of registration and inspection.

The British Aerial Transport Committee, which has made a thorough study of the subject, has drafted lengthy regulations, which are somewhat restrictive in nature, for military reasons, but which can be used as a basis for drafting national regulations to govern interstate air traffic.

(3) Regulations to govern aerial sports and competitions. These regulations are drafted by the International Aeronautic Federation, which is composed of the delegates of the National Aero Clubs of the nations of the world. The first regulations were drafted by the Federation in 1905, and all aerial sports and competitions are governed by them. These regulations have been recognized by the courts. They have supported the verdict of national aero clubs, representatives of the Federation, which fined and suspended aeronautic organizations for disobeying the rules of the Federation.

The regulations of the Federation governing aerial sports and contests, are accepted and recognized by 38 countries.

What Other Countries Are Doing

Unless prompt action is taken to establish air lines, the United States, the country of Langley, the Wrights, Curtiss, and other pioneers who helped to give the world the practical aeroplane and hydroaeroplane and flying boat, will again be backwards in aeronautics. Failure to act on time on Aerial preparedness resulted in our being too late aeronautically to be effective in the war. The reports from headquarters printed on December 24th, stated that on November 11th, when hostilities ceased, the American Expeditionary Forces had only 102 American-made aeroplanes at the front. Several hundred more were on the way, but had not yet reached the front. The rest of the planes being used by American aviators were of French or British make.

We paid an enormous price for our unpreparedness, and this should teach us a lesson.

Some of the air lines proposed by other countries are as follows:

Denmark, Norway and Sweden have formed companies for the development of International Commercial Aeronautic Transportation, with a capital of $5,000,000 paid in.

The purpose of the Norwegian company is to establish a rapid transit passenger carrying line which will eventually reach as far as Trondhjem. The first step in this direction will be a line from Christiania to Christiansand. It is the intention of the Norwegian Air Line Company to start with six large flying boats. The trip from Christiania to Christiansand at the present time takes about 18 hours, and the same distance could be covered by aeroplane in about three hours.

It is also the intention of the air line company to establish reserve stations about 30 or 40 miles apart. Three of these reserve stations to have a reserve aeroplane. The other stations will simply keep the most necessary supplies—gasoline, oil, etc. It is the intention of the company-to keep two planes running and four in reserve for this first route.

Places have been made for permanent landing places all the way to Trondhjem, and when these planes are in operation they will also operate about twenty-six flying boats.

Besides the Norwegian Air Line there is also established an International Line to the west coast of Norway, to Scotland from Christiania, to Gottenburg, and to Copenhagen.

It was the intention of the Norwegian company to have this line started as early as May of last year, but on account of the war it was impossible to secure the necessary planes.

In Canada the business men of Charlottetown, Prince Edward Island, have decided to form a company to organize and maintain an aerial mail service with the mainland, and in order to urge its cooperation in the development of aeroplanes, a deputation of the Canadian Division of the Aerial League of the British Empire waited upon the Government on December 9th, when members of the Cabinet expressed themselves as being heartily in sympathy with the objects of the League.

In Italy mail is being carried from Genoa to Naples and from the mainland to the Island of Sicily and extensive plans have been made by Mr. Caproni, one of the foremost constructors of large machines for commercial development in Italy.

In France the Government authorities are sending food and supplies by aeroplane to places in the devasted districts of Northern France that cannot be reached in any other way as well, and they have utilized for this purpose the large bombing machines and 70 tons of food and supplies are being delivered daily, according to recent reports.

Many companies are also being formed for the purpose of promoting commercial aviation.

The London-Paris passenger air line is already in operation. Some of the proposed routes are:

(1) From London to Salonica, by way of Nice, Rome Brindisi and Vallona.

(2) Between Australia and London, proposed at a meeting of business men at Sydney on October 2nd. The aerial service would take 150 hours for the trip.

(3) From London to everywhere, proposed and being carried out by Holt Thomas, the managing director of the British Aircraft Manufacturing Company, who explains his plans as follows:

"We are opening air routes all over the world in conjunction with local companies. In France we will operate in connection with a French company, and already arrangements for such a service are practically completed in Norway, Denmark, Italy, India and Africa. Later we will extend the service to Japan, China and the West Indies."

(4) From India to other parts of the British Empire, proposed by the Government of India as a postal service.

(5) From India, via Alexandria, and the Red Sea to Australia, via Cape Town, to New Zealand.

(*Continued on page* 1085)



THE NEWS OF THE WEEK



Sturtevant Company Planning Airship Line

The Manufacturers' Aircraft Association announced that one of its members was investigating the feasibility of establishing passenger service by dirigible between New York and Chicago. J. M. McElroy, chief engineer of the Sturtevant Airplane Company, of Boston, and Noble Foss, son of ex-Governor Foss of Massachusetts, estimate that a service with four airships can be established at an initial cost of about $5,000,000.

Preliminary plans for the aircraft to be used include carrying capacity for twenty-five passengers and ten members of a crew, and it is pointed out in the announcement that development of this type of airship is entirely feasible, inasmuch as dirigibles, as well as aeroplanes, have carried more persons than is proposed. Their first estimate is that it would cost about 65 cents a mile to carry each passenger, and that the fare probably would be more han $520 to Chicago. This estimate follows closely the figures of the report of the Civil Aerial Transport Committee of Great Britain and other organizations have made investigations.

"The ships would be of the Zeppelin type, rigid housing, and multiple compartment construction," says the announcement. " Helium gas would be used, thus removing the danger of inflammability that now exists with the use of hydrogen. Recent figures give a cost of 10 cents per cubic foot, which would amount to $50,000 for the initial inflation of 500,000 cubic foot capacity ship. The loss due to leakage is said to be less than that of hydrogen, and there are at least two plants in this country built especially for the production of this gas, which would insure an adequate supply.

"Cabin accommodations, under the plans, would be in the interior of the housing structure and in the centre of the ship, connected to the top of the structure, which would be a housed-in observation deck, by a spiral tubular staircasing. The cars would be swung out from the hull to give clearance for the propellers.

"The ship would be approximately 425 feet long and 45 feet in diameter. Its engines would total 1,200 horsepower. The bag would have 650,000 cubic foot capacity, providing a gross lift of 20 tons at sea level, which would mean approximately 10 tons useful lift. It would be capable of flying 70 miles an hour, and a trip to Chicago could be made comfortably in less than twelve hours.

"The power plant would consist of twin engines, side by side, driving through gears a central stub shaft mounting a variable pitch air screw. This arrangement would centralize the power and allow operation of one or both motors in the car to meet conditions of adverse or favorable winds, or fast or slow speeds. The engines would be heavier constructed than the typical aeroplane motor, with the reliability and endurance of the automobile type. Gasoline and oil tanks would be located along the keel and fuel fed to the engines through an automatic pressure system that would insure even loss in tanks, so as not to affect the balance of the ship."

Mr. McElroy believes that the greatest difficulty to be overcome in handling these air liners will be in landing them, but he asserts that problem can be solved. Passengers could be lowered in a cage, he thinks, or heavy windlasses could ease the craft into a dock. Another suggestion is that a dock floating in the air be devised so that he changes of the wind would not hamper a landing. This dock would be anchored only at one end.

As proof of their ideas that the use of the type of airships is feasible the promoters point to the successful flight of a German ship to East Africa, a journey of more than 7,000 miles, without reprovisioning. The last successful flight cited is that of the United States Navy dirigible C-1 from Long Island to Key West. From this preliminary type larger ships for oceanic flights probably could be developed, the announcement says, in pointing out that it is more desirable to carry out the preliminary experiments over land.

Manufacturers To Have Large Exhibits at Aero Show

The committee in charge of the arrangements for the Aero Show to be held at Madison Square Garden and the 69th Regiment Armory from March 1st to March 15th, is laying particular stress on the artistic arrangement of the Exhibits. Practically all aircraft manufacturers will be represented.

It is known that the Dayton-Wright Airplane Company, of Dayton, O., will have two machines on view, one of which, it is declared, will be novel in design and indicative of the new mode of travel. The Curtiss Aeroplane & Motor Corporation of Buffalo, N. Y., has reserved space for four planes and seaplanes. The L. W. F. Engineering Corporation, of College Point, L. I., is to exhibit three: the Aeromarine Plane and Motor Company, of New York City, will have one special design on display. Three Thomas-Morse models from the factory at Ithaca are to be placed as well as one from the Burgess Company, of Marblehead, Mass. The Gallaudet Aircraft Corporation of East Greenwich, R. I., is to show two of its productions.

While most of the foreign exhibits will be made directly by the United States government, there is considerable interest in the model to be shown by Pomilio Brothers, Italian manufacturers, with offices in New York.

The mail carrying planes used on the New York to Washington route will be on display.

One of the ingenious and useful devices to be exhibited is an improved type of aeroplane compass, which has underneath it a special magnet which counteracts any local magnetic attraction and makes long distance flights possible without ground observation.

Information just received from Washington indicates that balloons are to form no small part of the exposition. The army has a considerable number of these, of various types and sizes, ready to display. It has been suggested that a Caquot be inflated in Madison Square Garden. Army engineers who have figured on this work say that it can be done, although the balloon measures 96 by 30 feet. Another example is the famous French barrage balloon, 30 by 15 feet. It was this type of balloon that entered prominently into the defense of Paris.

Flew 2,900 Miles in 28 Hours 50 Minutes

Houston, Texas, Jan. 27.—Two De Haviland Liberty-motored planes, which left Ellington Field December 14 for a mapping and aerial observation flight from the Gulf of Mexico to the Great Lakes, returned to the field yesterday after covering 2,900 miles in twenty-eight hours and fifty minutes, flying time.

At the outset the two planes encountered bad weather and were detained ten days at St. Louis, nine days at Indianapolis, and six days at Detroit. During the trip they ran into temperatures 10 degrees below zero, heavy rains, and snow.

Aero Club of Northwest Arranging for Landing Places

Seattle, Washington.—The Aero Club of the Northwest has been conducting an active campaign for the establishment of air routes in Washington and Oregon. Inquiries have been conducted in the leading cities to ascertain the landing facilities for aeroplanes, hydroaeroplanes, and seaplanes available, and in cases where unavailable, what civic body would be interested in the establishment of aerial landing places.

The Board of Trustees of the Aero Club of the Northwest have passed a resolution making eligible to special membership all men in the aviation service, both Army and Navy, who have won their wings.

Great Britain Restricts Imports

Washington, D. C., January 29.—In order to facilitate the rehabilitation of her industries, and restore the balanced commercial relationships existing in pre-war days, the British Government has decided on certain important restrictions of imports. Those of special interest to aeronautic and allied industries are: manufactures of aluminum, metal baths of all kinds, woodworking machinery of various kinds, pictures, prints, photographs, weighing machines and balances of all types.

Major Macauley Completes Transcontinental Flight

Americus, Ga.—Major Theodore Macauley has completed his transcontinental flight and started on his return trip from the Atlantic coast to Taliaferro Field, where he is commanding officer, on January 26.

Major Macauley flew from Taliaferro Field to San Diego, Cal., then to Arcadia, Fla.

600 Pound Seaplane Makes Speed Record

The first scout hydroaeroplane detailed at the Naval Air Station, Anacostia, with speed capacity, was tried out recently.

Lieut. U. G. Shipman, who has been flying for seven years, piloted the plane in its first flight down the Potomac, attaining speed of 150 miles an hour, an innovation in the speed record of a hydroaeroplane.

The hydroaeroplane weighs approximately 600 pounds, and is propelled by a 100 horse-power motor.

Other trial flights will be made over Washington before the featherweight seaplane is shipped to a Western station for future experimental purposes.

United Aircraft Engineering Corporation Buys Canadian Equipment

The United Aircraft Engineering Corporation of New York City has purchased a large part of Canada's air service equipment.

The purchase included approximately 400 Curtiss JN-4 biplane, about 900 ninety-horsepower Curtiss OX motors and thousands of spare parts, struts, propellers, wires, wings and fuselages. In conjunction with this equipment the United Aircraft Engineering Corporation intends to use a new monoplane, the Stout, an invention of William B. Stout, of Dayton, Ohio, which the corporation is developing. This machine is being built in two types, a weight carrier and a single seater.



The three leading American Aces, who have just returned from France. Left to right: Lieut. P. F. Baer, Capt. Eddie Rickenbacker and Capt. Douglas Campbell

Fire at Far Rockaway Air Station

The explosion of gasoline in a tank on which repairs were being made with a blow torch in one of the largest hangars at the Naval Air School, Rockaway Beach, started a fire that destroyed the hangar and another aircraft shed adjoining and partly burned five small auxiliary buildings.

It was reported, but not officially admitted, that four large seaplanes and eight small Spads housed in the two hangars were destroyed.

Rickenbacker and Meissner Return

The White Star liner *Adriatic* brought in on January 31 Capt. Eddie Rickenbacker and Major James A. Meissner, two of the most intrepid yet unpretentious stars in the American aviation service, but all the committees that wanted to welcome them were debarred from going aboard the ship by order of the War Department.

Capt. Rickenbacker, of Detroit, was head of the "Hat in the Ring Squadron," otherwise No. 94, officially credited with destroying twenty-six Boche machines.

Major Meissner, of Flatbush, put eight Hun planes out of business. Flatbush was disappointed because it could not get anywhere near the Major, and several automobile and aero organizations protested when they learned that they would have to talk with Capt. Eddie over the rail.

Ban on Promotions Explained

Washington, D. C.—Secretary of War Baker has made a reply to the many critics of the policy of the War Department in prohibiting promotion to officers. Appointments are made only when vacancies exist, and will continue to be so made. However, when the demobilization orders were issued, there was created a surplus of officers of every grade, and hence no further promotions were possible. There is no contemplation of change of this policy.

Aerial Research Emphasized by Col. Bane

Washington, D. C.—In discussing the Army Bill before the House Committee on Military Affairs, Col. T. H. Bane, chief of the engineering work of the Air Service, laid great emphasis upon the necessity of carrying on all manner of experimental and research work in the aviation field, both with regard to planes and motors.

Col. Bane stated that it will be the policy of the experimental and research bureau to have exact working details, including drawings and blue prints, of the most highly developed aeroplanes of each class and the most highly developed and most satisfactory motor for each type of machine, so that in the event of the country being involved in war, immediate production of all types may be inaugurated. The amount of appropriation called for in the bill under consideration for such work is $10,663,280.

Regarding the purchase of flying fields, it was pointed out before the committee that $4,000,000 would be sufficient to purchase all fields which the Government for the present is not planning to place in active service. In view of the fact that $65,000,000 worth of equipment has been installed, it would be a measure of great economy. Fourteen fields of the thirty in operation during the war are to be maintained.

FONCK TO BE GUEST AT AERO CLUB BANQUET

Lieut. Rene Fonck, ace of all aces, who has an official record of 75 German machines to his credit, and an unofficial record of 125 machines, and who on two occasions has brought down six machines in one day, has been granted permission by the French Government to attend the 13th Annual Banquet of the Aero Club of America, and will be the guest of honor.

Lieut. Charles Nungesser, second in the list of French aces and Robert Esnault Pelterie, President of the Aeronautic Industries Association of France, are accompanying Lieut. Fonck and will be present at the Banquet.

Among the other aces expected to be present are, Colonel William A. Bishop, VC., D.S.O., M.C., D.F.C., Lieut. Colonel William Thaw, Captain Edward V. Rickenbacker, Major James A. Meissner, Captain Arthur J. Coyle, in command of the 1st Aero Squadron and one of the 300 aviators trained by the Aero Club of America in 1915-1916, and as many of the American Aviation Officers from the front as are free to attend on that evening.

Rear Admiral Robert E. Peary has accepted an invitation to speak upon "Exploration by Aeroplane" and the opportunity for great aerial transportation systems to be extended all over the United States.

Major General Charles T. Menoher, Director of the Air Service, will speak on Military Aeronautics, and Rear Admiral Bradley A. Fiske, U.S.N., retired, will speak upon recent developments in maritime Aeronautics.

Mr. John Hays Hammond, Jr., will speak on the subject "Polar Aero Radio Survey."

The Honorable Fiorello H. La Guardia, Major in the Air Service and Member of Congress, will speak upon the wonderful developments in aviation in Italy, and an invitation has been extended to Signor Gianni Caproni, who is expected to arrive in this country.

Col. Henry Arnold, Chief of Air Service on Coast

San Diego, Cal.—Col. Henry H. Arnold, one of the oldest American aviators in point of service, has been made military aeronautical officer for the California district. He will maintain offices at Coronado for himself and his staff.

Restrictions on Aeroplane Exhibitions Withdrawn

President Wilson has issued, under date of December 16, 1918, a proclamation revoking the proclamation of January 1, 1918, which imposed restrictions upon private aeroplane exhibitions in the United States.

New R. M. A.'s

The following named officers are rated as Reserve Military Aviators: Second Lieuts. Robert W. Catlin, Richard C. Sogge, Ernest W. Force, Arnold B. Henderson and Edmund Pincoffs.

Flying for Discharged Aviators

The Division of Military Aeronautics has announced that members of the Officers' Reserve Corps who are R. M. A.'s may be authorized upon application, at the discretion and at the convenience of the commanding officers, to make flights in Army aeroplanes. It is pointed out, however, that cross-country flights should not be permitted and that the regular training of pilots should not be interfered with.

A scheme providing for the use of ships by Reserve Officers is in preparation as part of the permanent organization of the Air Service, but cannot be put into effect at the present time.

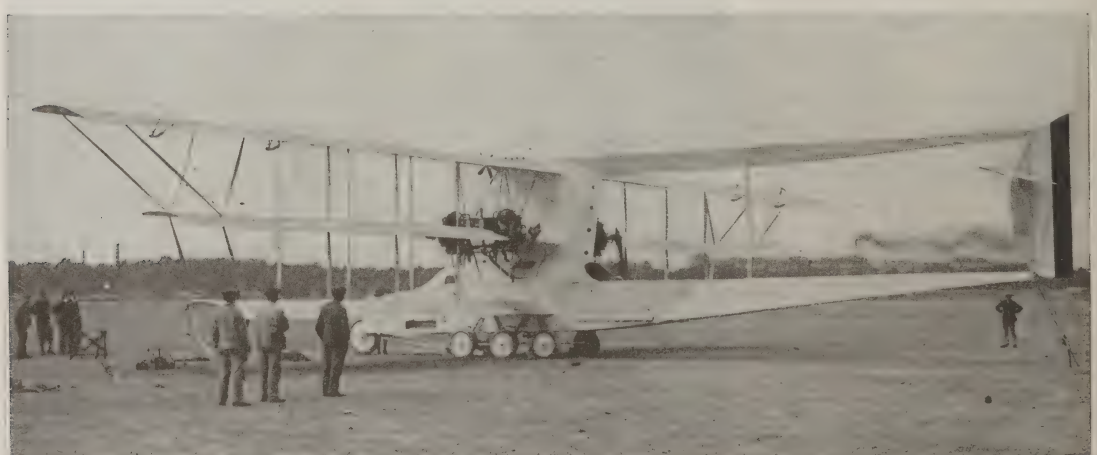
Geodetic Survey Planning Aerial Mapping

The following letter was received by the Standard Aircraft Corporation officials from George Otis Smith, director of the U. S. Geological Survey.

"The Geodetic Survey in cooperation first with the Council of National Defense and later with the Engineer Corps of the army has for more than a year been engaged in the development of a method of mapping, which involves the use of aeroplane photographs. The Geodetic Survey has not yet employed this method in its own work, but the investigations along this line are being continued."

Air Service History to be Written

Washington, D. C.—Lieutenant H. W. Heintz, Air Service, has been detailed to the Aeronautical Information Branch of the Executive Section, D.M.A., with the duty of compiling the history of every Aero Squadron that has served in American Expeditionary Forces. The originals of these documents will be filed in Washington and a set will be forwarded to Information Section, Air Service, A.E.F.



A Voisin Triplane with four motors

The AIRCRAFT TRADE REVIEW

A. E. J.

Curtiss Production Record

The figures for Curtiss motor and plane production have recently been made public. The Curtiss Company produced approximately 80% of the motors used on training planes. The Hammondsport plant made and shipped 5,474. At the Willys-Morrow plant in Elmira, 6,491 Curtiss motors are made.

At the Churchill street plant, Curtiss workmen built a total of 5,181 out of the 7,200 training planes of all types furnished the United States government.

Curtiss flying boats were largely used by the navy. Curtiss workmen built 90% of all furnished the United States and a large percentage of those used by our Allies. At the North Elmwood plant they built 673 of the small type known as the H-S-2-L. Four F-5's among the largest flying boats in the world were completed at the time of armistice. The Austin street plant built 149 gigantic flying whales of the H-16 type for the United States navy and the British admiralty. The total number of naval craft built exceeds 1,026.

And while this work was under way, the Curtiss Company designed and perfected the K-12 and K-6 motors, new types for aviation, and the most efficient the world has yet seen. They built also the greatest flying boat in the world, the NC-1, which recently flew with 50 passengers aboard.

B. F. Goodrich Co. Has Profitable Year

In a preliminary report of the B. F. Goodrich Company, manufacturers of rubbers goods, for the year 1918, net sales are shown to have been $123,400,000 and the net profits $15,000,000, before making provisions for Federal income and excess profits taxes, but after allowances for maintenance, charges, depreciation and doubtful debts. No provision was made as to the excess profits taxes because the company desired to await the terms of the pending revenue bill.

The Goodrich Company report for 1917 showed profits of $12,794,677 before making war tax allowances. After charging off $2,250,000 for such taxes there remained a balance for dividends of $10,544,677.

Gisholt Turret Lathe Adaptable To Many Uses

An examination of the Gisholt Turret Lathe by prospective users frequently leads to the conclusion that the lathe will fill the particular requirements of service under consideration.

The Gisholt Machine Company has issued a new catalog, which not only describes the Turret Lathe but more particularly what the lathe can do. Purchasers of lathes will be interested in the new catalog.

Precision Instrument Company Has Developed an Air Speed Indicator

At the request of the Bureau of Aircraft Production, the Precision Instrument Company of Detroit has developed an air speed indicator, which, unlike other gauges, is so constructed as to have all parts interchangeable, making replacements easy.

The gauge is a Venturi design of the Lahm type. The pressure side of the gauge is connected to the diaphragm, the vacuum being within the case.

The Precision gauge is accurate within 1½ miles over the entire scale; the friction does not affect the reading one mile per hour; the pointer remains steady under test conditions, and error due to tipping amounts to less than a mile per hour.

The Magnet Meter

Herman A. Holz, of New York City, manufacturer of measuring instruments for magnetic and metallurgical testing work, has brought out a standardized instrument for measuring the flux and retentivity of permanent magnets. The device is particularly adapted for laboratory measurements of horse shoe magnets for magnetos. A measuring instrument for this purpose must be capable of measuring not only the initial flux, but its power to retain flux under the adverse conditions of use, particularly those encountered in the case of magnetos mounted on aeroplanes and automobile motors.

The device is so designed that the accuracy of the measurements are in no way impaired by residual magnetic effects, even though a very weak magnet is measured immediately after measuring a strong one.

The instrument is rapid working, rugged and reliable. The current in the moving coil circuit is supplied from a dry cell, and the current in the solenoid circuit from a 6 to 8 volt storage battery. No bushings are required to adjust the instrument for testing different sizes of magnets.

This instrument should be a useful piece of equipment for the magneto designing engineer.

Recent Trade Mark Decisions

The patent office has confirmed through the Court of Appeals several important trade mark decisions. The use of the alphabet is limited to designating origin or ownership, and is not extended to manufacturers to designate gradings and quality of articles.

Another case of conflicting trade marks was decided in favor of the manufacturer who had first registered his trade mark, although it was made popular and became known through the publicity of the second manufacturer. First-come-First-served rule applies, regardless of the circumstances.

Dearborn Chemical Company Has Rust Preventor

A problem which has concerned the parts manufacturer and sub-contractor is the shipment of his products in such a manner that they will reach its destination in presentable condition without any rusting.

Realizing that the development of a material which can be applied on iron and steel products just prior to shipment which will prevent rusting would be of great value in all industries, the Dearborn Chemical Company have, after several years of research, placed their product—No-Ox-Ide—on the market.

This material prevents rust in two ways: first, by forming a physical film against the elements in the atmosphere; and second, by acting chemically on the corrosive elements, thereby preventing them from attacking the metal.

Another product recently put on the market by the Dearborn Chemical Company is Dearborline, which is used to remove the oils, gummy substances, grit, iron filings, and other matter on iron and steel products, leaving the article clear for shipping or the application of paint, varnish, plating or other coating.

Great Lakes Aviation School Remains Intact

Chicago, January 26.—Announcement has been made that the Great Lakes Aviation Training School will be kept intact and that other aviation schools in the United States will be brought to Great Lakes and concentrated in one big school.

Among the schools to be transferred to Great Lakes are: Naval Air Training Station, Pensacola; Boston School of Technology; Navy Liberty Motor School, Detroit; Navy Gas Engine School, Columbia University, New York; Naval Detachment, at Dunwoodie Institute, Minneapolis; Naval Training Station, Hampton Roads, Va.

Book Reviews

HEROES OF AVIATION; compiled by La Tourette Driggs. The author describes the thrilling deeds of aviators in the great war, whose deeds will never die. The value of the fourth arm of the military service is strongly brought out; it seems to overshadow the older branches—infantry, cavalry, artillery—with its brilliant tales of heroism and courageous initiative. This book belongs in every library which is to have a complete record of the war.

This book can be purchased at the Aeronautic Library, Inc., 299 Madison Avenue, New York City. Price $1.65, post paid.



The Glenn L. Martin Twin Liberty Motored Bomber

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service



PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

New Aerial Mail Terminal Approved

Newark, N. J.—Three examining officers representing the aerial mail service approved the purchase of a tract as a terminal for the New York-Chicago and other mail routes. The land is known as the Heller Tract.

Mr. T. H. Wheeless, representing the Post Office Department in Newark, stated that the Post Office officials who examined the tract were James B. Corridon, Chief of the Railway Mail Adjustment Bureau; Lieut. James Edgerton, of Nutley, N. J., Chief of Operations of the Aerial Mail Service, and Dr. J. K. Bussler.

Fast Passenger, Freight, and Mail Service Between U. S. and Brazil Is Urged

The American Chamber of Commerce for Brazil has adopted resolutions urging immediate establishment of a fast passenger, mail and freight service between Brazil and the United States under American ownership. The service would be apportioned as follows:

Tri-monthly to Rio Janeiro, Bahia and Santos.
Bi-monthly to Para and Pernambuco.
Monthly to Parana and Rio Grande.

The resolutions are understood to have official support. In part they read:

"We believe it is most imperative for the establishment and maintenance of American trade prestige in Brazil that such a service should be immediately established under American ownership and registry.

"The United States has assumed the role of protector and benefactor of South America, yet has neglected to furnish practical means for promoting trade and friendship. Brazil, who is her best friend and staunchest ally, is dependent upon European transportation companies, which allot only sufficient tonnage to attend to the portion of American trade which cannot be diverted to their own countries.

"By their control of Brazilian transportation, Europeans in the past have profited from freight and insurance exchange by financing trade between Brazil and America. They have also been enabled to monopolize the sale of low grade materials which are profitable only when freights are low.

"We also believe official announcement of regular sailing schedules would be worth millions to American trade, which could contract for business that is now returning to European sources of supply because American firms are unable to guarantee shipments on definite dates. Such an announcement also would enable Brazilian exporters to contract with American consumers for fixed quantities and regular deliveries, enabling the exporters to arrange credits and form organizations for producing and developing products required by America.

"Furthermore, the time to establish this service is now. Government and private interests should make every effort, even at the expense of other plans, to promote Brazilian-American trade relations. because all activities—commercial, financial and even political—depend upon establishment of communications between countries."

The use of aircraft for the completion of this program has been suggested by members of the Chamber of Commerce, an aerial mail company being organized to handle mail between London and Buenos Ayres.

Navy Has Taken Official Films

Naval Air Station, Pauillac, France.—Following the photographing (both motion and still) of the President's convoy, led by U.S.S. *Pennsylvania*, New York to Brest, the overseas section of the Photographic Division of the Bureau of Navigation, U. S. Navy, in charge of Lieut. Wells Hawks, U.S.N.R.F., left the air base supply station, Pauillac (Gironde), France, December 29, 1918, on a trip to take in all of the Navy activities in European waters. The party has just completed a week of photography in this vicinity and station, which is in command of Captain F. T. Evans, U.S.N., and from which station all of the planes and supplies for flying in France have been assembled and distributed. The party in association with Lieut. C. E. Ruttan, U.S.N.R.F., the aviator and photographer, made a series of midair photographs with two great seaplanes or flying boats. The aircraft went up to a height of 2,000 feet and photographs, both motion and still, were taken of each machine as it darted under and over each other above the river. In one machine, with Ensign Lopp, pilot, was Lieut. Hawks, while in the gun pit forward Chief Yeoman Harold Wenstrom ground out film from a motion picture camera. In the other machine was Lieut. Ruttan with an aerial camera, Chief Yeoman Edgar Hopp with a graflex, the pilot being Ensign Talbot. Lieut. Ruttan had just come from Brest, where in a dirigible he made pictures of the President's ship, while Lieut. Hawks' party worked from the forward turret of the battleship *Pennsylvania*. Pictures were also taken of the convoy by Chief Printer J. J. McCutcheon, who has been in charge of the photographic hut at the Pauillac station. For the tour the party travelled in a big truck fitted for apparatus and all supplies, rations for out of the way journeys. The party left here for Brest, a run of 458 miles, stops being made at Bordeaux, LaRochelle, Rochfort and the mine sweeper base at Lorient. After Brest the party headed for Paris, after picturing the Marine Camp at Finistere. From Paris it will go to Chateau Thierry and then cover places wherever the Navy had activities, covering the ground traversed by the big 16-inch battery, which the Navy sent into the interior on railroad cars. The activities in England will be covered in a like manner.

Aeroplanes May Protect Our Forests

The forest service of the United States Department of Agriculture is desirous of installing an aeroplane patrol service in connection with its work of fire protection, but is unable to put the plan into effect because of an insufficient appropriation. This information became known through a letter written to the Standard Aircraft Corporation of New Jersey by John L. Hall, Acting Forester.

"We have given considerable thought to the use of aircraft in the fire patrol of the national forests," declared Hall. "I believe that they could be used to excellent advantage and would like very much the opportunity of giving them a thorough trial. The Forest Service, however, as a government agency, is not prepared to purchase and operate a sufficient number of aircraft to adequately patrol the national forests; our appropriations are entirely too limited for a project of that magnitude.

"Similarly we are hardly in a position to ask Congress for additional funds for this purpose in view of the equipment now on hand by the Division of Military Aeronautics and also the fact that this division has numerous trained officers, observers, mechanics, etc. Briefly, we should like to have the Division of Military Aeronautics cooperate with the Forest Service in the patrol of national forests through the use of aircraft."

It is expected that the Forestry Bureau will urge Congress to provide an arrangement whereby the surplus of government aeroplanes on hand may be utilized for the important duties of forest patrol. The advantage of aerial scouting over the present methods has been forcibly impressed upon the forestry officials. A plan of operation similar to the one used in connection with the air-mail service is contemplated.

It has been estimated that thousands of dollars worth of valuable timber would be saved annually if flying machines were used for the detection of forest fires and the transportation of fire-fighting crews to the scenes of conflagration.

Weather Bureau to Use Aircraft

The Weather Bureau is contemplating the utilization of aeroplanes. C. F. Marvin, Chief of the Weather Bureau, made this statement in Washington recently:

"Unquestionably meteorological observations in aeroplanes will eventually form an important feature of the Weather Bureau work. There is no reason to doubt that such observations, taken at short intervals of time and over widely distributed areas, would materially assist us in determining the depth, extent and intensity of storms, and therefore, in increasing the accuracy of the weather forecasts."

Dirigible C-3 on 5 Day Endurance Test

Cape May, February 1.—The 300 foot dirigible C-3 of the submarine patrol station at Sewell's Point, manned by eight men, with supplies and provisions for 120 hours, started on January 30 for a five day endurance flight. So far she has not flown more than thirty miles from Cape May Station, but has hovered over the Army Hospital, exchanging signals with the wounded men and the nurses stationed here.

The dirigible is in command of Ensign Houghton. The men will receive a prize of $8,000 each if they succeed in completing the test.

Seeks Permission to Erect Hydroaeroplane Hangars in New York Harbor

New York, February 3.—An official proposal for the construction of ten hangars has been received by Commissioner of Docks, Mr. Murray Hulbert, to serve as the New York terminal for aerial service between New York, Boston and Philadelphia. Mr. Hulbert will approve the proposal, with the recommendation that the hangar be erected where they will not interfere with the heavy traffic in New York harbor.

Trancontinental Flight Cost $2 Per Mile for Eight Men

Washington, February 3.—Major Albert D. Smith started on the return flight to the Pacific coast from Bolling Field.

The trip from Rockwell Field, San Diego, to New York was accomplished in a flying time of fifty-five hours, for a distance of 4,500 miles. The total cost of the pioneer flight is given as $8,827.50 for the four planes and eight men.

The return journey will cover the southern route, the eastward trip having been made over the northern part of the country.

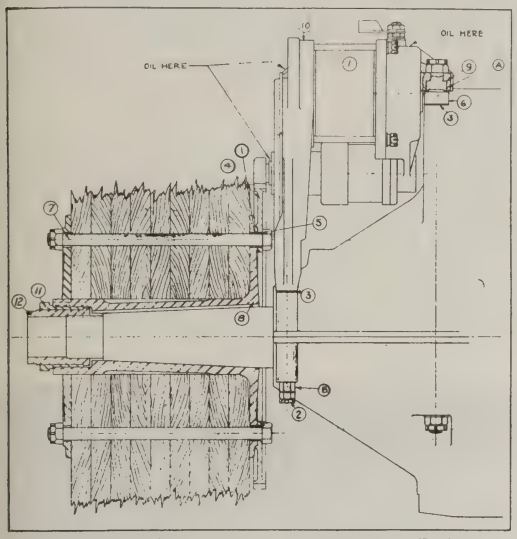
Oversea Aviators Plan Reunions

Aviation Instruction Center, France.—Pending demobilization of America's largest oversea instruction center, plans are under way at this post to make chance meetings of soldiers attached to the Aviation Instruction Center possible. A fraternal organization bearing the name "Issoudun," having as its emblem the Skull and Cross Bones, is to form the basis of reunion. It is proposed to have enterprising hotel men designate a room in their hostelries as "Issoudun" room, and to maintain registers of local "Issoudunites." As practically every aviator who has served in France has at some time or other been assigned to this post, the possibilities of such a mutually helpful and fraternal organization are bright. A plea for activity on the part of those already in the United States has been issued.

THE BIJUR ELECTRIC STARTER FOR AERO ENGINES

AMONG the war-time developments in the aeronautic field of which nothing has hitherto been published are the electric starters built by the Bijur Motor Appliance Company for the Liberty and other aeronautical engines, and supplied in some quantity to the Navy. Until recently there has been a federal injunction in force, prohibiting the disclosure of this device without permission of the Secretary of War, or of the Navy, but this has lately been vacated.

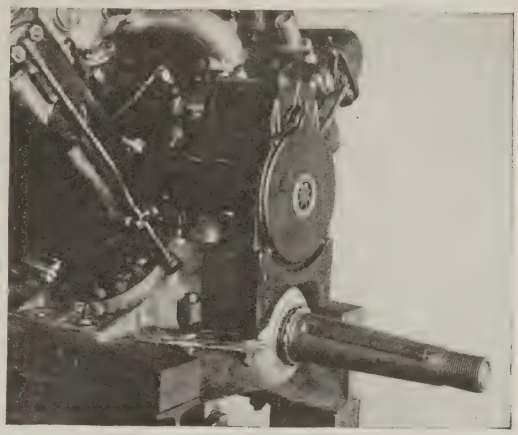
As will be noted from the accompanying illustrations, this device embodies several interesting features. The mechanism consists of a relatively small electric motor, of special design, fitted with a double gear reduction and a special form of the Bijur automatic shift. This mounts directly on the crankcase at the propeller end of the production Liberty engine, without the use of intermediate brackets and without making necessary any alteration to the engine.



Application of the Bijur Starter to the Liberty Engine

To mount the Bijur starter on the Liberty engine two nuts at the base of the cylinders nearest the propeller end (marked A in illustration) are removed and special extension studs are screwed on. Two lugs on the starting motor casing fit over these and are retained by the original engine nuts, which are put on the extension studs. The two end bearing bolts at the extreme propeller end of the engine crankcase (marked B in illustration) are removed and are replaced by two long studs which project from the starter housing.

Normally there is no connection between the starting motor



The Bijur Starter on a Hispano-Suiza Engine

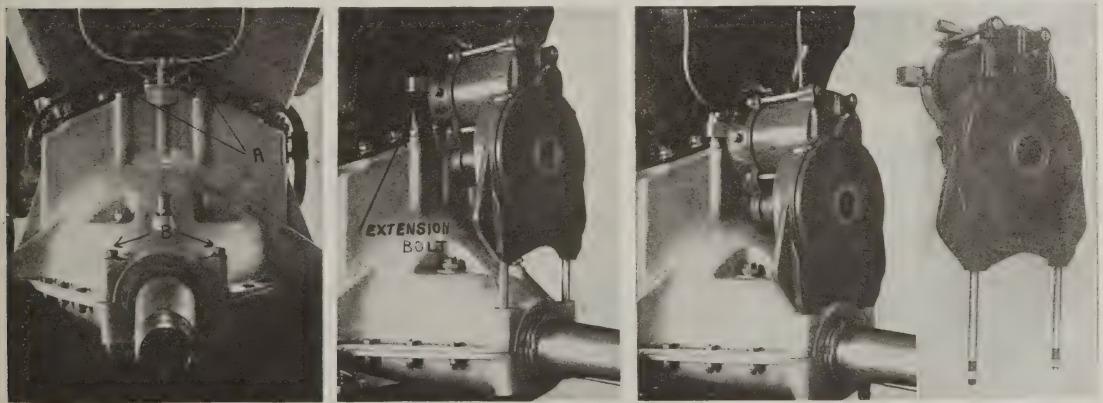
and the crankshaft. A gear ring is placed inside the propeller hub flange and held by the regular propeller bolts passing through holes jig-drilled for the pupose. The pinion of the starting motor is normally retained within the housing. When the starting switch is depressed the pinion meshes with the teeth of the gear ring and cranks the engine. The starting of the engine under its own power automatically demeshes the pinion. Provision is made which eliminates the possibility of the teeth jamming and they will not mesh with the gear ring if the switch is depressed while the engine is running. The use of an eight-tooth pinion is something of an innovation and makes possible a high gear reduction.

The Bijur Liberty Starter was originally designed for the Navy for use especially on seaplanes. At the suggestion of the Airplane Engineering Department of the Signal Corps, the design was made such as to obtain a starter of minimum weight and current consumption combined with a maximum of cranking power. It was thought that the obtaining of these two objects would, of necessity, entail the cutting down the cranking speed to a very low value, but this was found not to be the case. The success of the design as produced will be evident from the following data:

Weight of starting motor..... 20.5 lbs.
Normal cranking current.....100 Amperes (12 volt battery)
Maximum torque available on engine crankshaft..1300 ft. lbs.
Normal cranking speed (crankshaft).....40-50 R.P.M.

The propeller end of the engine was selected as the most feasible place of application because it makes possible the use of a simple and sturdy form of drive without the use of clutches or couplings. It also makes use of space not available for other purposes, while it is often desired to drive auxiliaries from the ignition end of this engine.

Present practice also seems to tend to the use of a fire bulkhead closely behind the ignition end and gasoline tanks immediately beyond, which makes this end of the engine more or less inaccessible. The Bijur Company states, however, that it is prepared to furnish similar starting motors to fit the ignition end of this and other aeronautical engines.



The Bijur Electric Starter applied to the Liberty "12" Engine. 1—Engine without starter. 2—Application ready for starter; starting motor in position. 3—Application complete. 4—The entire starting motor assembly

THE KING-BUGATTI AVIATION ENGINE

By G. DOUGLAS WARDROP, M.S.A.E., A.S.M.E.

WE are enabled to present to the readers of AERIAL AGE this week the first comprehensive engineering description of the King-Bugatti Aviation Engine, constructed by the Duesenberg Motors Corporation of Elizabeth, New Jersey, for the United States Government. Because of its unique type of design the Bugatti, when it was first brought over from France, and it was determined to put it into manufacture in this country, aroused a very great deal of interest in automotive circles, the interest being second only that evidenced in the Liberty. The Bugatti was of the geared type possessing certain features not embodied in the Liberty, and with the special feature of being able to mount a 37 millimeter cannon firing through the propeller shaft.

The United States Government put the redesigning of this power plant in the hands of Charles B. King, A.M.E., of the Signal Corps and he was made responsible for all changes. With a large force of draftsmen the work of adjusting the Bugatti type of design to American manufacturing methods was undertaken and upon the completion of the redesigned motor Mr. King transferred to the Aircraft Production Board a report which considered carefully all the details which are discussed hereafter and in which only minor changes have been made, since the report was handed in, which emphasizes the good judgment used when the motor was being redesigned.

The test referred to was one of fifty hours' endurance, ten periods of five hours each, the first half hour at 410 horse power and 4 hrs. 30 minutes at 380 h.p. The test was made at the Duesenberg test room. The compression ratio of the motor was 5-1; the gear reduction 28:42. The carburetors used were four special Miller with barrel throttle, with choke 1⅞", and 7 jets size No. 76, 76, 75, 72, 69, 58, 53. Four Dixie Model 800-38° advance magnetos; AC Titan Spark Plugs, two per cylinder. A calibrated propeller was used, and power readings used corresponding to speed reading. During the test a grand total of 19,284 H.P. hours were delivered.

Previous to this test 9 engines had been assembled and had run a total of 110 hours, during which test many details were studied. One of the points that required special study was the pressure oiling system due to cross interference of oil in the crank case. The non-pressure system as used in the French type of Bugatti was considered unsafe owing to the many long leads and on the uncertainty of outside temperature, and it was consequently abandoned. The pressure system developed by Mr. King has worked out very satisfactorily, as was proved by the fine condition of the bearings and running parts after the fifty hour test.

During the fifty hour test the performance was very consistent, as will be noted from the charts and tables printed herewith. The condition of the spark plugs, valves and cylinders, showed that the water circulation was satisfactory in every way. No valves required to be ground during the test and they were found to be in good condition when dissembled. From their appearance it is believed they would have stood an additional fifty hours.

In order to fully demonstrate and test the design of the reduction gears and bearings a propeller with extreme pitch for tractive effort was used throughout the test. It had a pitch of ten feet and was 9 ft. 4" in diameter. Owing to the high velocity of the wind passing over the engine during the test the forward carburetors worked under different conditions than the rear ones. All four carburetors were calibrated in the jets before the test, but the forward carburetors showed a different color of flame at the stacks, the rear caburetors being somewhat obstructed as to air currents by the magnetos directly next to them. Suction elbows were not used, the air being taken into the venturi passages. This probably accounts for the consumption of gasolene, which was .583 pounds per H.P. hour.

After the test all the pistons and piston fins were calipered and found round and true.

Upon dissembling the two forward cylinders adjacent to the propeller were found cracked above the flange in the skirt, but this did not interfere with the running. It was not discovered until after the engine had been taken down. This accident was accounted for by the fact that the iron of the cylinders was not in accord with Signal Corps specifications. The discrepancy of material was immediately remedied.

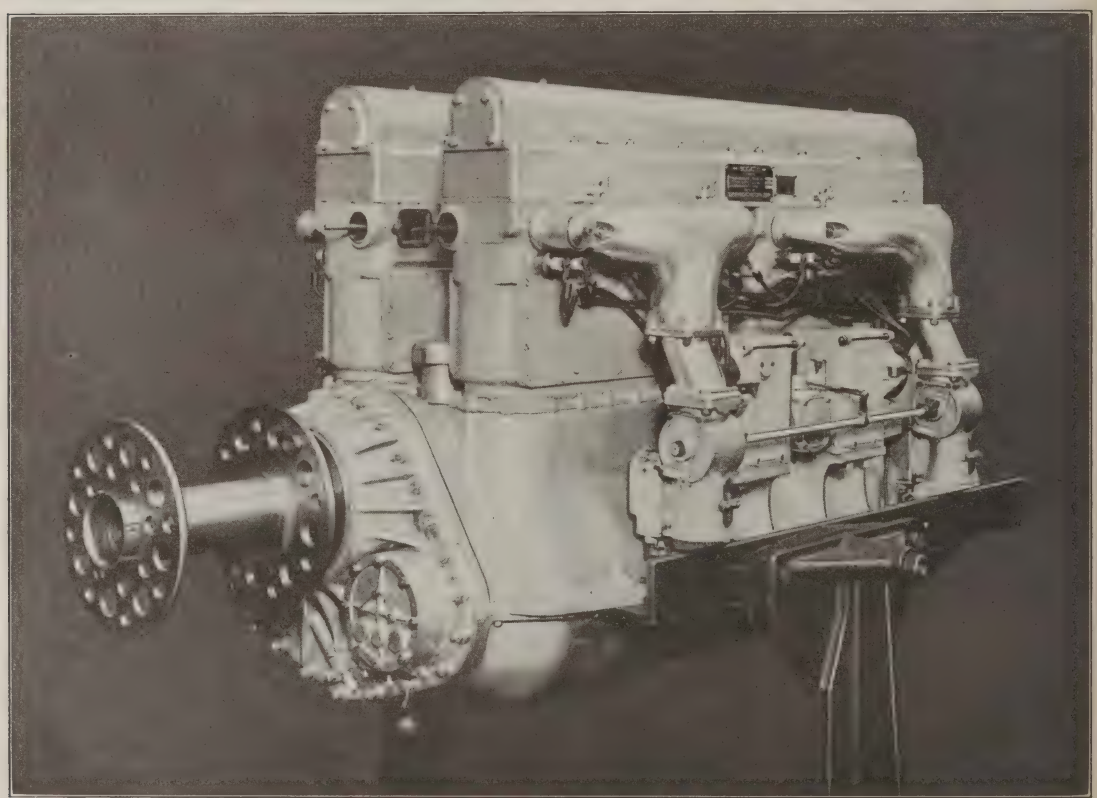
The test of fifty hours thoroughly demonstrated the reliability of the engine and endorsed all the changes that were made in the French design. The H.P. in the American motor was found to be greater than that of the French.

American and French Bugattis Compared

In the course of a very interesting report Mr. King offers definite data concerning the specific changes made in the Bugatti design and the reason therefor. Owing to the fact that the French engine which was sent over to this country had had a limited test in Paris of 37 hours and had not been in flight, all of the points in the design were very carefully considered. It was soon discovered that if the job was to be made a production one numerous changes would have to be made. Some of the more important of these changes are presented in diagram.

Water Jackets

It was evident that difficulties were experienced in cooling the valve seats of the French Bugatti, as cylinders and sample sections of used cylinders (see Illustration K) showed cracks between the exhaust and the inlets at Point A. See also Fig. 16 showing on the plant the point of fracture. In the American design, centers of the valves were increased in both directions from center of line, namely, from 1.732" to 1.764" and also from 1.693" to 1.694". This is clearly shown on Fig. 16. Section AA, Fig. 20, shows the deep unjacketed section of the cylinder in which the strain was set up, causing the cracked valve seats. To obviate this difficulty, the shape of the intake passage and exhaust passages were improved and the distance BV, showing the height of the unjacketed wall (see



The sixteen cylinder King-Bugatti aviation engine

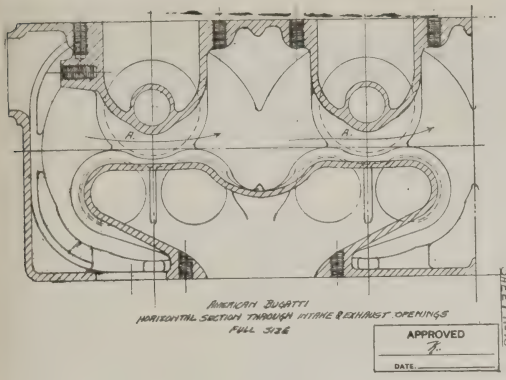


Fig. 15

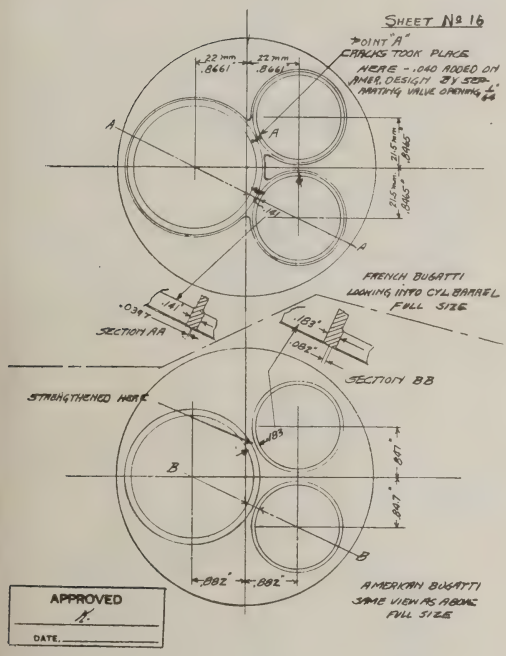


Fig. 16

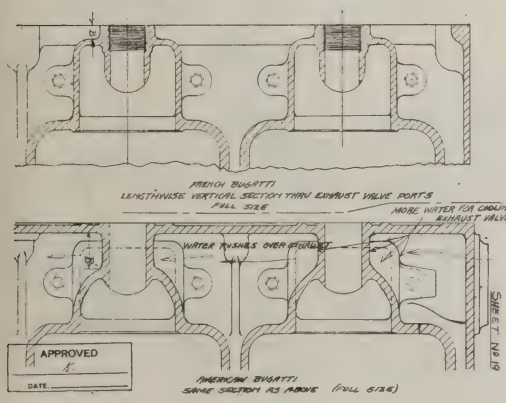
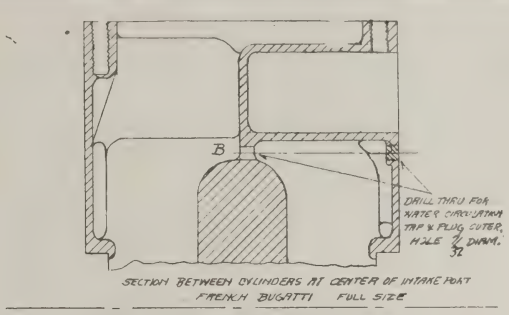


Fig. 19



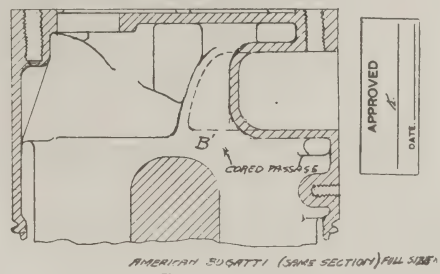
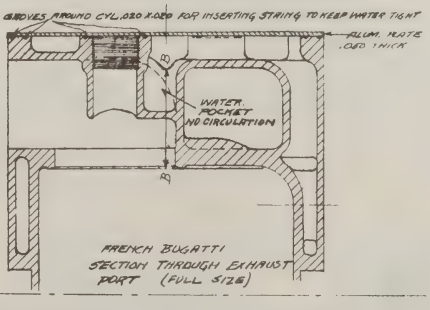


Fig. 17

SHEET No 18



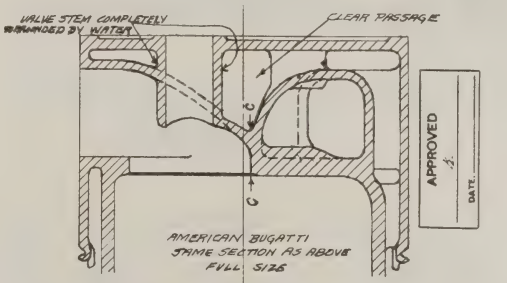


Fig. 18

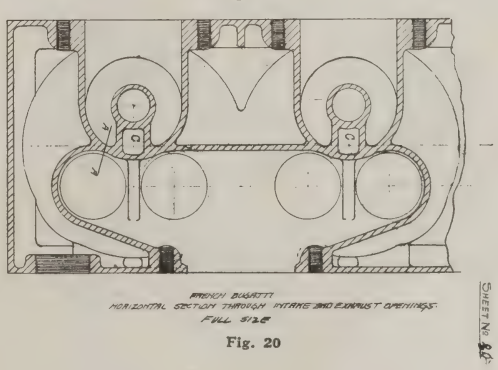


Fig. 20

Fig. 18) was reduced to distance CC, and at the same time circulation water was swept through this formerly restricted passage. To further improve the water circulation around the valve seats the small drilled hole B (see Fig. 17 and 21) was changed to a larger cored passage B', shown on this same Figure. The dead pocket C (see Fig. 20) was entirely eliminated and in its place clear passage was made as at D (see Fig. 15). The exhaust valve stems were not properly taken care of as to heat transference to the water jacket. The depth of water around valve stem guides is shown on Fig. 19, where the French Bugatti and American Bugatti are contrasted. (See B and B'.) Owing to poor conductivity through threaded portions of valve guides, the threading was eliminated and cast iron valve guides were pressed into place, thus making a much more uniformly cooled stem. The bronze guides taken from the French Bugatti showed evidence of high heat.

Propeller Gears

In transferring the French pitch of 5.6 to American pitch, it was considered that the coarser pitch, namely 5, would be preferable (see Fig. 32), and the number of teeth was changed but the ratio was practically maintained. It was further determined that there was an error of 4°10' in the French Bugatti engine between the timing of the right and the left crankshafts. As this would have considerable effect in the cross firing from the magnetos and, further, the engine would not be perfectly timed, this was corrected by changing belts from eight to nine in each gear. This with a certain relation between the holes and the teeth, enables the engine to be timed as stated with a slight error of 20'. The difference in running between engines thus timed can be easily appreciated.

Propeller Shaft and Bearings

At the request of Capt. Lepere the propeller was moved forward 3¾" to assist in stream lining the plane. This dimension would have brought an overhang of 8¾" forward of the front supporting bearing in the French engine. (See Figs. 23, 23A and 23B.) This was far from good practice and was not contemplated. A deep groove radial bearing was selected and the comparative overhang was reduced from 8¾" to 3" and further the gear load was taken between two such bearings. This deep groove bearing has proven in American practice to be good, as it takes both radial and thrust loads. The overhang gear as in the French engine has not been found successful in practice, as a certain wedging action takes place from the gear load and forces the true pitch contact line to assume a diagonal line. The ball bearing thrust as used in the French engine permits the balls to be thrown outward by centrifugal force and causes an improper contact on ball surfaces; this can be further aggravated by the wedging action of the gears. In the parts removed from the broken up French engine (see Illus. M) the thrust rings and balls were burned to a deep blue. The assembly of the propeller shaft bearings is a difficult "in place" assembly in the French engine. In the American design the bearings are entirely an "outside" assembly. The sliding door in front cover of the French engine has been eliminated.

Water Pump

The French Bugatti pump as mounted on the engine permits water leakage to enter the sump and mix with the lubricating oil. This will lead to difficulties in the operation of the engine. (See Fig. 22.) In the American model the pump was moved back, a better support added (see distances C and C') and an opening was arranged so that the leakage could pass outside of engine sump. Two bearings were provided on pump shaft. The rotor is riveted to shaft and driven with a Woodruff key. Lubrication is provided with water which passes through center of shaft. It is found in practice in draining the system in cold weather that where the rotor is brought clear to the housing wall (see Dimen-

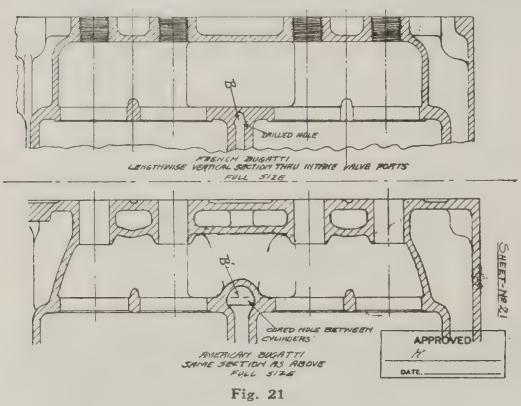
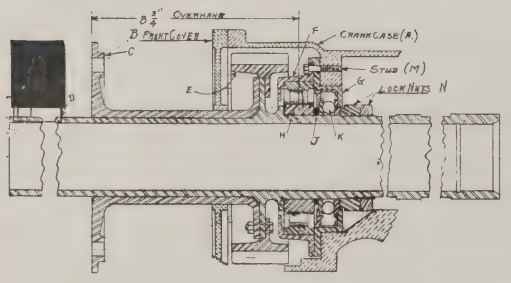


Fig. 21



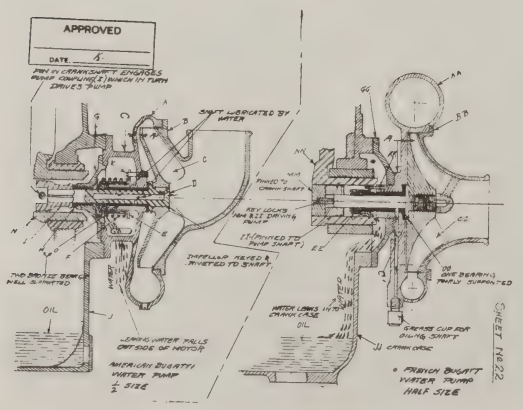


Fig. 22

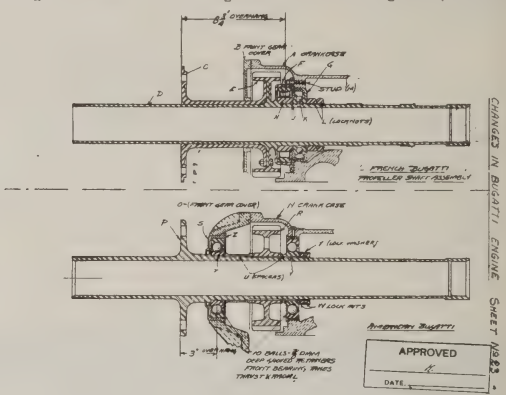


Fig. 23

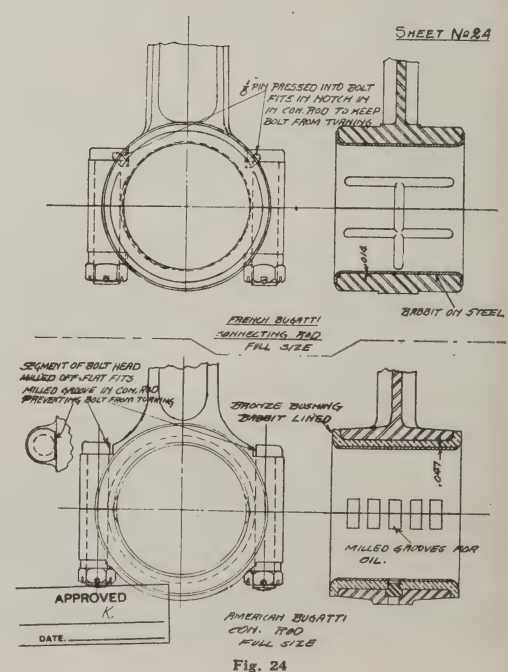


Fig. 24

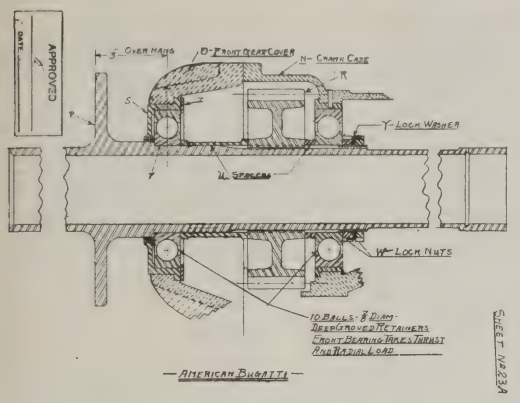


Fig. 23A

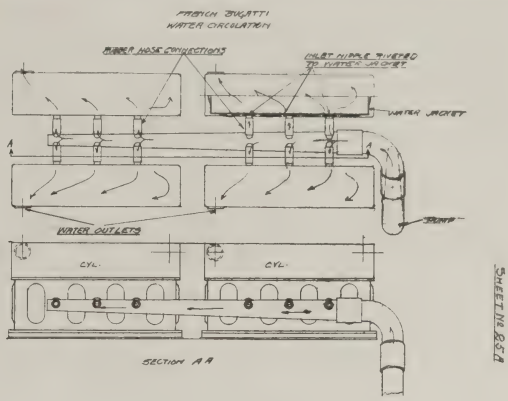


Fig. 25A

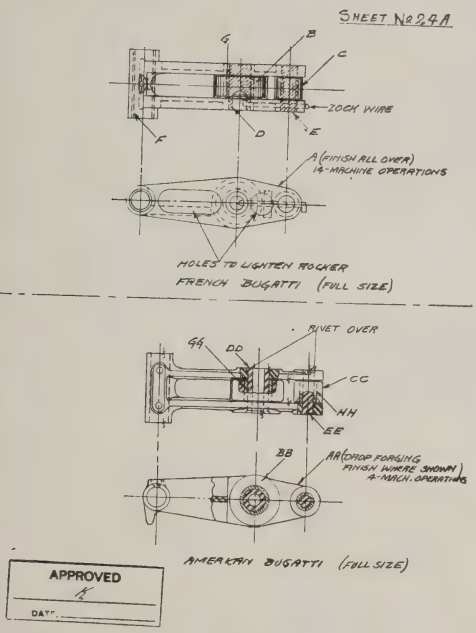


Fig. 24A

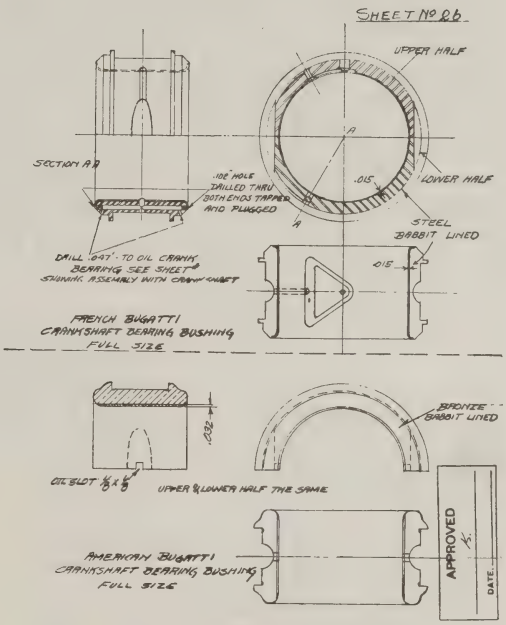


Fig. 26

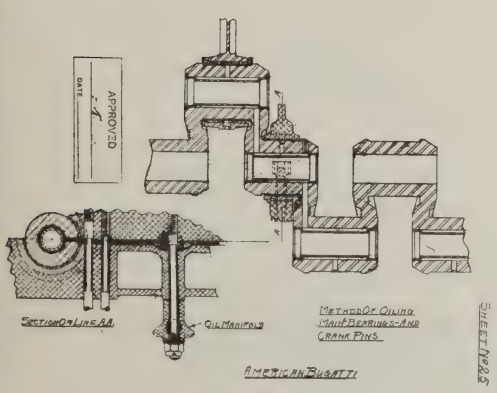


Fig. 25

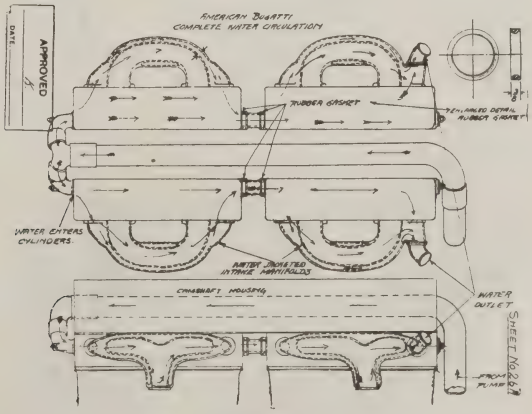


Fig. 26A

sion A) that water is held by capillary attraction in this narrow space and freezing results at this point and when the engine is started the pump shaft is sheared off. This space has been opened up in the American model (see Dimension A') and the water is thus permitted to freely pass out. An elbow has been added to pump cover which can be assembled pointing in any desired direction. It is believed in this redesign that the troubles experienced during the official test have been eliminated.

Rocker Arms

These are shown in detail on Fig. 24. Simplicity of machining was studied and from 14 machining operations on the French Bugatti this has been reduced to 4 on the American model. Each engine has 48 rocker arms; therefore the French engine has 672 machine operations as against 198 on the American model.

Piston and Piston Pin

The five piston rings, namely, 3/32 of an inch face are not considered commercial and were replaced by three rings ⅛ of an inch face. (See Fig. 31.) Further, the effective length of the piston was increased from 4 1/16 to 4⅞ and said piston was made of the slipper face principle, which eliminated contact with the side walls and gives better air cooling on the hot unjacketed vertical sections between cylinders. Ribs have been eliminated and the pistol wall arranged for uniform heat transference to the jacket. The stresses on the piston ring were figured and found to be high, indicating a weakness. The diameter of pins was therefore increased from 63/64 to 1 1/16". No report of breakage pins was received with engine, and upon receipt of the copy of the French Official Test received in May, 1918, from Lt. Col. Dunwoodie of the Technical Section, it was noted that in the test run of November 16, 1917, that piston pins were broken and three had to be replaced.

Water Circulation

The French engine had a water pipe with hose connections, three to each cylinder block between the cylinders. This is a difficult assembly, and in case of a leak in a complete engine means the removal of the exhaust pipes (see Fig. 25). In the American design the water can be sent through either end at the top of the cylinder blocks, thus sweeping all steam from exhaust seats. Part of it is deflected through the inlet manifolds. (See Fig. 26.)

Cam Shaft Gear Mounting

In the American model a loose piece is avoided, at center of shaft; also the small internal grinding in the camshaft. (See Fig. 26.)

Vertical Shaft Arrangement

In the French engine gear Y' (see Figs. 30 and 35) was screwed on the end of shaft Z'. This at once prevented interchangeability, as it in no way determined the location of a tooth in relation to the crank pin. This in each individual French engine was to be corrected by proper timing and then drilling the hole for pin N in vertical shaft. This was avoided in the American model by extending key to crank cheek ZZ fitting the gear directly to this same shaft. The key was accurately cut in relation to a tooth and uniform timing was at once obtained. The vertical shaft drive above was taken through two square shaft ends and not through a pin.

Connecting Rod Ends and Liners

The French Bugatti engine had no liners in connecting rod ends (see Fig. 24) and depended on a thickness of babbitt of .014 in. directly on the steel shell. This being an extremely thin layer, a considerable risk was offered in a 16 cylinder engine. In case a rod was burned out steel would come in contact with steel, resulting in a seizure of rod on crank pin, a broken rod would follow, meaning the ultimate wreck of engine. In the American engine, bronze liners were put into rod ends and .047 inches of babbitt was used. In case of a burned out rod, steel will come in contact with the bronze and the liner therefore will not seize on the crank pin. This will enable the flier to still operate his engine and make a landing. Owing to the oil pressure in the American engine, the long grooves in bearings are eliminated and in their place the short grooves are used. The replacing of liners in rods is comparatively easy and does not demand a quantity of spare connecting rods for repairs.

Main Bearing Liners

These are of bronze and not of steel as in the French engine, and for the same reason as in the connecting rods, viz., that a burned out bearing will not seize the crankshaft. Attention is called to the small lubricating oil holes in the French liners. These take care of the pins and are of such dimensions .047" (see Fig. 26) that they can be easily clogged, whether with sediment or cold oil. This is an open system with low oil pressures, and hence these passages cannot readily clean themselves. It is possible that clogging of these holes in the French engine caused the wreck of this engine on the test stand.

Carburetors

The placing of the carburetor float chambers in the French Bugatti is not according to standard practice and in climbing or in a nose dive a different mixture is likely to result in the forward and rear cylinders. (See Figs. 33 and 34.) In the French engine one float chamber is forward of the jet and one is in the rear. In the American engine they are both brought to the rear. The American engine therefore gets a uniform mixture in all cylinders.

Ignition

It was decided that two magnetos would be used. With the Splitdorf magneto a separate distributor is used mounted on the ends of the camshafts. The Simms magneto was used for half of the production, and these two magnetos were each equipped with their own distributors. A saving of over forty pounds was effected by this arrangement as against the use of four magnetos. Each engine is completely cross wired to each magneto; in other words, it is perfectly synchronized, and is such that each magneto taken separately will operate engine, and owing to this perfect synchronization the two magneto arrangement runs with less vibration than the four magneto scheme. With the two magnetos and the distributor a starting magneto is supplied. This consists of a hand operated independent magneto in the fuselage, which delivers a shower of sparks on the proper cylinder as selected by the distributor. Ease of starting is facilitated in this manner.

Oiling System

The oiling system as applied to the French Bugatti engine can be considered an open system non-pressure type, the pressure being determined by the diameters of the open orifices. (See Figs. 37 and 38.) In other words, with heavy or cold oil, the oil will take the path of least resistance and will not travel to the remote ends of oil leads. The small openings in bearings (as shown on Figs. 26, 37 and 38) become clogged with sediment, waste or coagulated oil. Owing to the pressure not being sufficient to clear these passages, trouble can be expected. Such trouble has already been experienced in engines built in this country. The fundamental principle in the American Bugatti engine was to obtain a true pressure system on all bearings, including camshafts. (See Figs. 39 and 40.) The oil to be controlled by a relief valve (shown on Fig. 39). This can be regulated and the proper pressure obtained. The seat of this valve is scored so that at all times a flow of oil is supplied to the gear faces and an additional flow will also come from the lift of this relief valve from its seat. All exterior oil pipes which are subject to breakage have been eliminated in the American Bugatti engine. The oil is fed upwards through drilled holes in crankcase and directed to the center of the camshaft through two openings. At each revolution of the camshaft a small groove in the bushing of this bearing passes a drilled oil hole lead to the center of camshaft. This squirt of oil is directed outward at each revolution over the cams, gears and rocker arms. The tie-bar in this engine is brought in contact with the front gear cover and the oil is led directly into same without the use of exterior piping. The oil lead to the gauge is further brought out at the rear end of this same member and an extra length of gauge pipe is thus avoided. Two oil pumps are driven by the crankshafts and said pumps are mounted on the propeller gear housing. One pump is arranged

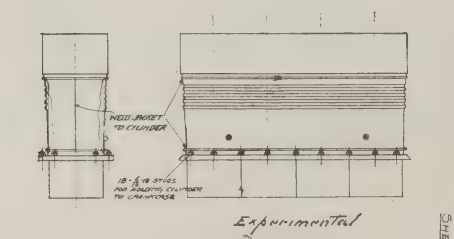


Fig. 27

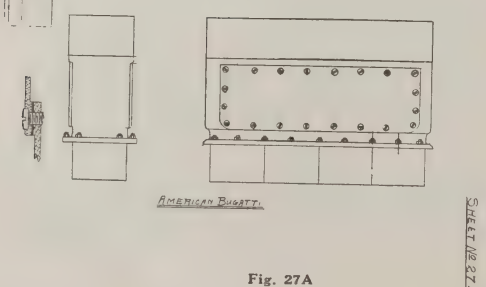


Fig. 27A

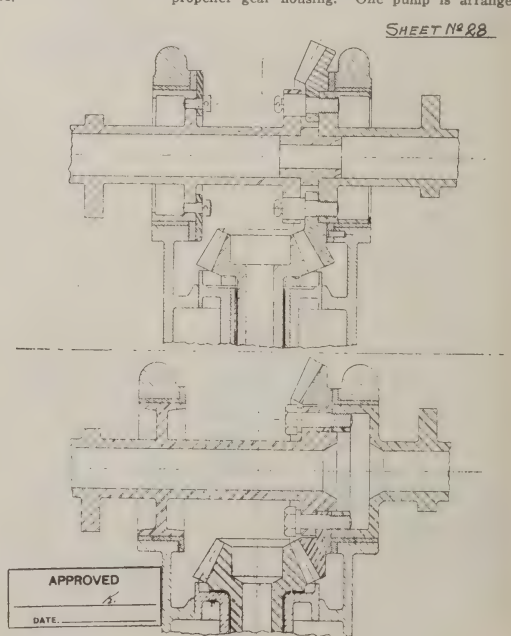


Fig. 28

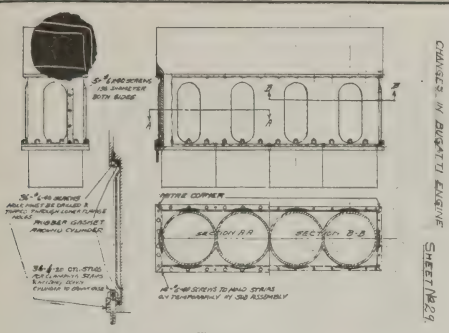


Fig. 29

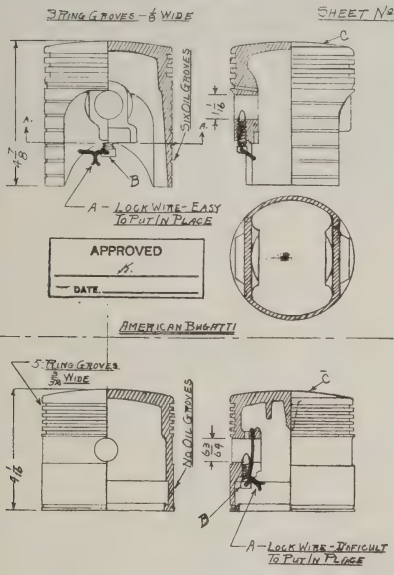


Fig. 31

SHEET Nº 34

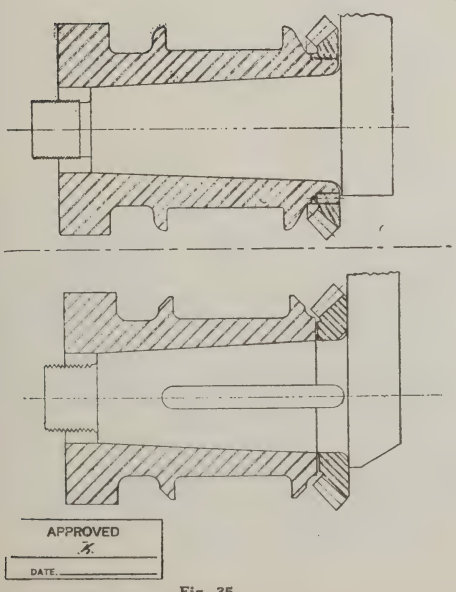


Fig. 35

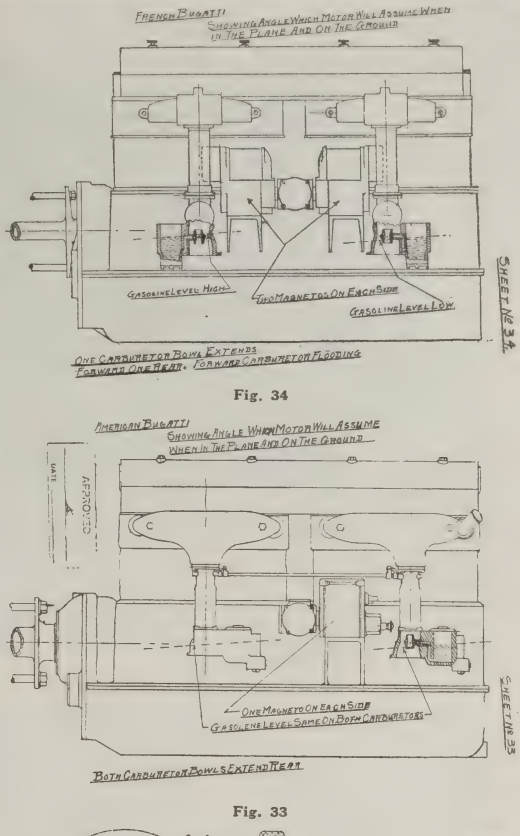


Fig. 34

Fig. 33

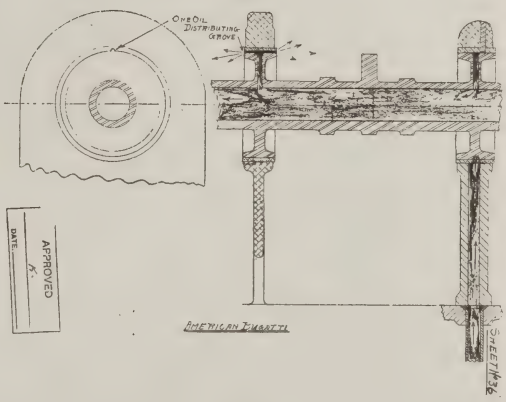


Fig. 36

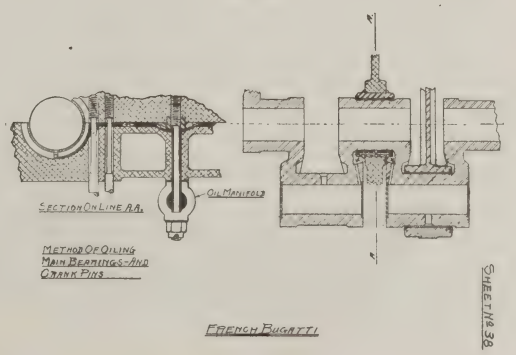
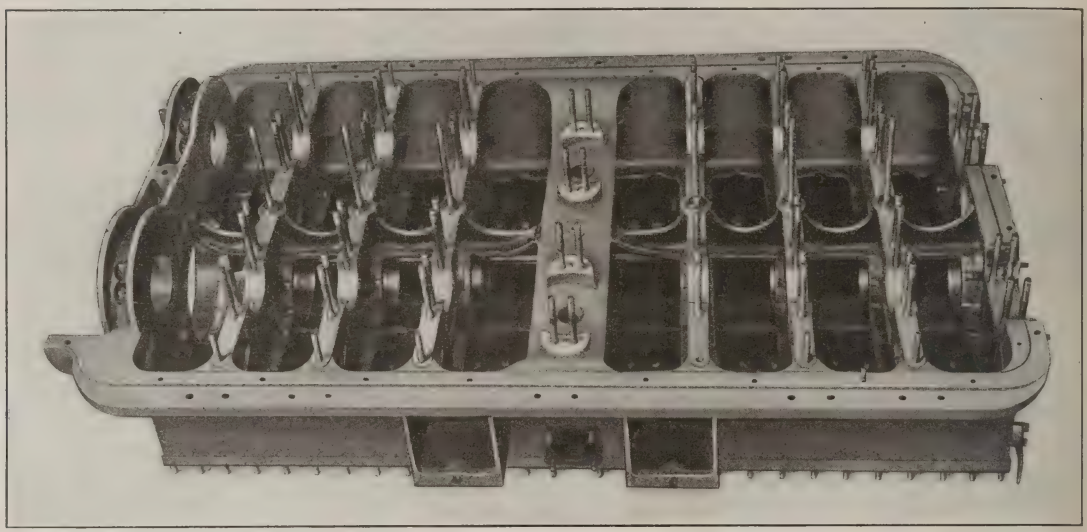


Fig. 38



to supply the pressure system, the duplicate pump is used to clear the forward end of the sump in a nose dive. In climbing, the oil is led out of the crankcase by gravity to the oil supply tank. Pipe into said tank being led into a position at the rear of the tank in order that the oil cannot flow back in the crankcase by gravity.

Outside Water Jackets

It was first contemplated to weld the sheet iron jacket to the cast iron cylinder by the oxyacetylene process. (See Fig. 27.) After certain experiments were carried out, it was considered that this was not a production job and the arrangement as shown on Fig. 27A with aluminum covers will probably be adopted.

This examination by Mr. King and his engineers led them to the conclusion that the Bugatti engine as delivered by the French to the American government was not a commercial engine, as it was necessary to redesign the entire motor and to bring it in line with American practice.

(To be continued)

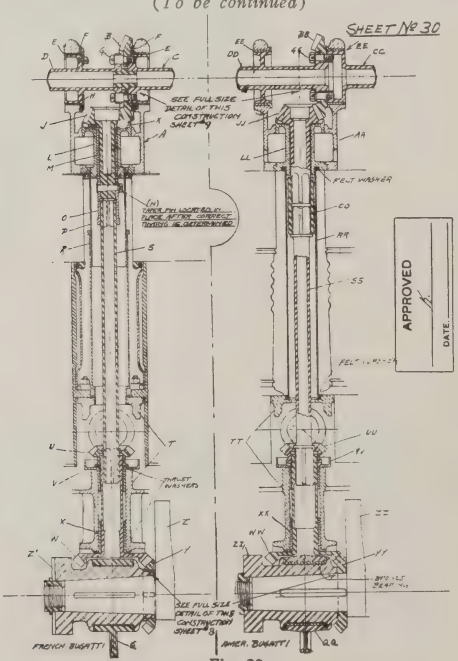


Fig. 30

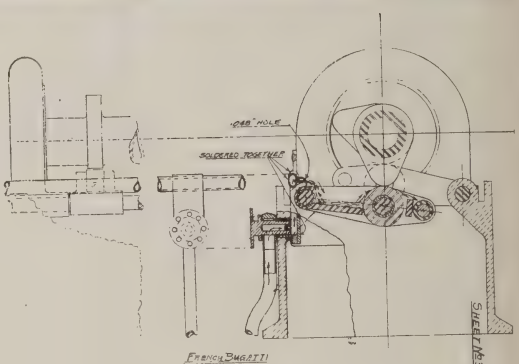
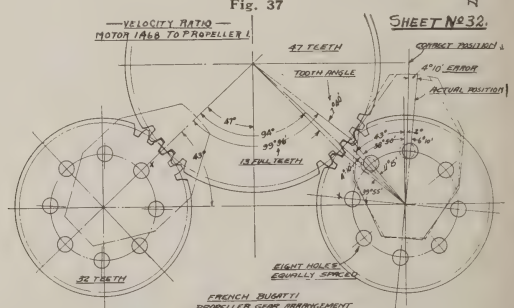


Fig. 37



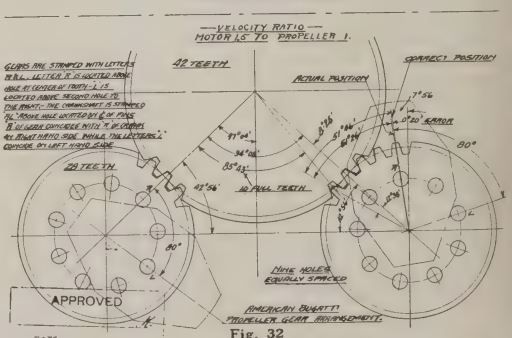


Fig. 32

THE MIESSNER AIRFONE

THE Miessner Airfone, designed and developed by B. F. Miessner of the Emil J. Simon Company, builders of radio apparatus, is a device of great value for intercommunication between pilot and student or pilot and observer.

In a recent interview Mr. Miessner expressd the opinion that this device could cut in half the time required for novices to learn to fly. This statement is not based on fancy, but is corroborated by Army Officers who have employed the Miessner device in the instruction of Air Cadets.

As an instance of the assistance which a simple and efficient means of communication between pilot and student may be in accelerating the student's progress, student aviators have been placed in sole charge of the controls for the first time and made ten-mile flights successfully, each error made by the student being instantly corrected by the instructor. This, contrasted with the usual method of taking the controls out of the student's hands, and telling him half an hour later what his mistake was, constitutes a great advance in methods of instruction.

The Airfone is entirely an acoustic instrument, it being a speaking tube so designed as to be adapted to use on an aeroplane in full power flight regardless of the size of its motors. Although telephones for inter-communication on aeroplanes depending on microphonic principles have been the subject of extensive experiments none has been developed which equals the efficiency of the Airfone according to statements of army officers. Furthermore the electric telephone requires expensive cumbersome and sensitive apparatus—a battery or dynamo as a source of power, delicate microphones and wiring subject to breakage. The electrical telephone for intercommunication is only necessary in cases where a wireless telephone transmitter is installed on the aeroplane in order to provide currents to vary with voice characteristics for modulation of the transmitting vacuum tubes.

The chief difficulty encountered in the design of interphones, the name usually applied to devices for intercommunication between passengers and pilots on aircraft, is to make it transmit clearly and loudly sentences uttered without particular effort on the part of the speaker and yet fail to transmit the considerably louder noise of the motor and the whistling of the wind.

It is this problem which has baffled inventors in this field.

Various efforts, however, with true



The Miessner Airfone in position

American persistance have been made to rid the telephone of these undesired sounds and some of these are mentioned below.

1. By provision of a special mouthpiece usually of soft rubber designed to fit around the mouth and nose of the user so as to exclude the extraneous sounds. This is undesirable for several reasons: Poor articulation results from the restricted lip and jaw movements and because the enclosure of the mouth muffles and suppresses the voice vibrations, especially those of the higher frequencies forming the hisses, t's, etc.—and allowing only the main fundamental tones to be transmitted satisfactorily.

2. By using a modified Maxim silencer scheme wherein the sudden pressure impulses of the most powerful noises such as those of the motor exhaust are prevented actuating the transmitted with full intensity by placing a series of small acoustic apertures with associated expansion chambers in the sound path through the mouthpiece to the diaphragm. While this scheme subdues the most powerful of the noises, it cannot differentiate between the voice sounds and the many complex noises attending aircraft flight so that these latter are still quite troublesome.

3. By providing throat and breast transmitters which are actuated by vibrations of the vocal chords transmitted through the neck or chest, and which by being pressed against the body are so covered up or enclosed as to greatly hinder the entrance of outside noises.

While these are successful to a degree in excluding outside noises and in transmitting vocal chord vibrations, the articulation is very poor owing to the almost entire omission of those very necessary modifications and of additions to the vocal chord sounds produced by the tongue, teeth, lips, etc.

All of these telephone methods of communication, therefore, have been beset by these various important obstructions, aside from the less serious difficulties in the way of batteries, delicate electrical mechanisms, connections, etc., all of which are more or less constant source of trouble.

It remained for Mr. Miessner, whose extensive experience as a radio engineer and research expert admirably fitted him for his task, to attack the problem from a new angle, and to design a simple, lightweight and efficient intercommunicating device which transmits speech to the exclusion of interfering and extraneous sounds.

That this has been successfully accomplished by the designer of the Airfone is the opinion of many army officers who have tried out this device. Not only has the Airfone been tested under flying conditions on training planes, but has given entire satisfaction on planes mounting 400 H. P. Liberty Motors while in flight and making loops, nose-dives, tail-spins and other stunts.

Another successful test performed consisted of talking into the transmitter placed only two feet from the cylinder exhausts of a 12-cylinder Liberty Motor mounted on a test stand and in the full propeller slip stream. No difficulty was experienced in making out the entire conversation, despite the severe conditions.

The Airfone is a form of speaking tube designed especially for service between pilot and observer, instructor and student, or any aeroplane occupants during full power flight. It consists essentially of a flexible speaking tube provided with a mouthpiece and a neck band and a helmet to which two earpieces are attached, suitable communications between the speaking tube and the earpieces being provided. For two-way conversation two such headgears and tubes are used.

Its present design is based on a very close and detailed study of aircraft noise conditions and on the application of the information gained by this study along strictly scientific lines in accord with the fundamental principles of acoustics.

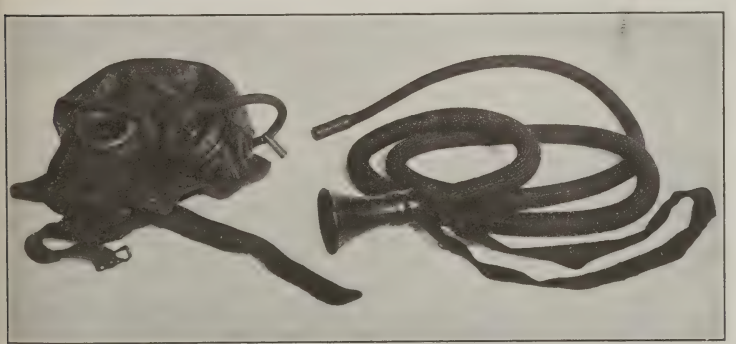
The two chief considerations governing the design of a speaking tube for aeroplane service have been found to be:

First: Effectively to prevent the aeroplane noises from reaching the ears directly through or around the earpieces; and

Second: To obtain the highest ratio of intensity of voice sounds to aeroplane noises reaching the ears through the speaking tube; in addition it is necessary that the acoustic characteristics of the tube be such as to permit of good articulation.

Of those two governing conditions, the first is met by the earpiece design, which permits of leading the voice vibrations directly to the ears, and of barring to a

(*Continued on page* 1095)



The Miessner Airfone Equipment

THE HANDLEY PAGE TYPE 0-400 BOMBER

BOTH in Great Britain and in the United States, the Handley Page has been the principal machine to be put into quantity production for bombing purposes. The American design is similar to the British, except that Liberty "12" 400 h.p. engines are employed in the former, and the Rolls-Royce or Sunbeam in the latter. The Handley Page machines described and illustrated here were built by the Standard Aero Corporation, Elizabeth, N. J.

Accommodations are made for one pilot and two or three gunners, and an observer who operates the bomb-dropping devices. Their placing is as follows: At the forward end of the fuselage is the gunner who operates a pair of flexible Lewis machine guns. Bowden cables at one side of the cockpit permit the release of bombs. Behind the gunner is the pilot's cockpit from which the gunner's cockpit is reached through an opening in the bulkhead separating the two compartments. The pilot is seated at the right side of the cockpit. Beside him is the observer's seat, hinged so it may be raised so as to permit access. Bomb-releasing controls are placed on the left side of the observer extending to the forward gunner's compartment and running back to the bomb racks located in the fuselage just between the wings.

Forward compartments are reached via a triangular door on the under side of the fuselage.

Aft of the bomb rack compartment, the rear gunners are placed. Two guns are located at the top of the fuselage and a third is arranged to fire through an opening in the under side of the fuselage. One gunner may have charge of all the rear guns, although usually two gunners man them. A platform is situated half way between upper and lower longerons of the fuselage, upon which the gunner stands when operating the upper guns.

General Dimensions

Span, upper plane	100'-0"
Span, lower plane	70'-0"
Chord, both planes	10'-0"
Gap between planes	11'-0"
Length over all	62'-10"
Height over all at overhang cabane	22'-0"
Height over all at center panel	17'-6"
Width, wings folded	31'-0"

Areas	*Square Feet*
Upper plane with ailerons	1018
Ailerons (2) each	172
Lower plane	630
Total wing area with ailerons	1648
Upper stabilizer	64
Lower stabilizer	47.6
Elevators (4)	63.0
Fin	14.7
Rudders (2)	46

Weights, General	*Pounds*
Machine empty	1566
Fuel and Oil	2496
Bombs	3000
Military Load	910
Total weight loaded	14300
Weight per square foot	8.7
Weight per horse power	17.9

Summation of Weights

Power Plant	3044
Fuel and Oil	2496
Passengers and miscellaneous equipment	610
Armament	300
Bombing equipment	3000
Body structure	1210
Tail surfaces	187
Wing structure	2738.5
Chassis	710
Total	14300.

WEIGHT SCHEDULE

Power Plant

	Pounds
Engine complete with carburetor and ignition system 2 x 835 =	1688
Radiator 2 x 112 =	224
Radiator and engine water 2 x 150 =	300
Fuel tank empty and pipes	350
Oil tank empty and pipes 16 x 2 =	32
Exhaust manifolds 2 x 75 =	150
Propeller and propeller hubs 2 x 60 =	120
Cowling 2 x 100 =	200
Total	3044

Fuel and Oil

Fuel (280 gallons)	2280
Oil (2 x 15.3 gallons 2 x 108 lbs.)	216
Total	2496

Passengers and Equipment

Pilot and clothing	170
Gunners and clothing	340
Dashboard instruments, fire extinguisher, tools and maps	100
Total	610

Armament

Two forward machine guns, mounting and ejection ammunition and sights	120
Three rear machine guns, mounting and ejection ammunition and sights	180
Total	300

Bombing Equipment

Bombs	2500
Bomb releases and sights	500
Total	3000

Body

Body frame 953 + 97 =	1050
Seats	60
Front control and rear control	100
Total	1210

Tail Surfaces with Bracing

Stabilizers (no covering) 3	57.2
Elevators (no covering) 4	34.4
Fin (no covering) 1	6.4
Rudder (no covering) 2	28.8
Covering	35.4
Struts and wires	24.4
Total	187.

Wing Structure

Upper wing with fittings, aileron and fuel tank in center section; lower wing with fittings	2032
Interplane struts	235.5
Interplane cables	261
Nacelle supports 2 x 105 =	210
Total	2738.5

Chassis

Wheels complete, 2 x 170 =	340
Shock absorber, 4 x 50 =	200
Miscellaneous parts, 4 x 30 =	120
Tail skid	50
Total	710

Volumes	*Cu. Ft.*
Bomb section, 3'-5¾" x 5'-2 15/16" x 4'-5"	80.6
Rear gunner's platform (upper) 3'-3⅞" x 5'-1⅛" x 4'-2¼"	71.45
Rear gunner's platform (lower) 2'-4" x 5'-1⅛" x 4'-2¼"	54.2
Total volume	206.25

Performances

Height (*Feet*)	Speed (*M.P.H.*)	Time of Climb (*Minutes*)
0	92	0
5,000	90	12
7,000		18
10,000	85	32

Service ceiling 10,000 feet.

Main Planes

Planes are not swept back and have no stagger nor decalage. Beyond the engine nacelles, both upper and lower planes have a dihedral angle of 4 degrees

Wing section employed, R. A. F. No. 6. Angle of lower wing chord to propeller axis, 3 degrees.

Aspect ratio of upper wing, 10; lower wing, 7.

Planes are in nine sections. Upper plane center section 16'-0" wide. Intermediate sections 22'-0" wide; overhang sections 16'-10" wide. Beyond this, the ailerons project for a distance of 3'-2".

Lower plane in four sections; two between fuselage and engine nacelles and two outer sections.

Interplane struts spaced as follows: nacelle struts 8'-0" from center of body; intermediate struts 10'-0" from nacelle struts; outer struts 12'-0" from intermediate struts. Overhang rods anchored 14'-0" from outer struts. Overhang beyond bracing 6'-0", including ailerons.

Ailerons are 20'-7½" long; 3'-9" in chord. Overhang portion 3'-1¼" wide.

The accompanying drawing illustrates the manner in which the main planes are hinged aft of the engine nacelles, permitting the wings to be folded back so as to facilitate housing in a comparatively narrow hangar. In folded position the measurement from leading edge of wing to centerline of fuselage is 15'-6".

For bracing between planes, oval section steel rods are used exclusively. Ends are formed to a solid section which is threaded and fitted with a trunnion barrel and forked terminals.

Fuselage

The fuselage is built up with the usual longerons and cross members. Bracing is with solid wires with swaged or forked ends.

Total length of fuselage, 62'-10¼"; maximum width at the wings, 4'-9", tapering in straight lines to 2'-11" wide at the stern; maximum height, 6'-10". In flying position the top longerons are horizontal to the propeller axes; top longerons 12'-3" above ground.

Leading edge of planes 12'-2" aft of fuselage nose.

Tail Group

The tail is of the biplane type with a gap of 6'-0". Average chord, 3'-6 17/32". Chord, above body, 5'-6". Span of stabilizers, 16'-7½".

There are two pairs of elevators 1'-10 15/32" wide and 8'-5½" long.

Struts from body to top tail plane spaced 2'-9¼" from center to center. From these, the outer forward struts and rudders are spaced 6'-3⅞".

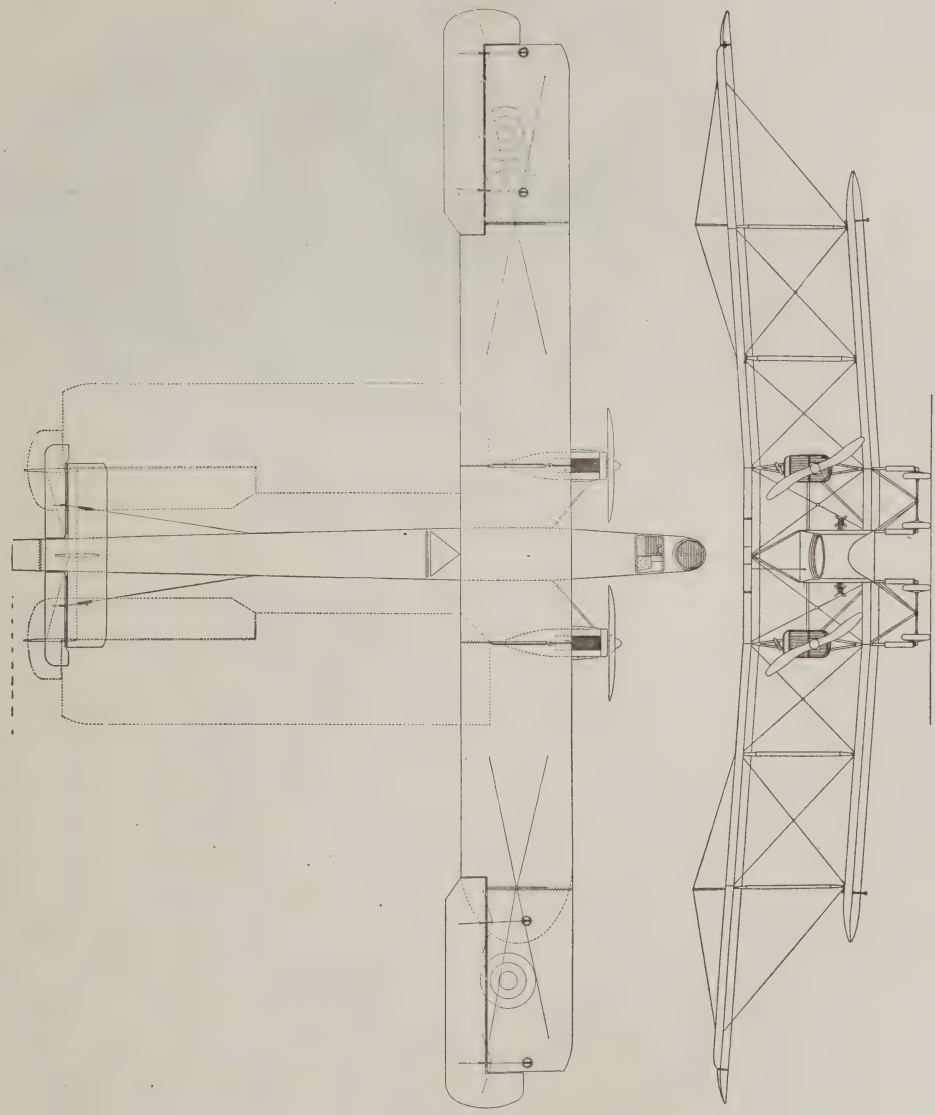
Central vertical fin 4'-0" wide.

Rudders are balanced. Width 4'-10½". Con-

(*Continued on page* 1095)



An American-built Handley Page Bomber with two 400 H.P. Liberty Engines, just about to leave the ground



HANDLEY PAGE
TWIN LIBERTY MOTORED
TYPE O/400 BOMBER

Scale of feet

McLaughlin

THE 450 H. P. NAPIER "LION" ENGINE

IT is now possible to give a few particulars of the special engine for aero work produced by Messrs. D. Napier & Son, Ltd. The general arrangement of the "Lion" engine can be gathered from the photograph; the twelve cylinders, 5½ in. bore, are arranged in three banks so that three pistons are connected to each crankpin of the four-throw crankshaft, the centre piston having a master connecting rod with links for the side ones. The crankshaft is carried in roller bearings. Made from steel forgings the cylinders are fitted with steel jackets, while the head is of aluminum and carries the camshafts which act directly on the valve heads. There are two inlet and two exhaust valves to each cylinder.

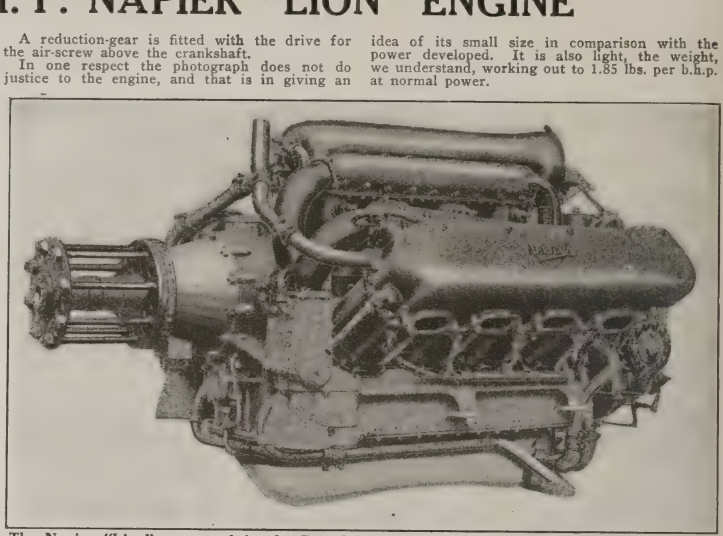
Arranged low down at one end of the engine, the carburetors are fitted with separate intake pipes with a view to eliminating any possibility of the machine catching fire owing to engine trouble. If there should be a back-fire in one cylinder the other two blocks will keep the engine running and suck in the flames. Special attention has been given to the heating of the carburetors, and the water jackets are carried down and round the throttle barrels themselves to prevent them freezing at high altitudes. During a test of one of these engines a temperature as low as 35 degrees Cent. was recorded.

Lubrication has also been the subject of special study; it is entirely automatic and designed with a view to preventing over-lubrication when the machine is dived or climbed steeply for a long time.

All moving parts of the engine are enclosed, and the usual accessories are fitted, provision being made for starting, speedometer drive, etc.

A reduction-gear is fitted with the drive for the air-screw above the crankshaft.

In one respect the photograph does not do justice to the engine, and that is in giving an idea of its small size in comparison with the power developed. It is also light, the weight, we understand, working out to 1.85 lbs. per b.h.p. at normal power.



The Napier "Lion" was used in the British aeroplane that recently established a world's altitude record

CITED FOR BRAVERY

UPON the recommendation of General Pershing, Distinguished Service Medals have been awarded to the following officers for exceptionally meritorious and distinguished service in positions of great responsibility:

Major General Mason M. Patrick, United States Army. For exceptionally meritorious and distinguished services. He displayed much ability and devotion to duty as director of construction and forestry, and, later, as Chief of the Air Service of the American Expeditionary Forces, he perfected and ably administered the organization of this important department.

The commander in chief, in the name of the President, has awarded the distinguished service cross to the following named officers and soldiers for the acts of extraordinary heroism described after their names:

Maj. K. P. Littauer, Air Service, United States Army. For repeated acts of heroism in action near Conflans, France, September 14, 1918, and near Doulcon, France, October 30, 1918. Maj. Littauer volunteered on a mission to protect a photographic plane for another squadron on September 14 and continued toward the objective at Conflans after three other protecting planes had failed to start. In an encounter with five enemy pursuit planes, he completely protected the photographic plane by skillful manoeuvring, although his observer was wounded and his machine seriously damaged. On October 30, Maj. Littauer, on duty as chief of air service of the Third Army Corps, volunteered and made an important reconnaissance of enemy machine gun emplacements at a low altitude near Doulcon. Home address, Alfred Littauer, father, One Hundred and Fifth Street, New York, N. Y.

Second Lieut. James M. Richardson, Air Service (pilot), 1st Aero Squadron. For extraordinary heroism in action near Grandpré, France, October 6, 1918. Lieut. Richardson undertook an infantry contact patrol mission under weather conditions which necessitated flying at an altitude of only 100 meters. Near the front lines machine guns opened an effective fire on his plane and he was wounded in the foot, but he continued on the mission until the front lines of the American troops were located and his observer had written out a report for the division commander. Home address, Miss Emma Richardson, sister, Devalle Bluff, Ark.

First Lieut. John F. Michener, Air Service (pilot), 1st Aero Squadron. For extraordinary heroism in action near Varennes, France, October 4, 1918. Lieut. Michener was assigned the mission of locating the front lines of our troops at a time when dense mist and low clouds compelled him to fly at an altitude of only 100 meters. His observer's signal rockets drew fire from an advanced hostile machine gun battery and Lieut. Michener was wounded in the leg. Despite his wound he continued the mission until the position of our troops was ascertained. He was then compelled to land on shell-torn ground behind the lines, the plane being completely wrecked. Home address, Mrs. A. R. Michener, mother, Erie, Pa.

Capt. John Mitchell, deceased, Air Service, 95th Aero Squadron. For extraordinary heroism in action near Beaumont, France, May 27, 1918. Seeing three enemy planes flying east over Apremont at 2,500 meters, Capt. Mitchell unhesitatingly attacked the three machines, which were in close formation, despite the fact that a fourth, hovering above, threatened to close in and join the enemy formation. He succeeded in shooting down the enemy machine, which proved to be a biplane returning from an important mission. Home address, Walter J. Mitchell, Manchester, Mass.

First Lieut. Asher E. Kelty, deceased, Air Service, 91st Aero Squadron. For extraordinary heroism in action near Crepion, France, September 26, 1918. In the course of a photographic mission Lieut. Kelty, with his observer, was obliged to penetrate a heavy enemy antiaircraft barrage, realizing that obtaining the location of the artillery objectives was of the greatest importance. When a shell struck his machine, his observer was instantly killed and his machine so badly wrecked that it plunged to the earth, thereby causing his death. Next of kin, Mrs. Cora B. Kelty, 1 South Main Street, Rice Lake, Wis.

Second Lieut. Francis B. Lowry, deceased, observer, C. A. C., 91st Aero Squadron. For extraordinary heroism in action near Crepion, France, September 26, 1918. On September 26, while on a very important photographic mission, Lieut. Lowry, with Lieut. Kelty (pilot), realized the importance of the mission and chose to continue their course through a harassing antiaircraft barrage. A shell made a direct hit on the plane, brought it down in fragments, and instantly killed Lieut. Lowry. Next of kin, Walter B. Lowry, 946 Corona Street, Denver, Colo.

First Lieutenant Robert P. Elliott, Air Service, pilot, 96th Aero Squadron. For extraordinary heroism in action near Olizy, France, October 27, 1918. Lieutenant Elliott flew in a formation over the enemy's lines on a bombing expedition. Attacked by a greatly superior number of enemy pursuit planes, his aileron controls soon shot away, Lieutenant Elliott continued to pilot his machine and give protection to his comrades. When his observer was seriously wounded, Lieutenant Elliott left the formation at great risk to himself, and with a disabled machine made a safe landing. Home address, J. M. Elliott, father, First National Bank, Los Angeles, Cal.

First Lieutenant Elmer Pendell, 120th Infantry, Air Service, observer, 168th Aero Squadron. For extraordinary heroism in action November 4, 1918. As observer in D. H. 4 plane. Lieutenant Pendell flew an infantry contact machine over the line of the 7th Division November 4, 1918. Because of exceedingly adverse weather conditions, Lieutenant Pendell disregarded the danger of fire from the ground and crossed the lines at 1,000 feet altitude. While thus flying he was wounded in the shoulder by an explosive bullet fired from the ground. Disregarding his wound, he came down to an altitude as low as 500 feet. After securing the desired information he wrote out his message with great effort and dropped it to the division. Home address, George C. Pendell, father, Caribou, Me.

First Lieut. John H. Lambert, pilot, Air Service, 91st Aero Squadron. For extraordinary heroism in action near Stenay, France, October 30, 1918. While on a photographic mission in the vicinity of Stenay, his work being seriously interfered with by the fire of a formation of enemy planes, Lieut. Lambert temporarily discontinued his mission, attacked the formation and dispersed it, destroying one plane and seriously damaging another. He then returned to his objective, completed his mission, and returned with information of great military value. Home address, Mrs. Joseph F. Kelley, 45 West Eleventh Street, New York, N. Y.

Capt. Everett R. Cook, pilot, Air Service, 91st Aero Squadron. For extraordinary heroism in action near Damvillers, France, September 26, 1918. While on a photographic mission in the vicinity of Damvillers, which necessitated a penetration of 20 kilometers within the enemy lines, Capt. Cook was attacked by seven enemy pursuit planes, and his plane was riddled with bullets. In spite of the attack he continued on his mission, turning only for our lines when his observer had secured photographs of great military value. In the combat one enemy aircraft was destroyed. Home address, Mrs. J. E. Cook, 232 Floyd Avenue, Toledo, Ohio.

First Lieut. John R. Cousins, Infantry, observer, 24th Aero Squadron. For extraordinary heroism in action near Conflans, France, November 2, 1918. In the course of a photographic mission of a particularly dangerous character, Lieut. Cousins and his pilot were attacked by a superior number of enemy pursuit planes. During the combat that ensued, with remarkable coolness and excellent shooting, he destroyed one of the attacking machines. Notwithstanding that the enemy aircraft continued to attack and harass them, Lieut. Cousins and pilot reached all their objectives and returned to our lines with photographs of great military importance. Home address, Mrs. J. A. Cousins, Whalley Avenue, Westville, Conn.

First Lieut. John H. Snyder, observer, Air Service, 1st Army. For extraordinary heroism in action September 12, 1918. While on a special mission to determine the probable enemy concentration in the back areas, Lieut. Snyder, with his pilot, in spite of almost impossible flying conditions, flew 60 kilometers over the enemy lines at a very low altitude. The unfavorable weather alone would have warranted them in turning back, but they continued on, regardless of very active and very accurate machine gun and antiaircraft fire. They returned to our lines when their mission was successfully completed. Home address, Mrs. William H. Noll, 319 North Sixth Street, Reading, Pa.

CIVILIAN FLYING OFFICIALLY SANCTIONED

THE Joint Army and Navy Board on Aeronautic Cognizance has issued the rules and regulations under which civilians may secure permission to fly. The application for such a license should be accompanied by the following information:

APPLICATION FOR LICENSE TO FLY CIVILIAN AIRCRAFT

License for flying civilian aircraft is desired under the following terms and conditions:

License to be issued to: ..... Address: .....
Owner: ..... Address: .....
To be operated by: ..... Address: .....
Date of first solo flight made by pilot.....
Date of designation as Reserve Military Aviator or Naval Aviator (and number) .....
Service in the U. S. Army or Navy.....
(An authenticated copy of a certificate or license as evidence of pilot's qualifications must be submitted.)
Passengers to be carried: .....
Description of aircraft: .....
Condition of planes: .....
Present number of hours each plane has been flown: .....
Description of motors: .....
Condition of motors: .....
Present number of hours of each motor.....
Means to be taken to insure upkeep of planes and reliability of motors: .....
Number of mechanics to be employed.....
Purpose for which flights are to be made:.....
Nature of aerial project to be organized: .....
(should be supplemented by statement in full)
.....
Financial backing available to initiate and sustain project: .....
(should be supplemented by evidence and reference)
.....

References:
Name: ..... Address: .....
Name: ..... Address: .....
Name: ..... Address: .....
Territory in which flights are to be made: .....
License to be valid from.....19....
Signature of applicant .....Date.....

This applicating after being properly executed should be sent to

THE JOINT ARMY & NAVY BOARD ON AERONAUTIC COGNIZANCE
Bldg. "D," 6th & B Sts., Washington, D. C.
L. G. Haugen, 1st Lieutenant, A. S. A.
Secretary.

INSTRUCTIONS TO LICENSEE

(1) All licensed aircraft shall display the license number in contrasting colors placed as follows:

Heavier-than-air craft: On the upper surface of each upper wing and the under surface of each lower wing.

Lighter-than-air craft: On the upper half and lower half, on opposite side from upper number.

All numbers will be five feet in height and nine inches in width of line, unless chord of wing is less than five feet, in which case height of numbers will equal wing chord, with above proportion of width of line.

(2) A monthly report is required from the holder of this License, giving the date, duration and number of flights made by the aircraft of this license number.

(3) This License is issued by the Board and accepted by the Licensee on condition that same may be revoked at any time the Board considers it necessary or desirable to do so.

(*Continued from page* 1068)

(6) From London to Brindisi, by way of Paris, Lyons, Marseilles, Turin, Florence, Rome.

(7) Across the Sahara Desert, from Algiers to Biskra, Ouargla, Bourassa, Timbuctoo, Koulikoro and Dakar.

I will now read an article on COMMERCIAL AVIATION IN THE LIGHT OF WAR EXPERIENCES, by Major-General Sir F. H. Sykes, K. C. B., C. M. G., Chief of the Air Staff (British), on Short Distance Passenger Services:

"I should like to say a few words on the prospects of individual passenger services between large centers separated only by a few hundred miles of distance. We have all been told in the papers how, before very long, business men and others will be telephoning to near-by aerodromes and ordering out their machines to convey them to Paris or Brussels or some other point. Well, there is morally no reason why this should not come about. It will interest you, I am sure, to hear what has been the experience of the Royal Air Force in this connection. Quite apart from the numbers of officers who have been transported to France in aeroplanes going out as reinforcements, we established in the summer of this year a small organization called the Communication Squadron. It was organized on comprehensive lines and consisted of two flights of D. H. 4s with Rolls Royce engines and a few other machines with a personnel of 61 officers and men. Between August and November there were made no fewer than 279 passenger cross-country flights such as to Paris, Nancy, Dunkirk, Manchester, York and Birmingham, and I am glad to say that there has not been a single case of a crash occurring to any machine with passengers on board. Many very distinguished people were transported, including several members of the British, French, American and Dominion Governments. One hundred and thirty-one visiting machines were also received and attended to. On one occasion two D. H. 4 machines were required to transport Mr. Paul Cravat and Mr. Crosby of the American Mission, and a record trip was made to Paris and back on the same day in four hours and twenty minutes. On another occasion a trip was made from Manchester, a distance of 170 miles, in an hour and twenty-five minutes, steering on a compass course above the clouds for a large portion of the distance. One of the pilots of this squadron, who is over 40 years old, has now flown across the Channel as pilot no less than 387 times, frequently in bad weather. Another organization which the Royal Air Force has found it necessary to maintain has been the single machine Channel Ferry from Lympne to Marquise, the establishment of which became necessary in order to rapidly return to England the large number of Ferry pilots who were engaged in taking out new machines to France. In this way it was possible to conduct the general dispatch of reinforcing machines to France with a smaller number of pilots. The results are of interest. During the four months of July, August, September and October of last year 227 trips were made, 8,085 miles were crossed, and 1,843 passengers transported. Of the 123 days in these four months, cross-channel flying was possible on 71 days, or approximately 60 per cent."

Are we going to stand inactive while other countries are going ahead aeronautically—and while one billion dollars' worth of aeroplanes, motors and equipment is deteriorating unused?

Aerial Transportation an Auxiliary to Water and Land Transportation

Aerial Transportation is here and is here to stay, as an auxiliary to land and water transportation. Aerial transportation bears the same relation to land and water transportation that the wireless bears to the regular mail and telegraph. It is unlimited by obstacles on land and water, curves are eliminated and there are no grades to climb after you reach your flying level.

When we enter the field of transportation of necessities and passengers, *speed* assumes exactly the relation which *cost* assumes when considering the transportation of coal on Ohio and Mississippi River barges, which are proverbial for snail-like progress as well as low cost.

Speed is a valuable factor in commerce as well as in war, and is desired by a large percentage of people in every walk of life, the means which have given greater speed in transportation and intercommunication have been well patronized.

Aerial transportation will be patronized because it affords greater speed. As an example one of the reasons passengers will travel by air in the near future is that it will be possible to leave New York in the morning and arrive in Chicago in the evening.

The great speed of the aeroplane makes it a valuable means of transportation, and many people will be glad to pay extra to have packages delivered in half the time required by other means of transportation.

It has been estimated that aerial express could be carried profitably at a charge of two dollars per pound for packages of a given size between New York and Chicago.

A twin-motored aeroplane can make the New York-Chicago trip in about seven hours, without stopping, carrying over one thousand pounds of express matter.

Such an aeroplane, made to order, will cost about $20,000. When built in large numbers they will cost probably only $10,000.

The life of the motors, if run throttled down, is about 500 hours of flying. The life of the plane is greater.

The Post Office has been operating an aerial mail line between New York and Washington daily since May 15, 1918, and has cut down the time for transit of mail between the two cities to two hours. Only small aeroplanes are used, which are more expensive to operate when figured on the ton per mile basis than large aeroplanes, yet the cost of operation, including all expenses, has been cut down to about forty cents per mile. It is cheaper than taxicab rates.

When large machines are employed and public aerodromes are in operation the cost of aerial transport may go down to less than one dollar per ton per mile.

British dirigible balloons, some of which are capable of carrying 60 tons of useful load, at a speed of over 60 miles an hour, may soon ply between Great Britain and the United States, carrying passengers, mail and express.

We Americans ought to be ashamed of our backwardness in this branch of aeronautics. The only dirigibles we have cannot carry a ton of useful load. They are small and slow, and we have only a few of them at that!

The field of lighter-than-air craft, German dirigibles of the

(*Continued on page* 1092)

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

ABC—Report to Army Balloon School, Arcadia, Cal.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
ARV—Report to Aviation Supply Depot, Richmond, Va.
BFT—Report to Barron Field, Fort Worth, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonia, Texas.
CRI—Report to Chanute Field, Rantoul, Ill.
CWT—Report to Call Field, Wichita Falls, Tex.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EOT—Report to Ellington Field, Olcott, Texas.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GLC—Report to Gerstner Field, Lake Charles, La.
HHM—Report to Hazelhurst Field, Mineola, L. I., N. Y.
KST—Report to Kelly Field, San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses.)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PWM—Report to Payne Field, West Point, Miss.
RSD—Report to Rockwell Field, San Diego, Cal.
RWT—Report to Rich Field, Waco, Tex.
TFT—Report to Taliaferro Field, Fort Worth, Tex. (When specified in the order, the number of the field is given in parentheses.)
TMA—Report to Taylor Field, Montgomery, Ala.
UTA—Report to School of Military Aeronautics, University of Texas, Austin Tex.
WDM—Wire Director of Military Aeronautics upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.

Note 2—Report to Akron, Ohio, to chief of the army balloon inspection.

Note 3—Report to Dayton, Ohio, to 25 South Main Street to manager aircraft finance and by wire to DAP.

Note 4—Report to Penn Field, Austin, Tex., to commanding officer.

Note 5—Report to Oteen, N. C., to commanding officer.

Note 6—Report to 360 Madison Avenue, N. Y. C., to district manager of aircraft finance and wire DAP.

Note 7—Report to Southeastern Department, Charleston, S. C.

Note 8—Report to Little Rock, Ark., to aviation supply depot.

Note 9—Report to 515 Little Building, Washington Street, Boston, Mass.

Note 10—Report to Speedway, Indianapolis, Indiana.

Note 11—Report to Middletown, Pa., to aviation general supply depot.

Note 12—Report to Camp McClellan, Anniston, Ala., to commanding general.

Note 13—Report to 2050 Elmwood Avenue, Buffalo, N. Y., and wire DAP.

Note 14—Report to Consumers Building, Chicago, Ill., and wire DAP.

Note 15—Report to Keenan Building, Pittsburgh, Pa., and wire DAP.

Note 16—Report to 1550 Woodward Avenue, Detroit, Mich., and wire DAP.

Note 17—Report to Godman Field, Camp Knox, Stithton, Ky.

Special Orders No. 21 to 25 Lnclusive

A

Albro, Ames S.....DMA
Ayling, John G.....Note 2
Ames, George P.....DMA
Atkinson, Bert M.....HHN

B

Branson, Raymond L.....Note 9
Bullock, Edward L., Jr.....DMA
Blair, Shiras A.....Note 10
Beveridge, John B., Jr.....DMA
Berglund, Eugene N.....DMA
Burns, Leroy W.....Note 4
Braig, Eugene C.....UTA
Beverly, Efford A.....DMA
Birnn, Rolland.....CAF
Bloomer, Harry C.....EOT

C

Connolly, Frederick W.....KST
Connolly, Cecil H.....Note 4
Carr, Harold H.....CAF
Christensen, Jens T.....CAF
Cobbey, Jean.....RSD
Cox, Arthur S.....CAF
Cohen, Abe W.....Note 11
Clock, Frank E., Jr.....Note 17
Connell, Carl W.....DMA
Connolly, Patrick J.....Note 6

D

Dabney, Henry B.....DAP
Derham, Peter F.....Note 4
Dun, Clifford E.....Note 9
Dunlap, James E.....PMT
Day, Oswald N.....Note 9
Danielson, Charles S.....Note 13
DeArmond, George W.....Note 8
Dreby, Ernest E.....CAF
Doyle, William J.....Note 13

E

Eckles, Gaylord B.....Note 6

F

Faris, Nicholas B.....CAF
Fisher, George V.....Note 9

G

Gowans, Louis L.....Note 4
Grout, Lewis W.....Note 9
Gordon, Frank C.....Note 6
Gunter, Edward R.....Note 14
Green, Horace.....MAC
Guinn, Joseph E.....KST
Gilbert, Arthur C., Jr.....CAF



The De Haviland 5, showing the peculiar stagger of the upper aerofoil, which gives the pilot a wide range of vision

Galligan, Frank A.....CAF
Gray, Ralph C.....CAF
Gadbury, Joseph H.....PFO

H

Harris, Hurshell I.....CAF
Hurt, Samuel F.....PMT
Howard, Edward P.....MAC
Hall, Benjamin L.....Note 14
Hynds, Harold D.....DMA
Hogan, Daniel W.....Note 6
Howry, John.....Note 12
Hummell, Frederick.....Note 14

J

Johnson, Donald W.....PFO

K

Kerr, Robert H.....LDT
Kinnear, Lawrence W.....DMA
Kennedy, Charles B.....BFT
Kirkham, James E.....CAF

L

Lintz, Roy P.....CAF
Lovell, McDonald.....DMA
Lepage, Clarence J.....PFO

M

Moran, William K.....CAF
Merrell, Cyrus W.....DMA
Moreton, Frederick A.....ABC
Munger, Paul E.....DMA
Meadows, James H.....Note 3

Mc

McAvoy, William H.....CAF
McGraw, Leroy E.....DMA
McKeon, George J.....DMA

N

Neal, Homer S.....Note 11
Nunn, Wesley I.....CAF

O

O'Brien, Mathew H.....Note 5
Olson, Charles W.....Note 16
Otis, Thomas F.....RSD
O'Hara, Arthur V.....MAC
Odale, Walter B.....Note 16

P

Peterson, Vernon.....Note 14
Pearson, Alexander, Jr.....CAF
Phillips, William H.....KST
Philbrook, Philip E.....ABC
Price, George W.....DMA
Pence, Frank A.....DMA
Piercy, James M.....Note 3
Polcyn, Frank N.....Note 3

Q

Quinn, Orlo H.....RSD

R

Robins, Augustus W.....DMA
Reid, Christopher A.....Note 9
Riblet, Philip D.....Note 17
Russell, Jacob G.....Note 3
Raimey, John R.....Note 11
Richards, Walter B.....Note 11
Reap, Michael B.....Note 6
Reece, Henry E.....DMA
Reid, Charles A.....Note 14
Richards, Harrison H. C.....DMA
Rodenbaugh, Albert I.....PMT
Robinson, Bernard B.....PMT
Randolph, William M.....RSD
Ralph, Edward J.....DMA

S

Stutzman, George B.....Note 15
Stewart, Joseph M.....Note 16
Stevens, William H.....Note 14
Skidmore, Wallace Gilman.....MDO
Sloan, Edward Crocker.....CAF
Skow, Charles T.....Note 17
Simpson, Samuel M.....CAF
Sherburne, Raymond F.....EOT
Sutton, Sefus.....Note 13
Stockard, Paul.....RSD
Spencer, Edward J.....CAF
Stedman, Livingston B., Jr.....CAF
Schaefer, Julius E.....PFO
Smith, Stanley.....Note 4

T

Tobin, Edgar G.....KST
Tapley, Elmer B.....CAF
Thaw, William.....RSD
Tufts, Walter, Jr.....Note 9
Toomer, William M.....KST
Turner, Wiley B.....CAF
Trowbridge, Jonas R.....Note 11
Thynnes, Louis C.....Note 3
Tingle, Charles G.....BFT

V

Vogel, Harry J.....DMA
Vail, Richard, Jr.....CAF

W

White, Will G.....PMT
Warner, Brady W.....CAF
Wilson, John H.....BFT
Woody, Kenyon.....CAF
Weed, Frank J.....CAF
Wyatt, John A.....CAF
Watson, Charles O.....KST
Watson, Henry W.....Note 5
Woods, Lonie.....Note 13
Walker, Thacker V.....DMA
Waters, Daniel.....AGC

Y

Younghanse, Arthur.....Note 6

OFFICIAL STATUS OF AIR SERVICE FIELDS ANNOUNCED
In Operation January 20, 1919

Active Flying Fields — *Location*	*Commanding Officers*
Barron Field, Everman, Texas	Lt. Col. Thomas C. Turner.
Carlstrom Field, Arcadia, Florida	Major Horace M. Hickam.
Ellington Field, Houston, Texas	Lt. Col. Ira A. Rader.
Kelly Field, San Antonio, Texas	Colonel Henry C. Pratt.
Love Field, Dallas, Texas	Major Albert L. Sneed.
March Field, Riverside, California	Major John P. C. Bartholf.
Park Field, Millington, Tennessee	Major John W. Simmons, Jr.
Post Field, Ft. Sill, Oklahoma	Lt. Col. Richard B. Barnitz.
Rockwell Field, San Diego, California	Lt. Col. H. B. S. Burwell.
Inactive Fields	
Bolling Field, Anacostia, D. C.	Lt. Col. Ralph Hartz.
Brooks Field, San Antonio, Texas	Major John B. Brooks.
Call Field, Wichita Falls, Texas	Major James R. Alfonte.
Carruthers Field, Benbrook, Texas	Lt. Col. Jacob E. Fickel.
Chanute Field, Rantoul, Illinois	Lt. Col. Ira Longanecker.
Chapman Field, Miami, Florida	Major Jacob H. Rudolph.
Dorr Field, Arcadia, Florida	Major Horace M. Hickam.
Eberts Field, Lonoke, Arkansas	Lt. Col. Thomas Duncan.
Gerstner Field, Lake Charles, Louisiana	Lt. Col. William C. McChord.
Mather Field, Sacramento, California	Major Walter W. Wynne.
Payne Field, West Point, Mississippi	Major Ralph P. Cousins.
Rich Field, Waco, Texas	Major John G. Whitesides.
Selfridge Field, Mt. Clemens, Michigan	Major Frank D. Lackland.
Scott Field, Belleville, Illinois	Major Henry Abbey.
Souther Field, Americus, Georgia	Lt. Col. Frederick T. Dickman.
Taliaferro Field, Hicks, Texas	Major Theodore C. McCauley.
Taylor Field, Montgomery, Alabama	Lt. Col. Seth W. Cook.
Camp Dick, (Cadet Gunnery Camp), Dallas, Texas	1st Lt. Ormsby McCammon, Acting
Langley Field, Hampton, Virginia	Major Clinton W. Howard.
Wilbur Wright Field, (Armorers School), Fairfield, Ohio	Lt. Col. Henry C. K. Muhlenberg.
Provisional Wings	
1st Provisional Wing, (Active), Hazelhurst, Long Island	Lt. Col. Millard F. Harmon, Jr.
Brindley Field, (Active), Commack, Long Island	Major H. H. C. Richards.
Henry J. Damm Field, (Active), Babylon, Long Island	Major E. Lyons.
Hazelhurst Field, (Active), Mineola, Long Island	Lt. Col. Millard F. Harmon, Jr.
Lufbery Field, (Active), Wantaugh, Long Island	1st Lt. W. B. Maurice.
Mitchell Field, (Active), Mineola, Long Island	Major H. M. Clark.
Roosevelt Field, (Active), Mineola, Long Island	Major Richard D. Gile.
2nd Provisional Wing, (Inactive) Park Place, Texas	Major Roy S. Brown.
Ground Schools	
Schools of Military Aeronautics:	
University of California, Berkeley, California	Major Chas. B. Crane.
*Cornell University, Ithaca, New York	Major Harral Mulliken.
*University of Illinois, Urbana, Illinois	Capt. Frank C. Hendry.
University of Texas, Austin, Texas	Capt. Herbert G. Knight.

*Discontinued training preparatory to being closed.



A Curtiss Flying Boat, of the type that bids well to become extraordinarily popular with sportsmen this year, making an excellent landing

FOREIGN NEWS

General Pershing Authorized to Grant Promotions to Officers

General Pershing has been authorized by the Secretary of War to grant promotions to officers up to and including the rank of Colonel. These promotions shall not be made merely as a reward for past service, but the effect of the order will be to permit many promotions which were unjustly excluded by the order issued immediately after the signing of the armistice.

Lieut. Nungesser to Accompany Fonck to U. S.

Paris, Feb. 2.—Sub-Lieutenant Nungesser, who gained more than forty-four aerial victories over the Germans, will accompany Rene Fonck, the leading French ace, when Fonck comes to the United States in a few days to attend the annual dinner of the Aero Club of America. The aviators will be accompanied by Robert Esnaul Pelterie, president of the Aeronautic Industries Association of France.

Ipswich to India Flight Held Up

The Handley Page aeroplane in which General MacEwen started from Ipswich to fly to India, and which was detained by bad weather at Mersa and Matruh, arrived at Heliopolis on January 3. It resumed its journey on the morning of January 12. No further report has been received regarding the progress of the flight.

British Government Refuses Air Route License

The British Government has declined to register a company formed to promote air services between London and Sydney, says the *Times* correspondent at Sydney. He adds that a statement has been issued implying that Mr. Hughes has arranged for a Government monopoly for this air route.

French Air Minister Resigns

Paris.—It was announced on January 9 that M. Dumesnil, Under-Secretary of State for Aviation, has resigned, primarily because of the decision of the Government to bring naval and military aeronautics under the Ministry of War. M. Clemenceau has expressed his regret that, owing to the reorganization of the War Ministry, it has become necessary for M. Dumesnil to relinquish his duties, and says that M. Dumesnil had succeeded in equipping France with an aviation service worthy of her Army.

Transatlantic Flight Soon, Says General Brancker

London, Feb. 2.—The Atlantic ocean certainly will be crossed by an aircraft this spring, probably by an American aeroplane, Gen. Sir William Brancker declared to the correspondent of *The Sun*.

The Aircraft Manufacturing Company, with which Gen. Brancker is actively connected, already is planning a transatlantic flight, using either a D. H. 10, one of the famous war bombing planes fitted with two 345 horse-power Rolls-Royce engines, giving a speed of 120 miles an hour and a duration of flight of 2,000 miles, or a new machine not yet completed fitted with one 600 horse-power engine with a speed of 125 miles an hour and a duration of 2,500 miles.

The flight will be made from east to west, the machine carrying two men, a navigator who will have charge of the flight and a pilot.

"The machine which has been selected by the Air Ministry for the attempt is a flying boat, similar in every way to those which did such valuable work as coastal patrols during the war. It is known as the Felixstowe, in commemoration of the station where it was built on the designs of Lieut. John Cyril Porte, the famous British airman who waited all the summer of 1914 on the American coast in the hope of being able to make the flight.

The machine is a triplane, with five engines of 375 horse-power, driving two tractor and three pusher airscrews. The extreme length of the wings is 123 feet, of the hull from nose to tail 60 feet. When the machine has completed its trials it will be dismantled and sent to America, where it will be reassembled for the flight."

Commercial Aeronautic Possibilities in South Africa

A London aeronautic publication has discussed the future of commercial aeronautics in South Africa in a recent issue which indicates the progressive attitude of the British industry.

Realizing that for the present the most important function that aeronautic transport can accomplish is the delivery of mails and passengers, in this respect, conditions in South Africa are especially conducive to aerial commerce. The population is small, but wealthy and active. Distance between cities is large and railroad communication poor. The railways follow the contour of the hills, having been built at so much per mile. The contractors therefore avoided bridges, tunnels, and embankments. Grades of one in forty are numerous. The windings and contortions of the snake-like tracks make it seem quite possible in many places to shake hands with the engineer in the rear car. The ever-present sand and dust are especially disagreeable. These conditions, as compared with cool and speedy transportation by aeroplane, would make it difficult for railroads to compete with well-organized aerial passenger lines.

The stable weather conditions, absence of hurricanes, and high winds, extreme clearness of the atmosphere, the definite rainy season on only one short fixed period of the year make conditions excellent for reliable air travel.

The natural wealth of the Union, not only in precious metals and minerals, but in the whole range of natural resources, as well as its ability to supply many of the necessary materials for the maintenance of commercial aircraft, makes the prospects of an enterprising aircraft organization most excellent. Alcohol suitable for fuel is produced in considerable quantities and the climate in some parts is suitable for spruce growing. Land is available for aerodromes at low rates.

The details of various routes are outlined in the article. The first route is suggested from Cape Town to Kimberly, 525 miles air line. The train service between these important points consists of two trains each way daily, with a running time of thirty hours. The estimated time by air, allowing for stops, is eight hours.

A route from Kimberly to Johannesburg requiring 45 hours by rail, could be covered by aeroplane in twelve hours. From Kimberly to Durban a saving of thirty-six hours could be made, the time by rail being forty-one hours and by plane five and a half hours.

The ultimate expansion of an aerial transport system would result in a route from Cape Town to Cairo.

Build Super-Airships

London, Jan. 13.—The *Evening News* announced today that the admiralty is building "super-airships" with a cruising radius of 8,000 miles. They would carry a crew of twenty-five persons and have a speed of seventy to eighty miles an hour.

Caproni Biplane Carries Ten Passengers Three Hundred Miles

Rome.—A Caproni Biplane carrying ten passengers flew from Milan to Rome in four hours carrying ten passengers. The distance is 300 miles.

British Planes To Take Food To Belgium Daily

London, Jan. 31.—The Government has allotted a squadron of military aeroplanes to convey foodstuffs to Belgium for the relief of the population. The service, which is to be daily, will begin immediately between Folkestone and Ghent.

Keep British Air Force Young Men's Service

London, January 28 (Via. Montreal).—Regulations just issued show that the authorities here are determined to maintain the air force as a young man's service. No colonel over forty-eight will be allowed to remain in the force unless he has had three years' service in war.

A special board has been appointed to investigate all candidates for permanent commissions. Future pay allowances will not necessarily be as good as those now in force.

Japan Establishing Additional Military Aeronautic Schools

Tokio, Japan.—The budget presented by the Japanese War Depart- inaugurating new undertakings. Two million of this is desired for ment for the coming fiscal year includes ten million dollars for the establishment of a military aviation school near Tokio and three million dollars for the expansion of the Japanese Air Service. Japan has already established a powerful air service and is profiting from allied experience in the war.



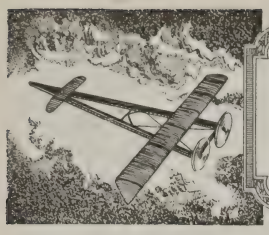
Triple-motored 1916 Caproni Biplane with rotary motors

Aeroplanes Added to Equipment of Northwest Mounted Police

Ottawa, Jan. 28.—The government announced that aeroplanes would be added to the equipment of the Northwest Mounted Police for their work in the frozen north.

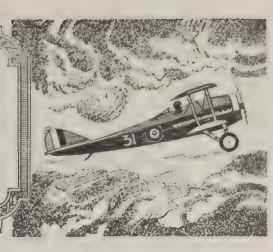
Air Conference to Have 25 Delegates

Paris.—As announced in previous issues, a conference will be held in the early part of February for framing international air laws. It has been announced that there will be five delegates each from France, Great Britain, Belgium, Italy, and the United States. The conclusion of this committee will be presented in the peace conference for discussion and adoption.



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

A FEW fittings are shown in the accompanying cut as well as a photo of the installation of a Ford motor in an aeroplane.

This photograph is of the mounting of the motor in Mr. E. H. Holterman's machine and the reader can get a very good idea of the general arrangements. Note that the engine is turned just the reverse to what it would be in an automobile; in order words, the crank handle end is in the rear now facing the pilot, while the fly wheel end is in front to which is bolted a special propeller hub that extends outward through a hole in the radiator. The reader can see the carburetor and magneto mounting as well as the specially made oil pan. This pan was made of sheet aluminum.

There are no exhaust pipes in place in the photograph, but they are attached by special clamps to the engine bolts.

Detail drawings of the Ford changes will be given on this page as soon as we get sufficient space for them.

The fittings shown below are the elevator and rudder arms and also the aileron arm. These are made of good strong 1/32" wall steel tubing and of oval shape. It is not always possible to purchase oval tubing ¾ x ½" so you can get ⅝" round and crush it to the desired shape. The long ones are needed, two for the elevator flaps and one for the rudder. Four short ones for the ailerons are needed. One for each aileron. The reader will note that the arms are fastened on top, to the top ailerons, and to the bottom of the lower ailerons.

The terminal plate shown is for use where all wires are to be fastened and where no other plate has been provided. For instance, the brace wires to the Fin, brace wires to the tail spars, where the control wires attach to the end, of ailerons, rudder, and flaps, etc.

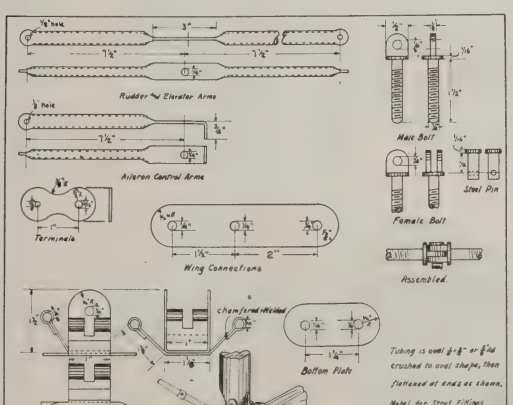
The plate is made from .050" cold rolled steel.

The wing connection plates are made of 1/10" or .090 cold rolled. Either thickness will do as the variation is not much and the builder can use the size which he can purchase the easiest.

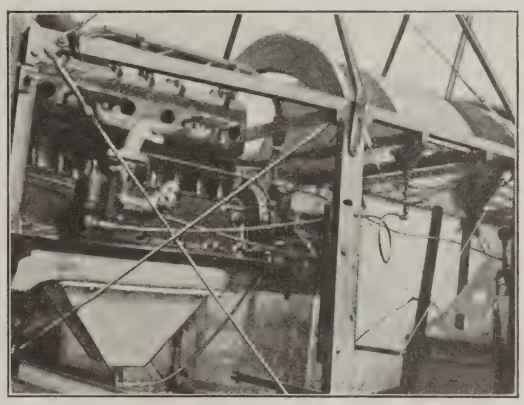
These plates are fastened to the wing spars, two being used on each spar and fastened with two bolts, two are also fastened to each end of the center section spar, a ¼" pin holding them together. 24 of these are needed.

The aileron, tail flap, and rudder hinges are shown at the upper right hand corner.

This is simply made of two ¼" special bolts, one having a forked end, the other having but one tongue which fits between the forked ends of the other and is held by a ¼" pin which is in turn held from falling out of place by a cotter pin. It is necessary to make 14 of these hinges. Two to each aileron, rudder, and elevator flap.



Details of fittings for the Ford motored aeroplane



Ford motor installed in an aeroplane

When setting these in place it would be advisable to cut a recess or drill a sort of a well out of the spar to allow the fitting to sink in a little deeper, to diminish the space between the main or stationary, and moving parts.

It might be a good time to tell the reader that all surplus ends on bolts and fittings should be cut off, as they should be no longer than is necessary because they only add a lot of weight without increasing the strength.

The lower fitting is the interplane strut fitting and is for attaching the struts and fastening the bracing wires too. This fitting is very simple and its strength is many times greater than is necessary.

Twenty of these fittings are needed. If you are not familiar with welding of metals I would advise that you have this work done by experts as the strength of this fitting depends on the strength of the jointed part.

The sketch shows clearly how the fitting is used, especially the setting of the bottom plate under the spar.

On the eight outside fittings one of the terminals can be cut off to save weight as only two, a side and rear connection, are needed.

(To be continued)

Model Aeroplane Contests

THE proposed model aeroplane contests which was announced to begin in the Spring seem to have met with considerable interest as the Model Department has been fairly swamped with letters and post cards asking for permission to enter one or more of the contests.

Some readers seem to think that they are late and cannot enter, which is a wrong impression as nothing has been decided on as yet.

There is plenty of time for every model reader or flyer in the United States and Canada to get in line. The style or order of events will be announced later.

A prominent member of the Aero Club of America has promised to offer a valuable prize for one of these contests and I am sure a few more well-known aeronautical men will follow up this kind offer.

The contests will not be for model flying alone, but for best design, construction, etc.

The readers who have not as yet sent in their names should do so at once, to enable us to estimate approximately the number of contestants, as the value of the prizes will no doubt be in proportion to the entry list.

We want the entry list to be big, and it would be well for those who are interested in this page to get your friends in line, as the benefits derived from model flying are many, and although a beginner may not win a prize this time, he will be a veteran when the next contests come around.

Send postal or letters to the Model Editor!



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Prohibition as a Boon to Aeronautics

Charles Walsh, proprietor of a large hotel in Connecticut well known to yachtsmen, motorists and aeronauts, is going to incorporate a company to build dirigible saloons. The possibilities of aeronautics loom larger and larger each day, as we realize that thousands of new aeronautic enthusiasts will swell our ranks in order to visit Charlie's gin mills.

We asked Charlie how we would land on his aerial oasis as we fly by in our 1920 Aerial Bullet.

"That will have to be worked out," he admitted, "but it could be arranged to hook patrons aboard from passing planes by some such device as that which hooks mail sacks off a passing train at rural stations. Or maybe the planes can be throttled down so visitors can step off. That is a minor detail. A thirsty man will dive off, if necessary."

Here we interposed and pointed to the recent feat of one of our military aviators in dropping from one plane in flight to another a few feet below. This had doubtless been done in anticipation of the establishment of the Walsh chain of Aerial Saloons.

Charlie's vision filled our hearts with hope and for the first time since Prohibition had been ratified did we feel like breathing freely. We could visualize ourselves imbibing stimulating spirits and laughing at the impotent constitution whose all embracing arm could not reach the heavens above.

"The sale of liquor may be legal in the air, but how can you get the stuff when it can't be manufactured on land?" asked one of our number.

Fortunately Charlie's answer was prompt, which saved me from heart-failure.

"Dirigible breweries and distilleries," he declared with a wave of the hand. "I have it on the authority of a chemist that at 3,500 feet the atmosphere is ideal for rapid distillation. But you must understand that there will be great quantities of liquors on hand long after the bone dry law goes into effect. The problem will be to sell them, and the dirigible will solve it."

"But the danger of men getting under the influence of drink and becoming careless to the point where they may topple off the air cafe," suggested one of our number.

"A man can stand much more drink in the higher altitude than on the ground," explained Mr. Walsh. "It is possible a drinker may consume incessantly at certain heights and never feel a flicker. You never heard of drunkenness on top of the Himalaya Mountains, did you?"

"No, but——"

Just then Big Ben woke me up to another day's work in this dry, dry world.

Found in a Bachelor's Room

A bird—a bottle,
An open-work stocking.
Some might think this awfully shocking, alas;
The bottle was empty
The bird a stuffed one
The open-work stocking
Needed mending some.

Twentieth Century Lament

Little Jack Horner, sat in a corner,
Eating some kind of a pie.
He stuck in his thumb
And looked awful glum
Then said, "Why in h—— can't I fly?"

Welcome Home, Airmen

Suggested menus for home-coming celebrations by AERIAL AGE's Culinary Editors:

Soups

Cream of Stall — Puree a la Side Slip

Relishes

Sliced Reversements
Combination Landing Salad
Falling Leaf With Zeroline Dressing
Fish
Fried Fillet of Loops

Entrees

Fried Wing Overs — Zoom Cutlets
Roast a la Bumble Bee

Desserts

Nose Dive Special — Whipp Stalls

Drinks

Dropinbay Highball — Highfog Flip
Tail Spin Rickey

SALADS

Tail Spin Fruit
Celery Hearts (broken)
Footballs La Petit

ENTREES

Baked Ornithopter, Immelman Sauce
Dressing (Oyster A. W. O. L.)
Giblet Gravy (Camouflaged)
Baked Chassis
Smashed Spads — Candied Fuselage
French Ballbearings
Cream Flowers

DESSERTS

Sideslip — Blighty Pudding
Phosfer Bronze Sauce
Exhaust — Intake
Wing Dope
Kentucy Julip Greens

METROPOLITAN MOVIES.



"Gee whiz, Jimmy! I'll betcha them's aojers in that there flyin' machine."
"Aw, g'wan! Soldiers nothin'! Them's the bugs what kses the prices of milk."

Courtesy N. Y. World

Safety First in Aeronautics

If you fly straight,
There is no need to worry;
If you fly improperly,
Of two things one is certain—
Either you spin or you don't.
If you don't spin,
There is no need to worry;
If you do spin,
Of two things one is certain—
Either you crash or you don't.
If you do not crash,
There is no need to worry;
If you do crash,
Of two things one is certain—
Either you are hurt slightly or seriously.
If you are hurt slightly,
There is no need to worry;
If you are hurt seriously,
Of two things one is certain—
Either you recover or you die.
If you recover,
There is no need to worry;
If you die, you cannot worry.

—*Speedway Dope.*



The production in quantity of this masterpiece of Aeroplane Engine Bearings, is a tribute of the highest order to the skill and perfection attained by this highly specialized branch of our organization.

DOEHLER DIE-CASTING CO.

MAIN OFFICE AND EASTERN PLANT
BROOKLYN. N.Y.

WESTERN PLANT
TOLEDO. OHIO.

NEW JERSEY PLANT
NEWARK. N.J.



MARTIN BOMBER

The Bomber Performance Demonstrates Military Supremacy

The Martin Plane is First to Fulfill Commercial Requirements

Our Freighter and 12-Passenger Airplane soon to be announced

THE GLENN L. MARTIN COMPANY
CLEVELAND

Contractors to the United States Government

(*Continued from page* 1085)

Zeppelin type have many long and sustained flights. One well authenticated report states that a dirigible flew from Jamboli in Bulgaria, carrying twenty-two men, 28 tons of medicines and supplies to one of the German Generals, Lettow-Vorbeck, in German East Africa. When the airship arrived over Khartoum it received a wireless message that the General had surrendered. It then returned without landing, having covered nearly four thousand miles, and remained in the air 96 hours.

England has built rigid dirigibles up to 70 tons capacity, with a speed of 78 miles per hour, and has projected still larger ones of 200 tons, 1,000 feet in length, 154 feet in diameter, to contain 10,000,000 cubic feet of gas, with a speed of 85 miles per hour, and have a cruising radius that would take them around the world. Inflated with non-inflammable gas such great airships, flocks of swift, small aeroplanes, giant cargo machines and flying boats, will soon solve our problems of rapid transportation and intercommunication over land and sea, ice and snow, mountains, plains, rivers, lakes, forests, swamps and deserts and make every city in the land a port on the great ocean of Atmosphere.

Aeroplanes capable of lifting from fifteen to twenty tons are already in operation. The Curtiss Naval seaplane "NC1" equipped with three Liberty motors, recently carried fifty-one passengers in one flight. The large Handley-Page biplane, equipped with four Rolls-Royce motors, recently carried 40 passengers on a flight and then flew from London to Africa with twelve passengers. A Rolls-Royce motor ran for seven days without stopping on a block test, at 2,000 r.p.m.

Recommendations for the Solution of National Aeronautic Problems

As the subject is new and confusing to most people, and the national aeronautic problems are very serious and pressing, we have, to facilitate matters, outlined a few recommendations for actions which should be taken in the near future.

We recommend (1) The organization of a Government organization similar to the Grain Corporation, to be known as the Aerial Transportation Corporation, or a similar name, capitalized at $50,000,000, which shall take over the $800,000,000 worth of aeroplanes, motors, and aeronautic equipment which the Army and Navy cannot use and are trying to dispose of. This corporation shall devise ways and means for salvaging this equipment, utilizing whatever can be used to establish aerial transportation lines in the United States and supplying the South and Central American countries which are anxious to have aerial transportation lines.

(2) Let this Government owned Aerial Transport Company take over the twenty or so Army aviation stations and aviation depots which the Army has abandoned or is abandoning and operate them as public aerodromes where the Post Office as well as civilian aviators can use the hangars and facilities by paying rent.

(3) Let this corporation establish and operate aerial transport lines between industrial centers. Some of these lines can run from New York to San Francisco, from Washington to Chicago, from Minneapolis to New Orleans, from New Orleans to New York, from Seattle and Portland, Oregon, to San Francisco, Los Angeles and San Diego, from Detroit to St. Paul, from Key West to Havana, from Portland, Maine, to Boston and New York. Scores of such aerial transportation lines could be established and operated immediately, employing some of the thousands of idle Army and Navy aviators and mechanics, and they would solve the difficult national problems of transportation, solving the problem of utilizing the idle equipment and employing the idle aviators.

(4) All air traffic should be classed with interstate and international traffic and the interstate traffic regulations should be extended to include air traffic.

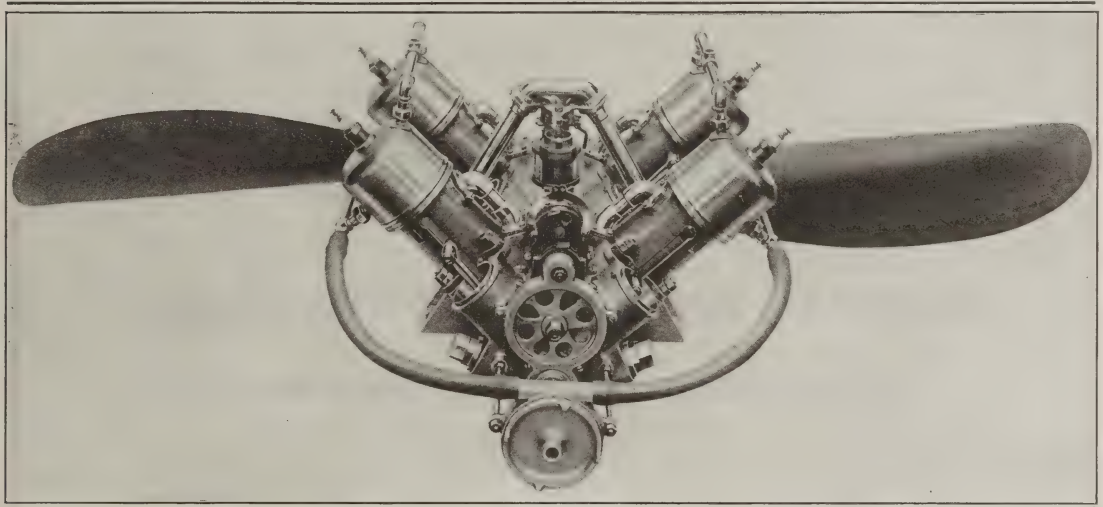
(5) The Department of Commerce should be given charge of the registration and inspection of aircraft, creating in the Department of Commerce an Aircraft Inspection service similar to the present Steamboat Inspection Service.

The subject is most extensive and the time available is limited. I will not, therefore, discuss in detail the regulations that have been proposed by the British Aerial Transport Committee, a copy of which I have with me and will be glad to show to any person who is interested in the subject. I also have a number of copies of *Flying*, the leading aeronautic magazine, which contains an article on serial regulations by Mr. Henry Woodhouse, who is considered the best posted man in aeronautics in America. He has made a close study of the aerial regulations of different countries in the past ten years and his article shows by actual illustrations how some of the most difficult problems of enforcing the aerial regulations can be solved by using the wireless telephones developed by Colonel C. C. Culver, and in other ways. I will be glad to give copies of *Flying*, containing Mr. Woodhouse's able article, to any person who wishes a copy.

Thomas

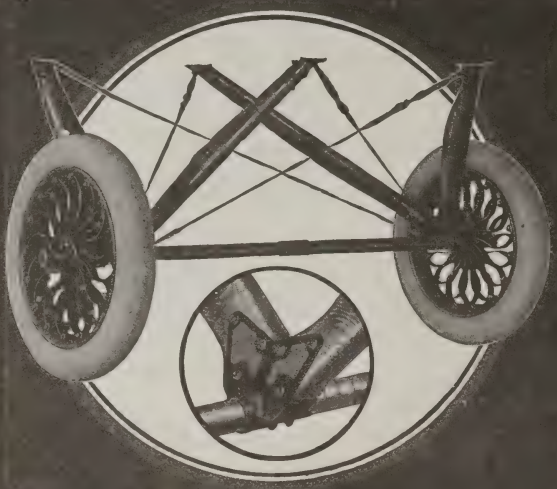


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ACKERMAN LANDING GEAR

SIMPLICITY STRENGTH and SERVICE

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542 Rockefeller Building, CLEVELAND, OHIO. U.S.A.

"NIEUPORT"

AND

GENERAL AIRCRAFT COMPANY, Ltd.

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OFFICE

LANGTON ROAD

CRICKLEWOOD, LONDON, N.W.2

Here It Is—The Practical Aeroplane

READY FOR IMMEDIATE DELIVERY

Designed for civilian use—for the man who rides his ranch, and the man who loves the air—regardless of the business that calls him.

Low in Cost of Upkeep



High in Factor of Safety

Dispatch Model, $2,500 f.o.b. factory

AIRCRAFT ENGINEERING CORPORATION, New York City

C. M. SWIFT, General Manager.....Bronx Boulevard—238th St.
N. W. DALTON, Chief Engineer.....2 East End Avenue
HORACE KEANE, Sales Manager.....220 West 42nd Street

On exhibition week of December 24th at showrooms of Willys-Overland Company, Broadway and 50th Street, New York

(*Continued from page* 1081)

large extent the entrance of interfering noises. These earpieces are mounted in the helmet and consist of pneumatic cushions or rings which surround the ear and maintain an airtight contact with the head with but small pressure. They are very efficient as well as comfortable.

Three headpiece designs consist in:

2. The use of a soft helmet.

1. The use of a hard helmet.

3. The use of any helmet, the earpieces being attached to an elastic head band and worn underneath any helmet.

The second governing condition relating to the design of the voice duct and requiring the maximum intensity ratio of voice sound to aeroplane noises is a matter which demands the closest attention in securing the best results.

Tube length—Except for very short tube length, there is a definite length which will give best results for a given aeroplane. In as much as the motor exhaust noises are the most powerful that have to be contended with and as they are periodic with a fairly uniform frequency they can be reckoned with on this basis: tube lengths equal to ¼, ¾, 5/4, etc., of the wave length of these motor exhaust sounds must be avoided in order to prevent amplification of those sounds by resonance.

Tube Diameter—A consideration of the limiting values indicates that an optimum tube diameter.

An infinitely small tube, it is evident, could offer an infinitely high resistance to the propogation of the voice vibration. On the other hand, an infinitely large tube would duplicate the conditions applying in talking directly through the open air, which, as has previously been pointed out, is impossible. In general, that tube length is to be preferred which will transmit the aeroplane noises with no greater intensity than those reaching the ears around the ear caps.

Tube Walls—The material comprising the walls of the tube, aside from the requirements as to flexibility, light weight, durability, etc., must prevent both the escape of voice sounds and the entrance of aeroplane noises and in addition the inside surface should be such as to break up any tendancy of the enclosed air columns to oscillate freely.

This is desirable firstly so that the air column is in a periodic vibrating body, which is necessary in order to prevent distortion, and secondly, so that it will form a very poor resonator to any periodic aeroplane noises which otherwise might be amplified by resonance.

All of these more important factors as well as others of a purely practical nature have determined the designs of the aeroplane and the highly satisfactory results obtained wherever it has been used testify eloquently to the wisdom of this course as distinguished from a design based only upon cut-and-try guesswork. As distinguished in the telephone method of communication the speaking tube has the additional great inherent advantage of requiring no vibratory diaphragms in the sound passage from the speaker to the listener. These are of course a necessary evil in the electrical transmission of speech for they not only distort many of the transmitted speech sounds out of all true similarities actuating vibrations, but they also hinder or prevent entirely the transmission of many of the complex vibrations comprising articulate speech. The result is, that only the nearest skeleton of a spoken word is trasnmitted and this explains the fact that, when unassisted by the context of telephone speech, such a very low percentage of words can be understood even with the best telephone equipment and without noise interference.

For such aircraft as are equipped with radio reception apparatus, a combination radio and airfone helmet has been desounds, as well as the radio signals or speech reach the ears through a common or combined earpiece so that these communications may be received separately or simultaneously, as desired by the radio operator.

The Airfone has indeed proven an admirable solution of this heretofore perplexing problem of pilot-observer communication—and it fills a strongly felt need in this whole field of aviation.

(*Continued from page* 1082)

trol cables run to their trailing edges, and a compensating cable runs through the fin from the leading edge of one rudder to the leading edge of the other.

Landing Gear

The landing gear comprises four 2'-11-7/16" diameter wheels with tires 7⅞" wide. Wheels arranged in two pairs, each pair having a 4'-6" tread, and inner wheels spaced 5'-8⅛" from center to center.

Axles are hinged at center. Vertical shock absorber mechanism enclosed in an aluminum casing.

Tail skid is the usual swivelled pylon-mounted ash skid, shod with a sheet steel plate.

Engines

The Liberty engines are entirely enclosed in streamlined sheet aluminum nacelles between the planes. Propeller axes 10'-11-1/16" above ground when machine is in flying position.

Propellers 10'-6" diameter, both revolving in the same direction.

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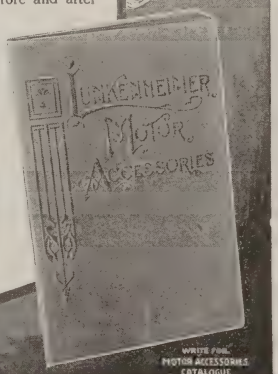
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AERIAL AGE WEEKLY

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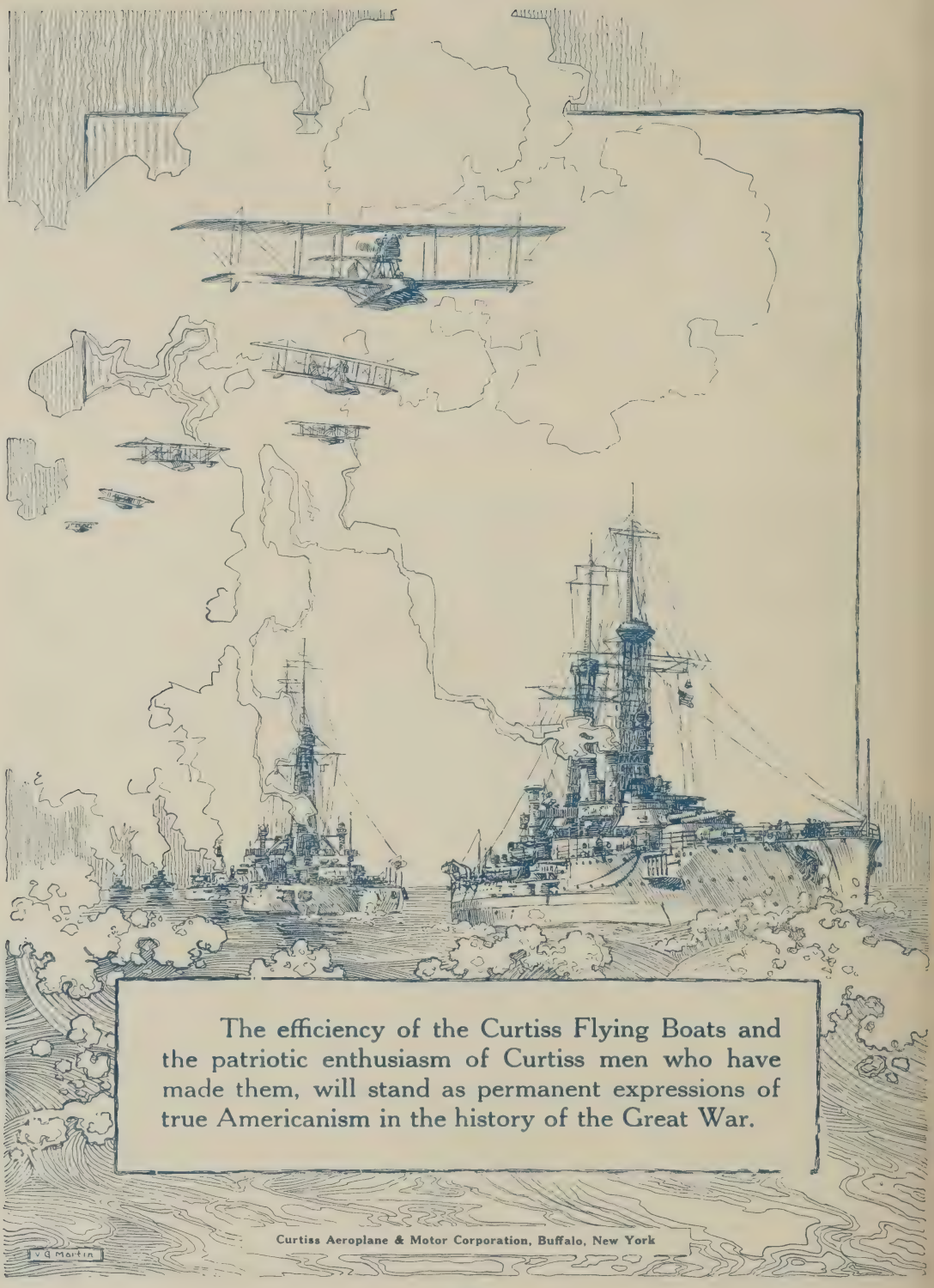


Four J N-4H training planes in V formation at the Ellington Field (Houston, Texas) Bombing School

U. S. Naval Aviators Plan Trans-Atlantic Flight

Appropriation for Large Dirigibles Should Be Granted

BLISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
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AERIAL AGE WEEKLY

VOL. VIII FEBRUARY 17, 1919 No. 23

TABLE OF CONTENTS

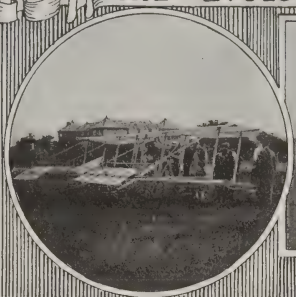
	PAGE
U. S. Naval Aviators Plan Trans-Atlantic Flight	1111
Appropriation for Large Dirigibles Should be Granted	1111
Plans Complete for Aero Club Banquet	1112
Idle Wings	1112
The News of the Week	1113
The Aircraft Trade Review	1116
U. S. Aerial Mail	1117
The Bellanca 35 H.P. Biplane	1118
Cited for Distinguished Service	1120
Douglas Automatic Aeroplane Ignition Interrupter	1121
Lieut. Harold H. Emmons, Chief of Engine Production Department	1122
Value of Plywood in Aeroplane Fuselage Construction	1123
The King-Bugatti Aviation Motor	1124
Naval and Military Aeronautics	1132
Foreign News	1134
Elementary Aeronautics and Model Notes	1135
Aeronitis	1136

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EVERY FIRST CLASS AEROPLANE REQUIRES A RETRACTABLE CHASSIS

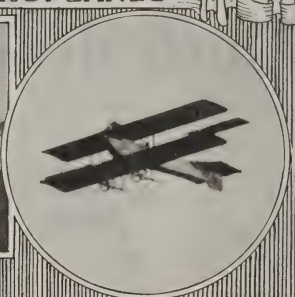
THE EVOLUTION OF MARTIN AEROPLANES



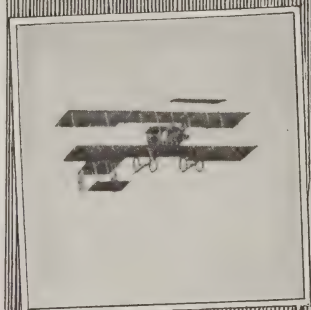
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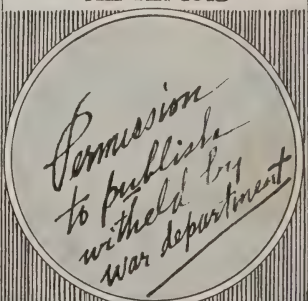
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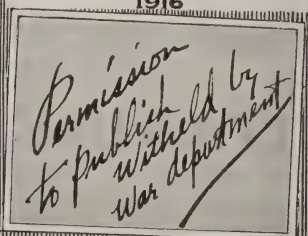
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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright, THE AERIAL AGE CO., February 17, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, FEBRUARY 17, 1919 NO. 23

U. S. NAVAL AVIATORS PLAN TRANS-ATLANTIC FLIGHT

THE announcement that the Navy Department has ordered Commander John H. Towers to take charge of "the development of plans and assembly of material and personnel for the proposed transatlantic flight" is very gratifying.

The matter of transatlantic flight has been a source of some anxiety to progressive Americans who rightly feel that the country of the Wrights, and Curtiss and other pioneers should be first in achieving this epoch making flight especially as America, through the progressive efforts of Mr. Rodman Wanamaker in 1914, was first to take up the subject seriously.

The announcement of the Navy Department came in an order from Secretary Daniels detailing Commander John H. Towers, who has been attached to the office of naval operations, to take charge of the development of plans and the assembly of material for the proposed trip. He will map out the route to be followed, make the arrangements for the momentous journey and probably recommend to the Secretary the men who will make up the crew of the airship in which it is to be made.

The fact that the navy was making ready for this enterprise and that Commander Tower had been ordered to take charge of the work was disclosed inadvertently. Nothing was to have been said until it was well under way. It is evidently the purpose of the Navy Department to win the distinction of being the first to make a successful flight across the ocean.

It is fitting that Commander Towers should have been selected to organize this flight. He was one of the two first naval officers in the world to take up aeronautics, the other being Lieut. Commander Theodore G. Ellison. Subsequently he was the representative of the Navy in co-operating with Mr. Rodman Wanamaker in the organization of the transatlantic flight in 1914, which was prevented by the advent of the war.

There are a number of other transatlantic projects under way, therefore America stands a good chance of being first to achieve this flight, which is to be an historic event in the annals of aeronautic history.

APPROPRIATION FOR LARGE DIRIGIBLES SHOULD BE GRANTED

THE appropriation requested by the Navy Department for large dirigibles should be granted.

America has been retrogressive in this branch of aeronautics, as it has been in all other branches, and has paid dearly for her retrogressiveness.

Had we had six large dirigibles, the patrolling of the Atlantic to protect shipping from U-boats would have been easy, and patrolling our coasts would have been easier still.

The loss to America, due to the number of American ships sunk in American waters was greater than it would have cost to build a fleet of fifty large dirigibles.

Dirigibles can be built of enormous size. The following quoted from Mr. Alan R. Hawley's address to the convention of the Rivers and Harbors Congress gives a good idea of what can be done in this branch of aeronautics.

"We Americans ought to be ashamed of our backwardness in this branch of aeronautics. The only dirigibles we have cannot carry a ton of useful load. They are small and slow, and we have only a few of them at that!

The field of lighter-than-air craft, German dirigibles of the Zeppelin type have many long and sustained flights. One well authenticated report states that a dirigible flew from Jamboli in Bulgaria, carrying twenty-two men, 28 tons of medicines and supplies to one of the German Generals, Lettow-Vorbeck, in German East Africa. When the airship arrived over Khartoum it received a wireless message that the General had surrendered. It then returned without landing, having covered nearly four thousand miles, and remained in the air 96 hours.

"England has built rigid dirigibles up to 70 tons capacity, with a speed of 78 miles per hour, and has projected still larger ones of 200 tons, 1,000 feet in length, 154 feet in diameter, to contain 10,000,000 cubic feet of gas, with a speed of 85 miles per hour, and have a cruising radius that would take them around the world. Inflated with non-inflammable gas such great airships, flocks of swift, small aeroplanes, giant cargo machines and flying boats, will soon solve our problems of rapid transportation and intercommunication over land and sea, ice and snow, mountains, plains, rivers, lakes, forests, swamps and deserts and make every city in the land a port on the great ocean of Atmosphere."

If we are to maintain our position in the aeronautic world of to-day, it is most important that the appropriation for the large dirigibles be granted.

PLANS COMPLETE FOR AERO CLUB BANQUET

PLANS have now been completed for the 13th Annual Banquet of the Aero Club of America to be held at the Waldorf-Astoria on February 19th.

Lieut. Rene Fonck, ace of all aces, who has an official record of 75 German machines to his credit, and an unofficial record of 125 machines, and who on two occasions has brought down six machines in one day, has been granted permission by the French Government to attend the 13th Annual Banquet of the Aero Club of America, and will be the guest of honor.

Lieut. Charles Nungesser, second in the list of French aces, and Robert Esnault Pelterie, president of the Aeronautic industries association of France, are accompanying Lieut. Fonck and will be present at the banquet.

Among the other aces expected to be present are, Colonel William A. Bishop, V.C., D.S.O., M.C., D.F.C.; Lieut. Colonel William Thaw, Captain Edward V. Rickenbacker, Major James A. Meissner, Captain Arthur J. Coyle, in command of the 1st Aero Squadron and one of the 300 aviators trained by the Aero Club of America in 1915-16, and as many of the American Aviation Officers from the front as are free to attend on that evening.

Rear Admiral Robert E. Peary has accepted an invitation to speak upon "Exploration by Aeroplane" and the opportunity for great aerial transportation systems to be extended all over the United States.

Major General Charles T. Menoher, Director of the Air Service, will speak on Military Aeronautics, and Rear Admiral Bradley A. Fiske, U. S. N., retired, will speak upon recent developments in maritime Aeronautics.

Mr. John Hays Hammond will speak on the subject of "Polar Aero Radio Survey."

The Honorable Fiorello H. La Guardia, Major in the Air Service and Member of Congress, will speak upon the wonderful developments in aviation in Italy, and an invitation has been extended to Signor Gianni Caproni, who is expected to arrive in this country.

Mr. Alan R. Hawley will preside and Mr. Henry A. Wise Wood will be toastmaster.

Arrangements have been made for ladies to hear the speeches from the boxes, to which they will be admitted any time after eight o'clock. Cards of admission may be obtained by subscribers to the banquet.

IDLE WINGS

WE printed last week the able address delivered by Mr. Alan R. Hawley, president of the Aero Club of America to the convention of the Rivers and Harbors Congress, in which he proposed a practical solution to the national aeronautic problems including the problem of utilizing idle army and navy aircraft, motors and aeronautic equipment and the employing of thousands of the army and navy aviators. The *N. Y. Tribune* gives a leading editorial to the subject endorsing Mr. Hawley's recommendations as follows:

Considered as a matter of dollars and cents:

The United States has trained 30,000 army and navy pilots, at an average cost of $10,000 each, a total of $300,000,000.

The United States has on hand aeronautic equipment valued at $800,000,000.

Dismissing as a closed incident the fact that our lack of aerial preparedness resulted in comparatively few of these trained pilots getting into the fighting and in only 102 American aeroplanes reaching the front, can we, rich as we are, afford to let $1,100,000,000 expended for training and material go to waste? That sum is only a small part of the amount dispensed. Those 30,000 men, for instance, were only the expert pilots. According to Secretary Baker, the day of the armistice saw 18,688 officers and 137,760 enlisted men in the air service.

But those 30,000 expert pilots and that $800,000,000 worth of material represent the assets of a concern that has gone out of business. What shall be done with these assets? Shall these young men who have qualified for the conquest of the air go back to the counter, the office and the shop? Shall this vast amount of material, the finest of motors, the pick of the spruce forests, the best product of the linen looms, decay in government warehouses while the United States, after giving the world the first practical aeroplane, relapses to the last place in aeronautics, which it held at the outbreak of the war?

The questions will have to be answered one way or the other very soon. Our aviators, discharged from the service, are asking what is in store for them. Captain Eddie Rickenbacker, the American ace of aces, talking of his plans for the future, said he could not imagine himself returning to his old profession of motor racing. He has definitely cut the bonds that bind him to the earth and expects the air to be his realm in the future. In the case of Captain Rickenbacker there will be no lack of opportunity to follow this chosen course, but what of the thousands of other young men just as eager for the new life, who, not having won the renown which attaches to an ace of aces, will not find so many opportunities open to them?

One answer is that proposed by Alan R. Hawley, president of the Aero Club of America, in an address at the convention of the Rivers and Harbors Congress in Washington. Captain Hawley proposed that the energy engendered by war be not permitted to die, but be turned while it is still under full momentum into the channels of commerce. The pith of the plan is in this paragraph:

"The organization of a government body similar to the grain corporation, to be known as the Aerial Transport Corporation or by a similar name, capitalized at $50,000,000, which shall take over the $800,000,000 worth of aeroplanes, motors and aeronautic equipment which the army and navy cannot use and are trying to dispose of. The corporation shall devise ways and means for salvaging this equipment, utilizing whatever can be used to establish aerial transportation lines in the United States and supplying the South and Central American countries, which are anxious to have aerial transportation lines."

Definite suggestions are put forth for the establishment of aerial transport lines connecting industrial centres, such as New York and San Francisco, Washington and Chicago, Minneapolis and New Orleans, Key West and Havana, and the like. The corporation would take over all the material the government has on hand and would give employment to such of the government-trained aviators as wish to continue the career in the air opened to them through their training for war.

There are twenty or more army aviation stations and aviation depots which this aerial transport corporation would take over and operate as public airdromes which could be used, by the payment of a fee, by private as well as government aviators, the latter being employed in such tasks as carrying mail. Such airdromes, by the way, are springing up in all parts of England, aerial transport is being established on a large scale, and a type of low-priced machine is being turned out for civilian fliers and is finding a large sale.

Bills now before Congress call for a peace program for the army which will make use of less than 2,500 pilots, and that of the navy calls for the retention of only 350 aviators of the present 10,000 flying men in that service. If the army and navy are to be reduced to such a footing it seems to be the part of wisdom for the government to provide some such possible auxiliary as would be afforded by the Aerial Transport Corporation.

THE HOMING AIRMEN

The flags halfstaff for Roosevelt fly
As back our airmen come,
The greetings not the bugle call
Our thrilling roll of drum.
We greet them with a half choked voice
And beating of the heart,
At thought of what these boys have faced,
And how they did their part.
We read within their dauntless eyes
The deeds that they have done,
Those eyes that once flashed forth the flame
That hurled to earth the Hun.

Some flushed by victory and fame
Like homing eagles soar,
Some torn by fury of the fight
Shall fly the skies no more.
But in our hearts fond memory keeps
A votive flame aglow,
For all who answered freedom's call
And headed for the foe.
And darting through despair's black cloud
Like fierce beams of the sun,
For our battalions blazed the way
Till abject quailed the Hun.

J. E. KELLY



THE NEWS OF THE WEEK



Aeronautic Exposition Plans Developing

Official Government exhibits for the aeronautical exposition of the Manufacturers Aircraft Association are being shipped to naval depots and army flying fields near New York City. At these places the planes and motors will be prepared for truck transportation to Madison Square Garden and the Sixty-ninth Regiment Armory, where, March 1 to 15, the exposition will be held.

It is now definitely known that the greatest types of aircraft from the United States, Great Britain and Italy will be on display, the Navy NC-1 and an all-American bomber being placed in the Garden and a Handley-Page and an Italian Government Caproni in the Sixty-ninth Regiment Armory. In the Garden, in such proximity to the great American machines that the contrast will be striking, will be the original machine in which Wilbur and Orville Wright made the first flight in the world's history in a heavier-than-air machine. Near this old Wright plane will be a copy of the original Langley plane, which, although built before the Wrights made their flight, was not flown until afterward and after Prof. Langley's death.

A remarkable feature of the exposition will be the accessories exhibit. Although the aircraft industry is very young it has already called into being a vast system of subsidiary manufactories. There are some 35,000 parts in a De Haviland aeroplane and many of these parts come to the aeroplane plants complete and ready for installation. Just as the accessory and parts people form an essential part of the automobile business, so they are entering into the production of aeroplanes and lighter-than-air craft. Bearings, veneer, glue, fabrics, castings, instruments, wire, leather and rubber form the elements of the aeroplane and their importance will increase as the plane is devoted more generally to commercial purposes. The accessory exhibits will occupy extensive space on the elevated platform of the Garden, in the exhibition hall and in the armory.

Many of the planes proposed by the Navy will be exhibited by the various people who produced them, so that the naval flying section of the exhibit will include mainly the experimental NC-1, the fifty-passenger flying boat; and a model of a rigid dirigible. There will also be a display from the Naval Aircraft Factory at League Island, showing an F-5 boat hull, with wing and tail sections.

The naval instrument section will include an accelerometer, air speed meters, balloonet guage, bilge pumps, communication helmets, fire extinguishers, hydrogen leak detectors, incidence indicators, inclinometers, instrument board, K. B. board box, manometers, oxygen respirators and breathers, pigeon carrier, safety belts, tension meter, turn indicator, etc.

The Navy type of rotary motor will be shown in the motor section of the Bureau of Steam Engineering Exhibit, and unique and foreign types of radiators will be included, as well as radiator shutters, oil and water heaters for use in cold water, self-starter for Liberty engines, combination electric and hand starter for Liberty engines, radio equipment, electric equipment, lamps, intercommunicating sets, airship type of running lights, electric heated clothing, recognition lights, and compass receiver.

The Bureau of Ordnance will show aerial bombs of various types, wind vane and ring sights, pistols and ammunition, the full ordnance of guns and equipment to be carried on the NC-1..

The Bureau of Navigation has available for shipment to New York an interesting collection of instruments, including the following: Taylor altimeter, 20,000 feet; Tagliabue altimeter, 25,000 feet; keyless clock, Waltham clock, electric clock, various types of compasses, barograph, pocket aneroid, atlas chart board, course and distance finder, bearing plate, navigation notebook, deviation cards, statoscope, goggles and life jackets.

The Navy has just received from abroad a consignment of carrier pigeons with remarkable war records. These pigeons will form another part of the exhibit.

As a distinct feature, the Navy also plans a motion picture exhibition, having just completed reels showing flights over Washington and along the Atlantic Coast.

Dayton Wright Honeymoon Aeroplane On Display

An aeroplane named "The Honeymoon Express" by the Dayton Wright Aeroplane Company, its designer and maker, has been brought to New York for display at the Aero Show at Madison Square Garden. It contains three seats, one for the pilot and two for the bride and groom. It is lavishly upholstered, and contains a heating apparatus for the comfort of the passengers. A telephone between passengers and pilot and a wind shield are other features of the plane.

Aeroplane Speeds Business in Iowa

Sheldon, Iowa.—Lieutenant Donaldson, late of the Army Air Service, is the first aviator on record to use an aeroplane for commercial purposes in Iowa. Lieutenant Donaldson carried a passenger from Nulford to Orange City, Iowa, and return, stopping over at Sheldon on his return trip to deliver certain important documents.

New Reserve Military Aviators

In accordance with recommendations from the Training Section, the following named officers are rated as Reserve Military Aviators: 2nd Lieut. Leland B. Bass, A. S. A.; 1st Lieut. A. L. Dade, Jr., A. S. A.; 2nd Lieut John M. Martin, A. S. A.; Captain Wilbur F. Wright, A. S. A.; Capt. Charles G. Eidson, A. S. A.; 1st Lieut. Hilton M. Patton, A. S. A.; 2nd Lieut. Clyde V. Finter, A. S. A.; Capt. C. A. Miller, A. S. A.

New Commandant at Great Lakes

Chicago, Ill.—Rear Admiral Frederick D. Bassett, formerly commander of the U. S. S. Utah, today became commandant of the Great Lakes Naval Training Station, succeeding Captain Archibald Scales, who leaves to assume the superintendency of the Naval Academy at Annapolis. Captain Scales had been at the Great Lakes only two months.

Debarkation Hospitals for Air Service

Washington, D. C.—The Surgeon-General's Office announces that sick and wounded men of the Air Service flying personnel, on arrival at ports of debarkation will be sent to Army General Hospital No. 2 at Fort McHenry, Baltimore, Md. Those already convalescent are sent to the Air Service Depot, Garden City, L. I.

Flying personnel patients arriving at General Hospitals already convalescent will be sent to the Military Convalescent Hospital, Cooperstown, N. Y., or to the Air Service Depot at Garden City.

General Mitchell Decorated

Paris, France.—Brigadier-General William Mitchell, Chief of Air Service, 3rd Army of Occupation, was named a commander in the French Legion of Honor.

Government Aeroplane Factory for Fisher Body Corp.

Detroit.—Fisher Body Corp. is now endeavoring to lease or purchase the aeroplane factory adjoining its plant, built by the Government for aircraft production. Federal officials are now in the city. An inventory and survey of the plant is under way, and the matter will probably come to a head in the course of a few days.

Detroit-Pittsburgh Aeroplane Express Route Advocated

Detroit.—Automobile and other automotive industrial companies are asked to guarantee sufficient business to permit the establishment of an aeroplane express route between Detroit and Pittsburgh this spring. The Detroit and Pittsburgh Boards of Commerce have endorsed a plan submitted by Lieutenant B. Vernon, Flying Field, Philadelphia, for the immediate establishment of such a line, providing sufficient business can be secured. Lieutenant Vernon proposes to operate two planes, one to fly from Detroit to Pittsburgh and the other from Pittsburgh to Detroit, stopping at all intermediate cities. Discounting time required to make principal stops, a machine leaving Detroit at 10.30 a. m. will reach Pittsburgh at 3.30 p. m.

The proposed air express company will carry express for $1.78 a pound, subject to a 40 per cent discount if a satisfactory amount is sent at one time.

Development of the Castor Oil Industry

With the entrance of the United States in the war, the sudden enormous increase in demand for castor oil for aeroplane motors proved to be a serious problem. However, the co-operation of the Signal Corps, the Department of Agriculture and the Export Bureau of the War Trade Board in the solution of this problem and the energetic campaign that was conducted was a thorough success. Captain H. L. Scaife went into the work of persuading farmers to produce this crop and his success can be judged by the fact that 108,000 acres were planted in the United States with additional acreages in Central America, Cuba, Haiti, and San Domingo. The estimated crop is 2,000,000 gallons.

Mr. W. W. Stockberger, Department of Agriculture expert on castor beans, estimated that the California yield per acre ranged from 30 to 40 bushels, while the Middle West was only able to produce from 15 to 25 bushels per acre.

The zeal of the California land owning public not only resulted in large castor oil plantations on the ranches, but also in back-yard cultivation in the cities.

Castor oil is necessary on the high speed rotary motors, such as used on combat and advanced training planes but is not required for the Liberty Motor.

Personal Par

Elbert Warford, who has been in the aviation service, has returned to his former position as advertising manager of the Seattle branch of the B. F. Goodrich Rubber Company.



The reconstructed De Havilland Biplane with Rolls-Royce engine, that is being used by Premier Lloyd George and Bonar Law, for their journeys to the Paris Peace Conference from London

Director of Sales Office Being Organized in War Department

Washington, D. C., January 29th.—A Board of Sales Review under the direction of C. W. Hare, and his assistant E. C. Morse, has been selected, each member of which is an expert in some particular class of materials. Lieutenant-Colonel A. Le Mar will be in charge of machine tools, metal and wood railway and power machinery; Major W. M. Crunden, building material and supplies; Captain Fred Glover, motor trucks, motor cars, motorcycles, and supplies and parts for same; Mr. L. H. Hartman, quartermaster supplies, gasolene, barbed wire, etc.; Mr. G. F. Woods, real estate; Captain A. L. Mercer, raw materials, minerals, metals, chemicals, etc.; and an additional member for all types of ordnance and munitions.

New Jersey to Prohibit Aerial Hunting

Trenton, N. J.—A law is being recommended to the New Jersey State Legislature prohibiting hunting from aeroplanes. In arguing in favor of the proposal, Mr. Robertson S. Ward, of the Fish and Game Commission pointed out that a large number of ducks have been slaughtered by airmen on Long Island, New York, without their having been gathered from the surface of the water after being shot.

Whale Hunting by Aeroplane

San Diego, California.—Lieut. James McCullough, attached to the army's aerial gunnery school at Ream Field, near San Diego, Cal., recently shot and killed a small whale with the machine gun of his aeroplane off Imperial Beach. Several of the army airmen saw a whale spouting about two miles offshore and made for it. Lieut. McCullough soon swooped down near the animal and let loose a stream of bullets at it. The broad back of the whale looked like a sieve when he had finished firing. Residents of Imperial Beach towed the whale ashore.

Film Company Seeks Transatlantic Photo Rights

New York.—It was recently learned here that a large film company is planning to raise $100,000 as a prize to the first flyer to cross from England to the United States. The method that will be employed to raise this sum will be to select one hundred firms, each representative of a particular industry and to photograph for $1,000 its plant, its officers, and product in the same multiple reel film depicting the preparations of the flight, its start, the flight and the landing. It was said that some of the money had already been pledged.

Arrival of Doctors by Aeroplane Prevents Critical Situation

Norfolk, Va.—Owing to the poor transportation facilities, the population of the isolated districts of Manteo, Ocracoke, and near-by communities, had been unable to secure outside assistance when a large proportion of the population became victims of influenza. The situation was brought to the attention of the Federal authorities. Two doctors and a quantity of medical supplies were dispatched by means of a naval aeroplane. Many families were found with every member ill, and only remedies available were home-made medicines. The arrival of the doctors was a complete surprise and the situation was greatly improved before their departure.

Wolf Hunt by Aeroplane

Indianapolis, Ind.—Aeroplanes will direct the movement of hunters in a wolf hunt to be held in the White River district. Wolves have been observed here recently, and it is anticipated that the aviators will make it possible to make a large haul.

Civilians May Wear Chevrons

Washington, D. C.—There are no regulations covering the wearing of Chevrons after entry into civilian life and it is understood that the War Department has no objection to the wearing of gold, silver, blue, or red chevrons after return to civilian apparel.

Lewis Gun Mounting Improved at Taliafero Field

Under the direction of Lieut. H. C. Parish, the experimental department of this field has recently perfected and constructed a double Lewis Aircraft gun.

Two Lewis guns are mounted side by side about ten inches apart and so aligned that the lines of sight converge at two hundred yards range. The sights are attached to the right gun and a double trigger mechanism is operated from the left gun. A universal jointed rod connects the two trigger mechanisms and when the guns are properly timed both can be fired by pressing the trigger of the left gun. Either gun can be operated singly simply by removing the connection of the rod to the trigger mechanism of that particular gun.

Each gun carries a large Lewis magazine and an extra large deflector bag. Parts of each gun are interchangeable and ample clearance is provided for clearing jambs or changing parts.

The French government has been using a design of double Lewis gun, but in their design the framework connecting the two guns is very heavy and bulky. Also there is no mechanism by which both triggers can be pulled from one single stock. Their arrangement was simply two separate guns on a single mounting, while this is two guns which operate as one. Full details of the design and construction of this new improvement have been furnished the navy of this country for its approval and use.

Other worthy inventions and improvements are the electrically operated automatic firing mechanism on the Marlin Aircraft Gun, which is synchronized with the propeller. Also the stationary mounted Lewis gun, which is mounted on the center section of the upper wing and is operated in a similar manner to the fixed camera gun which we now use.

Naval Radio for Aircraft Makes Great Strides In War

The report of Rear-Admiral Robert S. Griffin, U. S. N., Chief of the Bureau of Steam Engineering, states that radio telegraphic communication from planes in flight to land stations is possible for a distance of 200 miles; communication from land to plane is practicable for distances up to 50 miles. Improvements in the vacuum tube for transmitting has made radio telephony possible from plane to shore for sixty miles and inter-communication for fifteen miles. The Bureau has provided and maintained 4,000 radio stations on naval merchant vessels.

Vedrines Plans Around-the-World Flight

In an interview following his feat of landing on a Paris roof, Jules Vedrines outlined his plan for an around-the-world flight to a group of newspaper men. Given the necessary financial backing, he declared that it would be possible to accomplish this feat in three months, allowing for stoppages.

"I should begin with a tour of Africa, then go East to India. From India I should fly via the Straits Settlement to Australia; there is a pretty big jump thereabout, but I believe I could manage it. Back from Australia I should fly by the same way and on to Japan, then via Siberia and across the Behring Strait to Alaska." From there Vedrines would fly to San Francisco across the United States to New York, thence to Newfoundland, across the Atlantic to Ireland.

Newarker Is President of Aerial Photographers

Sergeant Henry Van Arsdale, of 44 Avon avenue, Newark, is president of the U. S. A. Aerial Photographers Association, which was recently formed at the aerial photograph school at Rochester, N. Y., with a charter membership of 400. Sergeant Van Arsdale is an instructor at the school. He attended Newark Academy and was graduated from Princeton in 1910. He then attended the New York Law School. He was inducted into service by Local Board No. 9 of this city.

It is expected that nearly all of the aerial photographers now in the army will become members of the new association, which will hold yearly meetings.

Honorably Discharged from Air Service

The following officers have been honorably discharged from the Service of the United States: 1st Lieut. Earl Z. Giblon, 2nd Lieut. Oliver M. Smart, Capt. Lee A. Christy, 2nd Lieut. Fred E. Kunkel, Major James Barnes, Capt. Ord Preston, 2nd Lieut. Sumner B. Emerson, 1st Lieut. Augustus J. P. Gallagher, Capt. Roderick Tower, 2nd Lieut. Levin Rank, 1st Lieut. John Levi Clark, 1st Lieut. Ned V. Tanner, 1st Lieut. Quilla Coleman Duke, Capt. Percy J. Ebbott, 2nd Lieut. Jesse I. Memefee, Col. E. Lester Jones, Capt. Carl A. Miller, Capt. John H. McCawley, 1st Lieut. Edmunds Easters, 1st Lieut. William D. Irvine, Capt. Donald G. Keeble, 2nd Lieut. Victor B. Caldwell, 1st Lieut. Van Winkle Todd, 2nd Lieut. James Moore.

Payne Field Has Many Possibilities

West Point, Miss.—The record of Payne Field as an aviation instruction school, under the command of Lieut.-Col. Jack W. Heard, is an excellent one. According to a recent statement this field has a record of eight hours in the air for each and every machine attached to the field.

This is partly due to the natural conditions, the terrain in the locality being most adaptable to aviation. The field is situated in a natural field of open country four thousand miles square. Aviators assigned here have frequently remarked about the absence of air pockets and bumps, which makes it an ideal flying country. The weather conditions are good.

It was from this field that flying officer Harry Weddington made a cross country flight of 4,000 miles, visiting twelve aviation fields. On Thanksgiving Day, in charge of the same officer, 100 ships, directed by wireless, spelled the word "Victory" in the air. The formation extended over one mile and flew for ten miles.



The O.E.C. 80 H.P. Le Rhone Training Scout, designed and built by the Ordnance Engineering Corporation

National Advisory Committee for Aeronautics Gets New Quarters

Washington, D. C.—The National Advisory Committee for Aeronautics announces the removal of its offices from the fourth wing, second floor, building "D", 4th Street and Missouri Avenue, N. W., Washington, D. C., to the fourth wing, third floor, same building.

In the future the official address of the Committee to which all communications should be addressed will be as follows, and all parties concerned in addressing mail or other matter to the Committee are requested to take notice of, and use this form:

National Advisory Committee for Aeronautics,
D-433, 4th Street & Missouri Ave., N. W.,
Washington, D. C.

Colonel Nugent H. Slaughter in Charge of Radiophone Development

Washington, D. C.—Following the announcement that the War Department had developed a successful radiophone for aircraft, the names of those connected with the development were made public.

As early as August 1910, Colonel Culver (then a lieutenant) began experiments on radio telegraph sets for aircraft. In October of that year, at the International Aviators Tournament at Belmont Park, Colonel Culver conceived the idea of voice-commanded aerial manoeuvring. In 1915 Colonel Culver was detailed to San Diego for working out a series of radio sets for aeroplanes, including design of reception apparatus. Upon the outbreak of the war, General George O. Squier, Chief Signal Officer of the Army, called into conference leading radio engineers, including Dr. F. B. Jewett, of the Western Electric Company; Colonel Rees, of the R. F. C., and Colonel Culver. As a result of this conference, the Radio Development Section was organized, Lieutenant-Colonel Nugent H. Slaughter being made officer-in-charge. The organization which Colonel Slaughter built up designed and brought to the point of production the numerous types of radio equipment used by the Army. Capt. G. Francis Gray directed the research work conducted by manufacturers and others outside of the Signal Corps. The energetic work of these officers resulted in the design of the most advanced type of radio equipment.

Fourth Annual Speed Boat Regatta Will Have Sham Air Battle

Miami, Florida.—Fifty aeroplanes through the courtesy of the commanders of the Naval Aviation Schools at Miami and Key West will perform stunts for the amusement of the crowds. Silver cups will be awarded to the aviators performing the most spectacular stunts.

A mock air battle will be a feature of the program. Two flights of aviators from the Marine Corps School will meet in an exhioition engagement over the race-course. Several seaplane races for silver cups are also on the program.

G. J. Kluyskens Moves to Larger Quarters

G. J. Kluyskens, Inc., importer of foreign aircraft motors, has moved from his former offices to larger and more centrally located quarters at 220 Broadway, New York City.

1,000 Feet Jump from Seaplane in a Parachute

Mr. Leslie L. Irving made a parachute jump from a seaplane recently at Rockaway Beach, L. I., from an altitude of 1,000 feet. The seaplane was in full power flight. The parachute, designed and developed by Mr. Irving, opened very rapidly and was fully spread before a drop of 50 feet had been attained. The descent thereafter continued at a rate of only 7 miles an hour. An excellent feature of the Irving Parachute is that its course can be guided during descent.. The style of harness with which the chute is equipped is so designed as to permit immediate release of the parachute upon reaching the ground, thus preventing the parachute from dragging the aviator along the ground in a high wind.

Major Biddle Addresses National Geographic Society

Washington, D. C.—Members of the National Geographic Society heard just how America's intrepid aviators drove the enemy back into his own country and helped bring the war to a victorious close, when Maj. Charles J. Biddle, one of America's foremost "aces" spoke before that organization in the New Masonic Auditorium.

Maj. Gen. William L. Kenly, chief of the air service of the United States Army, introduced Maj. Biddle and in doing so told something of the administration of America's flying corps from Washington during the country's participation in the great war.

Official motion pictures just received from France of the foremost Yank fliers in action over the lines were shown for the first time with Maj. Biddle's lecture. These pictures show Capt. Rickenbacker, leading American "ace" doing "stunts" high up in the clouds over the trenches and the official decoration of these flying men on the field in France with the distinguished service cross, the highest honor received by Americans in the war.

Speaking of the employment of parachutes as a means of reducing aviation casualties, Major Biddle said:

"I am not aware that any of the entente allies' air forces used the parachute except in connection with observation balloons, but there are numerous instances on record in which the German fliers used this means of gliding to safety from a wrecked or burning aeroplane. One of these instances I witnessed. On that occasion the enemy plane was a two-seater which had been put out of commission by one of our pilots. The machine went into a spin and at a height of several thousand feet the observer fell out and, of course, was instantly killed. The pilot, however, while still some distance from the ground, succeeded in jumping with his parachute and landed safely."

Work of S. A. E. in War

The record for war service of the Society of Automotive Engineers is an enviable one, its members having participated in all phases of war activity.

For several months prior to the entry of this country into the war, committees of this Society at the request of the Transportation Division of the Quartermaster Department made a careful study of military truck specifications, starting with a draft originally prepared by that department. When this work was taken over by the Motor Transport Corps, members of the Society were called upon to do a large proportion of the work.

At the request of the Secretary of the Navy, the Society appointed two of its members, who had been presidents of the Society, members of the Naval Consulting Board, an organization which rendered very valuable service to the Nation. One of these past presidents later became chairman of the Aircraft Board, a group of patriotic men of affairs, which though they labored under great difficulties performed service of unquestioned value to the Government, among other things arranging for the design and production of the Liberty engine.

Both of the engineers who figured prominently in the design of the Liberty engine were members of the Society, one of them being an officer of the Society at the time the work was undertaken.

Another and very logical outcome of S. A. E. work in aircraft standardization matters was the creation of an International Aircraft Standards Board, the chairman and most of its members, so far as this country was concerned, being members of the Society whose experience had been gained in serving on the S. A. E. Standards Committee.

The International Aircraft Standards Board made a trip to Europe early in 1917, and laid the foundation for international cooperation in aircraft standardization matters. This resulted in inestimable good to the Allies as well as to this country.

Similar cooperation in aircraft standardization matters was brought about with the Navy Department, with which most cordial and beneficial relations existed.

Other members of the Society serving both on the committees of the National Advisory Committee for Aeronautics and in cooperation with the National Bureau of Standards, helped to bring about research work of no little importance in the Government program. One result of this work was the design and establishment at the Bureau of Standards of so-called altitude laboratories, in which it was possible to submit engines to test under the low pressure and temperature conditions encountered in actual flight. Laboratories of this character were a novelty in the field of engineering and were the means of securing much data of great value.

The aeronautic division of the Standards Committee of the Society held many important sessions during the war and adopted many standards for aircraft parts and materials which were later of great benefit to the Government in the preparation of aircraft specifications. This work was done at a time when few appreciated, as did the Society with its long experience in standardization matters, the need and value of such work without which production in quantity is beset with the greatest difficulties, if not impossible.



The Sunstedt Trans-Atlantic Cruiser being assembled. It is equipped with two Hall-Scott motors

The AIRCRAFT TRADE REVIEW

Curtiss Sales Force On Peace Basis

With the ending of the war, most of America's big industrial concerns, whose efforts have been bent toward the defeat of the Hun, are now being transferred back upon a peace footing. This transitions is, necessarily, a slow process, owing to the suddenness of the break down of the German military system, but already many firms are operating on the same basis as before the war.

The Curtiss Aeroplane and Motor Corporation, which has been dominant in the development of aeronautics in the U. S. since the earliest days of experimentation, and which, at the entrance of America into the struggle, was equipped to assist in the air program adopted here, is now rapidly getting back to a peace basis. It has made plans for continued dominance in the commercial field which has been opened up through the achievements of the aeroplane during the war.

John N. Willys, president of the Curtiss Corporation, who has been most successful in the creation of new markets, has defined plans for a sales campaign, which will place Curtiss products in all parts of the world.

The sales office has been opened at 52 Vanderbilt Avenue, New York City, and will be under the supervision of J. P. Davies, who has been in the air service since the beginning of the war. Mr. Davies, in addition to his technical experience gained through study of aeronautics both in this country and abroad, has had wide experience in salesmanship. Previous to his enlistment, he was a successful general agent in Wisconsin for the Northwestern Mutual Life Insurance Company. After a year as instructor at Ellington Field, Texas, was sent to the fighting front in France as a representative of the government, to study night bombing in order to install a uniform course of instruction at the flying fields in America.

Associated with him will be E. H. Ballard, C. W. Webster, and J. M. Bickel, as assistant sales managers. Messrs. Ballard and Webster have been with the company for several years, and they are thoroughly familiar with Curtiss products. Mr. Bickel was formerly treasurer of the Madison, Wis., *Democrat*.

Fay L. Faurote, advertising manager, formerly located in Buffalo, has transferred his organization to Garden City and to the New York office. Associated with him will be W. D. Richardson, formerly with the Milwaukee *Sentinel*.

Personal Pars

G. Edward Barnhart has accepted the position of chief engineer in the Handley Page engineering department of the Standard Aircraft Corporation, Elizabeth, N. J.

E. K. Hill, formerly with the inspection department of the Wright-Martin Aircraft Corporation, New Brunswick, N. J., has accepted the position of mechanical draftsman for the E. J. Longyear Company, exploring engineers, Minneapolis, Minn., and builders of drills and other mining machinery.

W. H. Wilson has left the Lincoln Motor Company, Detroit, and is now with the Wright-Martin Aircraft Corporation, Long Island City, N. Y.

E. K. Hoag has been appointed engineer in the sales department of the Hyatt Roller Bearing Company, Detroit. Mr. Hoag left the company to engage in war work, having been with the engineering division of the Motor Equipment Section of the Ordnance Department.

L. M. Baker has been engaged as a special sales engineer by the Hyatt Roller Bearing Company.

Major Howard Blood, executive officer of the Aeroplane Engineering Division, Dayton, Ohio, has been transferred to the Finance Division at Detroit, Michigan.

Standard Parts Operating On Peace Basis

Cleveland, Ohio.—The Standard Parts Company has reorganized its organization on the pre-war basis with a separate general management for each plant. The executive, financial and supervisory functions will be executed through the main offices, but each plant will be put on a competitive basis.

The general managers of the various plants are as follows: Standard Welding Plant, H. H. Newsom; Perfection Spring Plant, F. F. Grimmelsman; Bock Bearing Plant, George H. Kleinert; American Axle and Cincinnati Axle Plants, producing Stan-Par Axles, D. K. Moore, with headquarters in Cleveland; Canton Spring and Canton Forge Plants, J. B. Childe; Connersville Spring and Wheeling Axle Plants, E. V. Overman, with headquarters in Cincinnati; Pontiac Spring Plant, B. A. Litchfield; Flint Spring Plant, R. T. Armstrong; St. Louis Spring Plant, M. B. Champ; Perfection Heater Plant and Spring Jobbing Division, B. R. Winborn.

Lewis P. Kalb, formerly Major of design, testing, and specification division of the Motor Transport Corps, has joined the engineering department of the Standard Parts Company as assistant to the director of engineering. Mr. Kalb has been identified with the engineering forces of the Kelly-Springfield Motor Company and the Pierce Arrow Motor Company.

Mr. A. L. Watts, formerly a Captain in the specification and record section of the engineering division of the Motor Transport Corps and previously with the Pierce Arrow Motor Car Company has also joined the engineering forces of the Standard Parts Company.



Mr. Charles B. King, A. M. E., of the Signal Corps, who was entrusted with the re-designing of the French Bugatti engine, as outlined in our last and present issues. Mr. King has had entensive engineering experience

New Aeroplane Classes at the College of the City of New York

New classes in aeronautics are being started this month at the College of the City of New York. To take care of the expansion in the work in this Department, a number of courses are being added to those previously given, making a total of five courses now offered in this field. These include aeroplane mechanics, aeroplane engines, aeroplane design, aeroplane drafting and a factory inspector's course. The instruction is given in the evenings, each course lasting eight weeks.

Applicants should apply directly to the College for registration.

The College has an equipment of about $85,000 worth of aeroplanes and aeroplane engines. It has turned out over 450 students in these courses since their commencement last summer.

The courses last eight weeks and a registration fee of $10 is asked.

Aeroplane Gets Oil Man There First

Dallas, Texas.—An aeroplane was recently used by officers of two oil companies in a race to arrive first at a newly discovered oil field.

Many oilmen are considering the use of aeroplanes as a rapid means of transportation between the various Texas oil holdings. The favorable terrain and the fact that so many thousand aviators have learned to fly in Texas has brought the general population of this part of the United States, perhaps more than any other, to consider the aeroplanes for practical use.

Addressing Mail to A. E. F.

Attention has been called to the fact that many persons are addressing mail to members of the American Expeditionary Forces since the signing of the armistice to the French cities or towns where troops are stationed. Mail so addressed cannot be delivered under the jurisdiction of the United States at the three-cent rate and is returned to sender unless five-cent postage is provided.

Large quantities of mail have been lost in this manner.

Curtiss Motors Make Excellent Record

When Ensign T. E. Maythem of the Navy air service established what is thought to be a new world's record for time spent in continuous flight he used a Navy dirigible driven by a Curtiss OXX motor. The record, which has been allowed officially, is 40 hours 48 minutes in the air.

The flight was made on December 24-26 and Ensign Maythem was accompanied by Chief Carpenter's Mate J. H. Collier. The course covered 691 miles, exclusive of thirteen hours of exhibition flying at Key West, Tampa, Cape Sable and Palm Beach.

A thirty-two-hour endurance flight was made in another Navy dirigible on November 23-25, the Curtiss OXX motor being used. Previous to this flight the motor had 90 hours in the air without overhauling. During the flight the motor was not stopped at any time, oil being supplied from a three-gallon auxiliary tank and additional water being found unnecessary.

The dirigible carried full equipment, totalling 832 pounds. This included extra oil, gasoline, clothing, sea-anchor, life-belts, camera, radio apparatus, light and batteries.

Martin Bomber in 450-Mile Flight

Glenn Martin Bomber Number 4, arrived at Bolling Field, Anacostia, D. C., February 6th, from Cleveland. The entire trip, via Baltimore amounting to practically 450 miles air travel, was made in two hours and fifty-eight minutes. This is the second machine of this type delivered to the Division of Military Aeronautics by the Glenn Martin Company. It will be flown to New York later in the month for exhibition in the International Aeronautical Exposition at Madison Square Garden.

The Martin Bomber was piloted by Mr. Eric Springer of the Martin Company and carried three passengers, the Chief Engineer of the Martin Company, a representative of the Post Office, and a mechanic.

Chest of Gold For U. S. "Ace"

Los Angeles, January 27.—A chest of gold for Eddie Rickenbacker, the Los Angeles race driver who became the American "ace" of aces in France, is proposed to the Pacific Aero Club, in a letter received today from Miss Katherine Stinson, the aviatrix. Miss Stinson is in Paris. She accompanied her suggestion with a check for $300 as the first contribution.

"It would be a shame if Rickenbacker was compelled to commercialize the glory he has attained in the skies of France," says Miss Stinson.

"The war has developed two great American heroes—Gen. Pershing and Eddie Rickenbacker. Now that the war is ended, promoters by the score are attempting to contract with Rickenbacker to give exhibition flights in the United States. I know that he does not wish to commercialize his glory.

"May I not suggest that the automobile people of America and others who admire him contribute to a chest of gold for Rickenbacker that will eliminate any possibility of his flying against his wishes."

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service



PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

Alaska Seeks Aerial Mail

Juneau, Alaska.—Governor Thomas Riggs, Jr., of Alaska is making a strong effort in co-operation with the Post Office Department to secure bids for carrying mail by aeroplane from Valdez to Fairbanks.

The substitution of aerial mail transportation for the dog and sled will result in saving of many days in the delivery of mail, and make possible much more frequent delivery. Some districts now have only one delivery per month owing to the difficulties of travel, but the use of aeroplanes will obviate many of these.

Brazil Authorizes Aerial Mail

Under an executive decree of October 23, 1918, Joao Teixeira Seares and Antonio Rossi are authorized to establish an Aeroplane Mail Service between Rio de Janeiro and the capitals of the different States of Brazil. The service is to be in operation, unless the time is extended, within a period of two years. In addition to mails and parcels, if aviation development so justifies and the Government agrees thereto, persons may also be transported.

Cuba to Have Aero Mail Service to Key West

A report from the Havana press is to the effect that a company with a large capital has been organized in New York to establish a daily mail and passenger aeroplane service between Havana and Key West, employing the Caproni machines for this purpose.

Trans-Adriatic Postal Air Service

According to *Giornale d'Italia*, a trans-Adriatic Aerial Postal Service has been established between Venice and Ancona, and Trieste, Fiume, Porenzo, Zara, and Pola. A service will be shortly established between Brindisi and Dalmatia.

Captain William F. Jones in Charge of Testing

Captain William F. Jones has been the commanding officer of the Proving Section at Wilbur Wright Field for some months, and in that capacity has supervised the official tests of new types of aeroplanes upon which the War Department desired full information as to defects and possibilities.

In the performance of this duty Captain Jones was the first American aviator to pilot "The Langley," the first American-built Handley Page machine. Captain Jones is a pioneer in the testing of parachute devices, and under his direction official tests of such devices submitted by the Technical Section of the Division of Military Aeronautics were conducted.

Among the speedy flights which Captain Jones has made was one from Detroit, Michigan, to Dayton, Ohio, a distance of 212 miles, in 84 minutes, flying a new La Pere fighting plane.

Captain H. M. Horton, Air-Radio Pioneer An R. M. A.

Riverside, California.—Captain H. M. Horton, now stationed at March Field, has been rated a Reserve Military Aviator. Captain March worked with Colonel Culver at San Diego in the early radio experiments on aircraft, which were started in 1910.

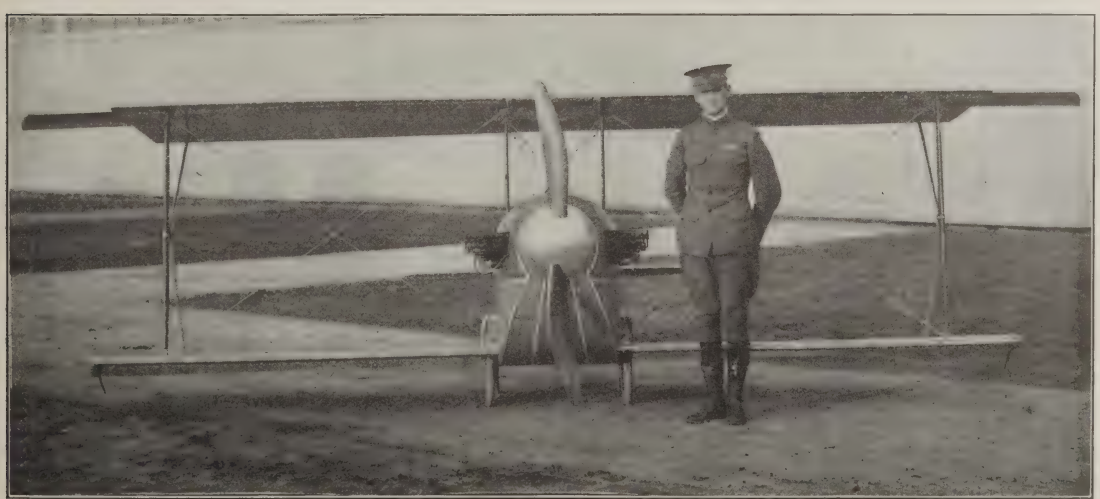
Captain E. L. Ryerson, Second Lieutenant R. G. Elbert and Second Lieutenant D. I. Henderson have been rated Reserve Military Aviators.

Gasoline and Kerosene Carburetors, By Victor W. Page

A New Up-to-Date Book on Modern Carburetion Practice. This is a simple, comprehensive and authoritative treatise for practical men on the basic principles pertaining to carburetion, explaining how liquid fuels are vaporized for operating all types of internal combustion engines. All leading types of carburetors are described in detail, special attention being given to the forms devised to the use of the cheaper fuels, such as kerosene. Carburetion troubles, fuel system troubles, carburetor repairs and installation, electric primers and economizers, hot spot manifolds and all modern carburetor developments are considered in a thorough manner. Methods of adjusting all types of carburetors are fully discussed as well as suggestions for securing maximum fuel economy and obtaining highest engine power. This book is invaluable to repairmen, students and motorists. The drawings showing carburetor construction are made from accurate engineering designs and show all parts of late types of carburetors.

Table of contents: Chapter 1, Liquid Fuel suitable for power; Chapter 2, Liquid Fuel supply methods; Chapter 3, Carburetors Action and Construction; Chapter 4, Modern Gasoline Carburetors; Chapter 5, Kerosene Carburetors; Chapter 6, Manifolds and Carburetors Installation; Chapter 7, Carburetor Faults, Location and Remedies.

This book can be purchased at The Aeronautic Library, Inc., 299 Madison Ave., N. Y. C., at the price of $1.65 postpaid.



Recent picture of the Martin K-III Scout, designed by Captain Jas. V. Martin, and comprising some of the special Martin features

THE BELLANCA 35 H. P. BIPLANE



THE light passenger-carrying Bellanca biplane has been designed to answer the requisites of quick get away, fast climb, and high speed, and to have at the same time light weight, the ability to glide at a flat angle, and low flying speed to insure a great degree of safety in landing. To these qualities are added the item of moderate cost and ease of maintenance, high-grade construction and the possibility of rapidly assembling and dissembling.

The inventor had in mind the idea of presenting a machine which would be of universal use for popular flying as well as for training. Careful attention was given to all details as dictated by the latest research and accepted good practice. That such things have been attained the demonstrations of its performances seem to bear out.

The machine was tested out at Central Park, Long Island, just about a year ago by Pilot Arthur Heinrich. On his first flight he released the controls when an altitude of 1,000 feet was reached. Perfect stability and high climb were observed. The throttle was full open. Without touching the controls, the throttle was retarded to diminish the power about 50 per cent and the machine proceeded in straight horizontal flight. With the engine shut off the machine quietly disposed itself to a flat glide.

Other tests of the machine's speed show that with full power, it is capable of 85 m.p.h., and by throttling the engine the speed can be reduced to 34 m.p.h. The value of this performance will be better realized when it is understood that the Bleriot and Deperdussin monoplanes of similar horse power have a speed range of 40 to 46 and 40 to 48 m.p.h., respectively. Favorable comparison will also be found with a number of modern machines, both European and American, with 100 h.p. or more, which make an average speed of 70 to 80 m.p.h.

In climb tests the Bellanca biplane ascended to 3300 feet in 10 minutes and 4600 feet in 14 minutes, with the engine throttled down to 1080 r.p.m., equal to 18 h.p.

With the engine turning at 1080 r.p.m. the machine made a speed of 69½ m.p.h. in three consecutive half-mile flights at a height of 15 feet from the ground. The speed mentioned was the average for the three flights. With the engine increased to 1,200 r.p.m., equal to 24 h.p., the climb of the machine increased to 530 feet per minute and the horizontal speed was 76 m.p.m. The climb was measured by means of a barograph and aneroid.

In testing the gliding quality, the pilot began a glide from an altitude of 4,600 feet at a distance of about ten miles from the starting point. With the engine shut off the field was reached and passed, and it was necessary to turn back and glide against the wind toward the field, adding two miles to the distance traversed. In this maneuver a time of 8 minutes and 5 seconds elapsed before the ground was touched. In this glide the machine was favored by a wind of 6 to 7 m.p.h. The incidence angle indicator showed that the machine was gliding at an angle of 5 degrees, which is equal to a ratio of 1 to 11.5.

The above test shows that in case of a forced landing from an altitude of 4,600 feet, the pilot will have ample time to select a landing place within a diameter of 24 miles.

General Description

Best selected white ash is used for the principal parts of wings, fuselage, landing gear, etc.

Brazing and welding have been eliminated wherever possible. Care has been observed to avoid the piercing of longerons and other vital members.

Safety Factor

The factor of safety of lift stresses on the beams of upper and lower wings is 16, and the factor of drift stresses is 14. In the body and landing gear the safety factor of the weakest point is 12.

Field tests have shown a high safety factor under difficult conditions. Even in snow 14 inches deep, the machine never met with difficulty in leaving the ground nor in landing. In diving and even in tail spinning tests, the machine was quick to recover itself, confirming the strength of sustaining surfaces.

Assembling Facility

In actual tests, the machine was dissembled in 15 minutes and reassembled ready to fly in 20 minutes. This item is expediated by the employment of a special turnbuckle, which can be loosed and detached without losing the adjustment of tension, so that a simple movement restores the attachment of the cable with its original adjustment.

General Specifications

Span, upper plane	26'-0"
Span, lower plane	20'-6"
Chord, upper plane	4'-0"
Chord, lower plane	2'-4"
Total area	150 sq. ft.
Length overall	17'-7"
Weight, machine empty	400 lbs.
Useful load	375 lbs.

Performances

		(*Miles per hour*)
Maximum Speed, Light	35 H. P.	85
	24 H. P.	76
	18 H. P.	70
Minimum Speed		34

		(*Feet per min.*)
Maximum Climbing Speed	35 H. P.	820
	24 H. P.	530
	18 H. P.	330
Gliding Angle		1 to 11.5
Min. H. P. required for horizontal flight		6

Main Planes

The dynamical stability of the planes is almost the same as the Eiffel 32. It is most suited to high speed because of its very small drift at small angles of incidence, and because of the structural advantages afforded by the section.

Spars are of ash, having a safety factor of 14. Struts between planes are of streamline section of constant depth for two-thirds their length. Ends taper to the strut fittings.

Controls

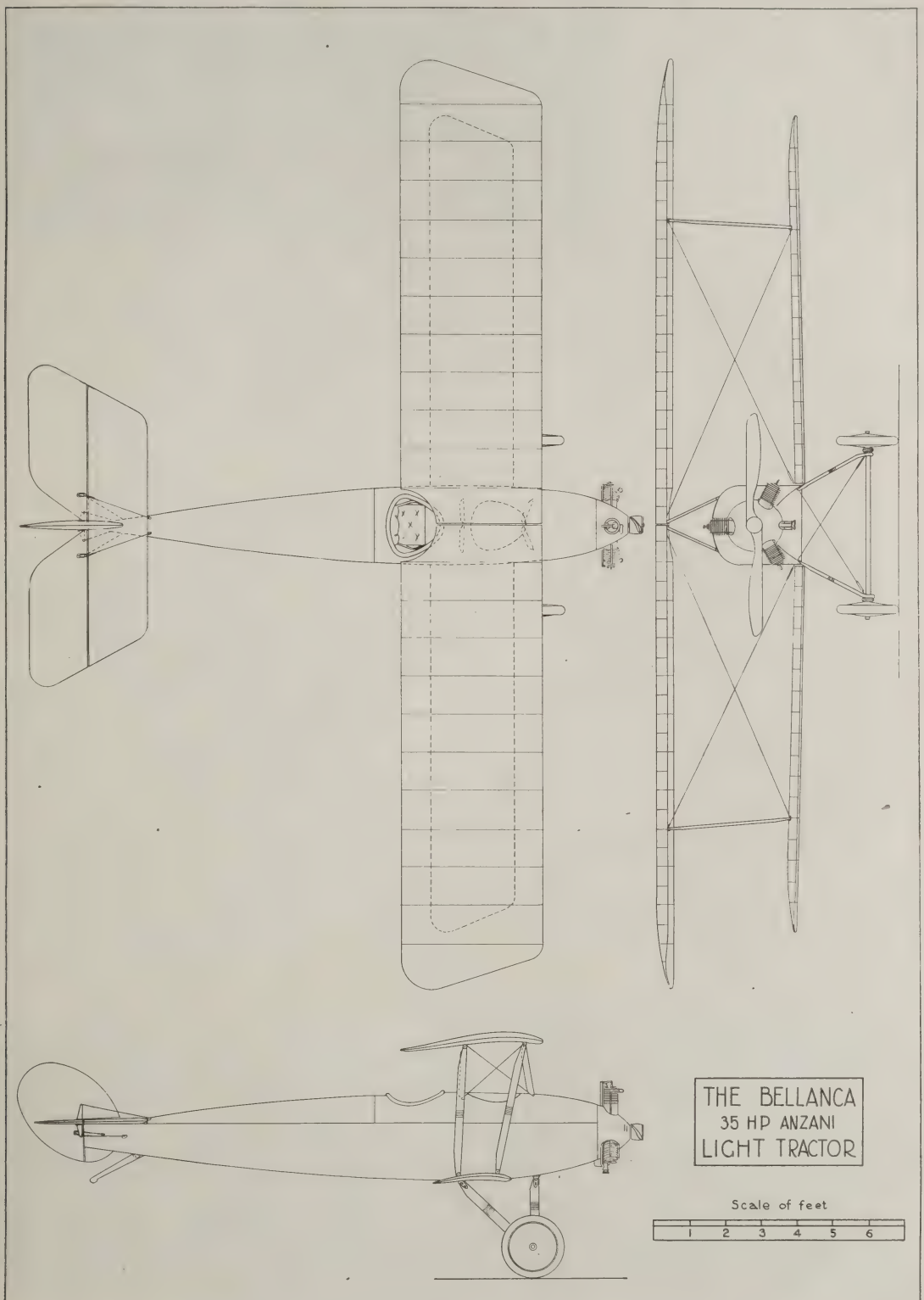
Lateral and longitudinal balance is operated by stick control. The rudder is balanced; it is operated by the foot bar.

Lateral control is obtained by warping the

(*Continued on page* 1120)



The Bellanca Biplane, showing the neat appearance of the warping wings and streamline body


THE BELLANCA
35 HP ANZANI
LIGHT TRACTOR
Scale of feet
1 2 3 4 5 6
McLaughlin

(*Continued from page* 118)

wings, and its effect is so immediate as to require but a slight movement of the stick.

Fuselage

The fuselage is of good streamline form. Its wooden frame is of box-girder construction, braced by cables from the pilot's cockpit forward and with wire from the same cockpit rearward. The nose is covered with aluminium, a round door in one side giving access to the engine. The remainder is covered with linen, doped and varnished. The front deck is of veneer, linen covered. The body tapers to a vertical strut edge at the rear, on which the rudder is hinged. No bolts pass through the fuselage spars, a simple and light fitting making this possible. In front of the pilot is a dash, on which are found oil sights, clock, aneroid, inclinometer, and incidence angle indicator.

Landing Gear

The chassis is of the ordinary V type, each V consisting of two ash laminated streamline struts, joined together by steel and aluminium plates. Rubber shock absorbers bind the axle to the struts.

Tail Group

The empennage group is composed of a non-lifting fixed stabilizer, to which is fastened the elevator flaps.

The attachment of the stabilizer is such that it is easily detached by removing four cotter pins.

The rudder is of oval shape and is of sufficient area to insure complete control in handling the machine on the ground.



The Bellanca Biplane, which makes a speed of 85 M.P.H. with a 35 H.P. Anzani Engine

Engine Group

An ir cooled 3 cylinder Anzani Y type 35 H. P. is used. Its weight is 120 lbs. Propeller 6'-7" in diameter and 5'-9" pitch. The engine is so attached as to form with the rest of the body a perfect streamline form with low head resistance.

Only part of the cylinders are exposed, which are efficaciously cooled by such a flow of air as obtained by a speed of 85 M. P. H.

To ascertain the complete cooling of the engine, repeated and accurate tests were performed. The engine was first tested on the ground, and after five minutes' running, it was already losing 15% of its initial H. P. This loss was increasing as the engine continued to work.

On the contrary when the machine was flying, such power loss was almost completely eliminated, for after from 40 to 60 minutes of flight, no over-heating was observed.

A convincing proof of the mentioned condition has been given by measuring the rate of climb, for it was shown by the barographic charts that the rate of climb remains almost uniform for the first 5,000 feet.

Even the speed tests confirmed the results previously obtained, for the speed at the beginning and at the end of trials was similar.

CITED FOR DISTINGUISHED SERVICE

THE commander in chief, in the name of the President, has awarded the distinguished service cross to the following named officers and soldiers for the acts of extraordinary heroism set forth after their names:

First Lieut. Robert Lindsay, 139th Aero Squadron. For extraordinary heroism in action near Bantheville, France, October 27, 1918. In company with two other planes, Lieut. Lindsay attacked three enemy flanes (Fokker type) at an altitude of 3,000 meters, and after a sharp fight brought down one of them. While engaged with the two remaining machines, eight more planes (Fokker type) came at him from straight ahead. He flew straight through their formation, gained an advantageous position, and brought down another plane before he withdrew from the combat. Home address, N. H. Lindsay, mother, Madison, N. C.

First Lieut. James O. Beane, 22d Aero Squadron. For extraordinary heroism in action near Bantheville, France, October 29, 1918. When Lieut. Beane's patrol was attacked by eight planes (Fokker type) he dived into their midst in order to divert their attention from the other machines of his group and shot down one of the Fokkers in flames. Four other Fokkers then joined in the battle, one of which was also destroyed by this officer. Home address, Wilfred Wheeler, 81 Ludbury Road, Concord, Mass.

First Lieut. Josiah Pegues, 95th Aero Squadron. For extraordinary heroism in action near Duns-sur-Meuse, France, November 5, 1918. On account of heavy clouds and mist, Lieut. Peques became detached from his formation. While endeavoring to find it he came upon eight hostile planes, which were maneuvering to attack four of our planes. With great courage and skill he passed through the formation and, attacking its leader, dispersed the formation, preventing further attack. Home address, S. F. Pegues, father, 643 Woodlawn Avenue, Chicago, Ill.

Capt. Reed Chambers, 94th Aero Squadron. For extraordinary heroism in action near the Bois de la Cote, Lemont, France, October 21, 1918. Capt. Chambers is awarded a bar, to be worn with the distinguished service cross awarded him November 8, 1918. While on a voluntary patrol, Capt. Chambers encountered five enemy planes (Fokker type) harrassing our Infantry at an altitude of 300 meters. Attacking them without hesitation, he shot down two of them and drove off the others. Home address, J. S. Chambers, father, Fort Huachuca, Ariz.

First Lieut. Shelden V. Clarke, Balloon Section. For extraordinary heroism in action near of enemy territory on August 28 and September 26, 1918. While making a general surveillance of enemy territory on August 23 and September 26, 1918, Lieut. Clarke was attacked by enemy planes. On both occasions he remained at his post and directed the fire by telephone until his balloon had been set on fire. On August 28 he assisted a passenger to descend and did not jump himself until the other's parachute had opened. On both occasions he re-ascended as soon as another balloon could be obtained. Home address, Virgin A. Clarke, mother, 39 East Third Street, Williamsport, Pa.

First Lieut. Harlow P. Neibling, Field Artillery. For repeated acts of extraordinary heroism in action at Brouville, France, September 2, 1918, and near Fort Dummar, France, September 26, 1918. While Lieut. Neibling was making an aerial reconnaissance from a balloon, he was repeatedly attacked by enemy planes, two of which dived at the balloon and opened fire with incendiary bullets. With great coolness he fired at one of them with his pistol and took a picture of the plane with his camera. When the balloon took fire he was forced to jump, but he took two more pictures on the way down in spite of being fired upon. He re-ascended as soon as a new balloon could be inflated. On September 26 this officer was again attacked while conducting a reglage, but hanging from the basket with one arm he fired his pistol at one of the enemy planes and jumped only when his balloon burst into flames. He immediately continued his mission in another balloon. Home address, Mrs. Elizabeth Neo, mother, 1819 Lyndale Avenue, South Minneapolis, Minn.

First Lieut. Sumner Sewall, 15th Aero Squadron. For repeated acts of extraordinary heroism in action near Menil-la-Tour, France, June 3, 1918, and near Landres-St. Georges, France, October 13, 1918. On June 3 Lieut. Sewall with two other pilots attacked a formation of six hostile planes. Though his companions were forced to withdraw because of jammed guns, he continued in the fight for 15 minutes and succeeded in sending one of his adversaries down in flames. On October 18, while on a voluntary patrol, this officer saw an American observation plane being attacked by a German machine (Fokker type), accompanied by eight other hostile planes. He immediately attacked and destroyed the Fokker and was in turn attacked by the other eight planes. By skillful manoeuvering he evaded them and escorted the observation plane back to our lines. Home address, W. D. Sewall, father 1142 Washington Street, Bath, Me.

First Lieut. George C. Carroll. For extraordinary heroism in action near Fort Dumarr, France, September 26, 1918. Lieut. Carroll had ascended in a balloon to a height of 1 kilometer on a reglage mission, when he was attacked by enemy planes; but he refused to leave his post and fired on the planes with his pistol while incendiary bullets were striking his basket and balloon. He was finally forced to jump when his balloon burst into flames, but he reascended as soon as a new balloon could be inflated. On three occasions Lieut. Carroll also gave proof of exceptional courage by remaining in his balloon in the face of aeroplane attacks, jumping only when his balloon took fire and immediately re-ascending when a new balloon could be inflated. Home address, Harry S. Carroll, father, Garrett, Ind.

First Lieut. Harold H. George, 139th Aero Squadron. For extraordinary heroism in action near Bantheville, France, October 27, 1918. Lieut. George displayed great courage in attacking a formation of four enemy planes (Fokker type), destroying two of them in a terrific fight and driving the other two back to their own territory. Home address, William H. George, brother, 210 East Tenth Street, New York, N. Y.

First Lieut. Percy Rivington Pyne, 103d Aero Pursuit Squadron. For extraordinary heroism in action near Dun-sur-Meuse, France, October 23, 1918. While protecting three planes on a photographic mission, Lieut. Pyne attacked and drove off five enemy machines (Fokker type). Later another German formation of seven (Fokker type) was encountered, but despite the odds Lieut. Pyne swung up into the midst of the enemy and scattered them, diving on one of the Fokkers and sending it crashing to the ground. Home address, Percy R. Pyne, father, 680 Park Avenue, New York City.

First Lieut. George R. Nixon, Field Artillery. For repeated acts of extraordinary heroism in action near Domevre-en-Haye, France, August 29, 1918, and near Malan-court, France, September 28, 1918. On August 28 Lieut. Nixon was locating active enemy batteries from his balloon and was attacked several times by enemy planes, but refused to descend until one had set fire to the balloon. On September 28, while he was on a reglage mission, five enemy planes fired at him. He remained in the basket until the balloon was a mass of flames, and one of the enemy aviators followed him to the ground, firing at him. Despite his narrow escape, he immediately re-ascended. Home address, Mrs. George E. Nixon, wife, 748 South Harvard Boulevard, Los Angeles, Cal.

First Lieut. William Thomas Ponder, Aviation Section, 103d Aero Pursuit Squadron. For extraordinary heroism in action near Fontaines, France, October 23, 1918. Having been separated from his patrol, Lieut. Ponder observed and went to the assistance of an allied plane which was being attacked by 30 of the enemy. Lieut. Ponder destroyed one enemy plane and so demoralized the remaining that both he and his comrade were able to return to their lines. Home address, W. P. Ponder, father, Mangum, Okla.

First Lieut. John J. Quinn, 139th Aero Squadron. For extraordinary heroism in action near Bantheville, France, October 23, 1918. While patrolling the lines, Lieut. Quinn, with one other pilot, sighted and attacked four enemy machines (Fokker type). Several additional enemy planes joined the first four, and, notwithstanding his great odds, he sent one machine crashing to the earth. Motor trouble forced him to drive straight through the enemy formation, and although followed and his machine badly damaged he was able to outmaneuver and escape from his adversaries. Home address, August N. J. Quinn, father, 407 Post Office Building, Philadelphia, Pa.

DOUGLAS AUTOMATIC AEROPLANE IGNITION INTERRUPTER

THIS instrument, designed to increase the safety factor in flying, is a product of the war period. It is unique in its particular field and in its functioning is said to have met every requirement.

The Interrupter is an invention of Theodore Douglas, President of The Duplex Engine Governor Company, Inc., of Brooklyn, N. Y., and was developed by him under the auspices of the National Advisory Committee for Aeronautics. Facilities for the development were furnished by the Navy and Army at various Air Stations.

The function of the instrument is to automatically interrupt the engine ignition, thereby stopping the power development of the engine, in the event of the propeller breaking, or other similar breakage resulting in a seriously unbalanced condition of the power plant.

In flying, other than under war conditions, the danger of such breakages is fortunately not serious, though it is always present. With certain types of machines the danger is greater than with others. Under war conditions on the other hand such breakages, accidental or from gun-fire, are very frequent and in a large percentage of cases end fatally for the pilot.

The tendency of a tractor plane, in the event of its propeller breaking, is to go into a dive, and of a pusher plane to go into a tail-stall. Under such conditions either type of machine is apt to pass into a spin as a result of the unbroken propeller blade tending to swing the machine around a neutral, or pivot, point between the centre of pressure of the unbroken blade and the centre of torque. Other factors may increase or lessen this influence, and the engine may or may not go overboard as a result of the unbalanced torque reaction.

The resulting intense vibration is apt to break a gasoline line, and, consequent upon the continuance of the flame of combustion exhausting into the gasoline-charged atmosphere, be followed by fire. Sometimes the most perfect mental and physical coordination on the part of the pilot fail to prevent this, since the brain and hand can seldom act quick enough, as many thoroughly understood accidents of this nature attest. This manual limitation will be better realized when we consider that the time interval per revolution for aeroplane engines, assuming full throttle, varies from one twenty-third to one twenty-seventh of a second. Even under peace conditions some of our best pilots have been unable to prevent fatal crashes following such mishaps. This is particularly true at the present time with the high powered engines, high engine speeds, four bladed propellers, and the generally high stresses employed.

The interrupter supplements the action of the pilot in such instances, and through practically instantaneous action interrupts the power development, thereby confining the danger to the initial breakage. Such a breakage is seldom serious in itself. The danger lies in the unbalanced power development which follows, and the consequent injuries to the plane may range from a weakening of the general structure without showing visible fracture, through broken bearers, crankcase, crankshaft, gasoline line, etc., to a fatal crash. How important, then, it is to localize the danger through limiting the breakage to the initial incident—the propeller. The monetary cost and danger from such accidents would not be great if the danger stopped with the propeller. It is the consequent breakages which count, and particularly the overstraining of the general structure.

The interrupter is thought to be particularly desirable on twin-engine machines, as such an accident happening to one engine would cause the good engine to tend to suddenly swing the machine around and probably into a spin. On such machines the interrupter may be so installed as to instantly cut out both engines, thus maintaining an approximately normal flying position. The pilot then has the alternative of making a landing with dead engines, or of switching off his damaged engine and continuing his flying with his good engine and reduced speed.

In the equipment of the blimps the instrument would find another important application, as it would tend to reduce the fire risk following propeller breakages, as the propeller fragments are apt to puncture the gas bag.

The Design

As to the elements of the design of the instrument, these are extremely simple and may be briefly described as consisting of a suitably pivoted metal bar, so mounted as to swing in a plane transverse to the axis of rotation of the propeller. By means of tensions springs "2"-"2", the free movement of this bar is confined, under normal aeroplane operating conditions, to a very limited arc in its plane of movement. The amplitude of this movement is determined by the weight of the bar, the intensity and frequency of the transverse vibrations of the engine, and the opposing strength of the springs confining it. The extended end of the trigger "3" is constantly pressed toward the floor of the instrument by the compression spring "4", and is designed to engage the latch "5". On the under side of the trigger "3" there is an inclined surface "6", by which the trigger is raised. A ball-pointed hardened steel screw is fitted into the bar directly beneath the trigger, and designed to engage an inclined surface and thus to lift the trigger when the swing of the bar is sufficient. When the trigger is lifted the latch "5", held under tension by the spring "7", is released and moves out of engagement with the trigger. The cam "8" is for the resetting of the latch through rotating it back into position by means of the push button "10" from the outside of the instrument.

The compression spring "9", presenting an unbalanced force, is designed to prevent the bar from disengaging the latch "5" as a result of cylinder misses coinciding with bad vibration periods of the engine, etc., thus increasing the amplitude of the swing of the bar through synchronism, or from lateral shocks to which the plane may be subjected in landing. An intense oscillating shock transverse to the axis of the engine, such as an unbalanced engine-propeler torque reaction resulting from the breaking of a propeller at speed, are the types of shock from which the instrument is designed to operate, and to which it will immediately respond. Under such conditions the bar will swing through its full amplitude, raise the trigger, which releases the latch, and thus interrupt the ignition through grounding the magnetos. From the interrupter terminals "11" and "12" wires are connected to the grounding terminals of the magnetos, and from the terminal "13" of the interrupter a wire is connected to the engine ground. On the disengagement of the latch "5" a triple contact is made between the interrupter terminals "11", "12" and "13".

Provision is made for testing by the pilot before each flight, of the operation of the interrupter. Such a test can be conducted in ten seconds. The handle "14" which projects through a slot in the end of the instrument is pushed gently to the left until the red spot "15" of the tell-tale, which bears a luminous cross for night flying, appears. Before the engine stops, the instrument may be re-set by pressing down on the button "10" until the red spot of the tell-tale disappears. Should the engine not stop it would indicate that either the interrupter switch is in the wrong position, or that its wiring system, etc., is defective.

A manually operated switch is provided with each instrument, by which the interrupter may be thrown into and out of the grounding circuit as desired.

Types of Interrupters

Interrupters are furnished of two general types, maker and breaker instruments, and in several models to best suit various engine and air plane conditions.

Maker-instruments, such as the one just described, are intended for magneto ignition engines, in which cases there is no flow of current through the instrument, excepting at the moment of interrupting the ignition.

Breaker-instruments are intended for Liberty engines, using the Delco system, where the flow of the current is constantly through the instrument, and where two separate current channels are provided, because of the double distributor system used on these engines. The interruption of the ignition results from breaking these channels.

Different Models

The interrupter is manufactured in five models, suiting it to the two general ignition systems employed—magneto and Liberty—and to the requirements of engine location whether on the fuselage or in the wings. All instruments are provided with shunting switches. When the engine is located in the wings, the interrupter is mounted on a weather-proof casing attached to an engine-bearer, and the shunting switch is located on the instrument board.

The weight of the instrument, of both types and of all models, is under ten ounces.

Its Efficiency

The point has been raised that the presence of the instrument would be apt to complicate the ignition, and particularly so on the Liberty engine. Theoretically this would seem to be so, yet practically, judging from statements of naval pilots who have been flying interrupter-equipped machines during the past six months, experience would indicate that this possibility need not be seriously considered, as during that entire period the ignition of these Liberty engines has at no time been adversely affected. The operation of the instrument has been most satisfactory in every way and has fully met all of the claims which have been made for it.

The various tests of the interrupter made by the Navy Department have shown in general the following results:

(a)—As nearly as it has been possible to determine, the instrument will operate within one complete revolution of the engine following the propeller breakage, or within a time interval of one-twenty-third of a second.

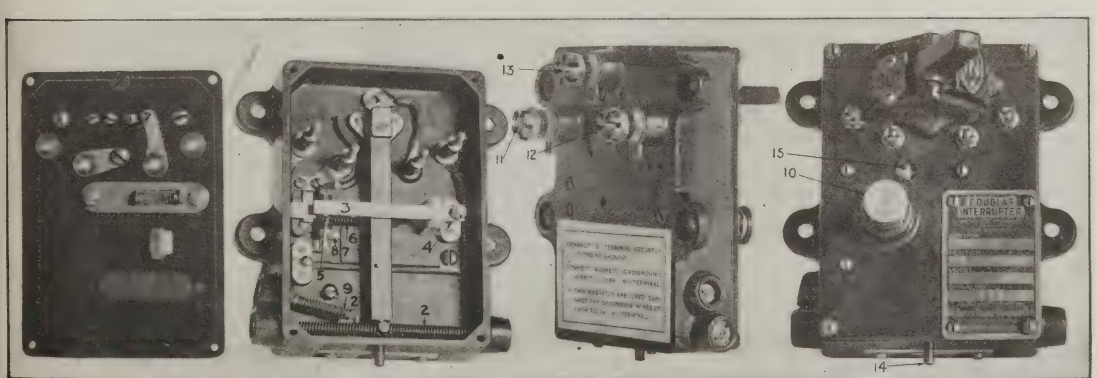
(b)—It may be depended upon to do this every time that such a breakage occurs, as shown by tests in the air and on the ground.

(c)—It will not interfere with the efficiency of the ignition system, nor has it caused complications therein of any kind.

(d)—The electrical resistance of the interrupter on Liberty engines has been determined by a representative of the Delco Company as being less than .03 to .05 ohm, representing a loss of potential in the primary current to the distributors of .33 to .55 of one per cent, a value which is entirely negligible.

The design, workmanship, and materials employed in the construction of the interrupter are of high quality. The latches and triggers of the instruments are of hardened steel heavily silver plated to minimize electrical resistance, to

(*Continued on page* 1141)



The Douglas Automatic Aeroplane Interrupter

LIEUT. HAROLD H. EMMONS, CHIEF OF ENGINE PRODUCTION DEPARTMENT

LIEUTENANT HAROLD H. EMMONS, U. S. N. R. F., A. S. A. P., has been Chief of the Engine Production Department, Aircraft Production Board, since August 15, 1917, until the signing of the armistice. As such he directed the contracting and production of all the aviation engines for the Army and Navy, which totaled 95,993. These engines, together with their spare parts, called for the expenditure of upwards of $450,000,000. Of these engines 31,814 had been delivered when the activity was stopped by the termination of the War. During the month of October, 1918, Liberty 12-cylinder engines were produced and delivered into Service at the rate of over 150 per day. Of all types of Aviation engines over 200 were delivered into Service for each working day of that month. This was a greater production than was achieved by England and France combined during any month during the four years of the War. Production of engines would have reached 8,000 per month by January, 1919, and 10,000 per month by early Spring.

Just prior to entering the Service he was an active member of the law firm of Clark, Emmons, Bryant & Klein. Lieutenant Emmons up to 1917 was a leading executive in a syndicate operating factories for the manufacture of automobiles, carburetors, magnetos, stamped metal ware and parts. This, together with his experience as a member for nineteen years of the Michigan Naval Reserve, fitted him for the responsible work which he so successfully carried on for the winning of the War.

Harold H. Emmons was born in Detroit, Michigan, June 30, 1875. He was educated in the public schools of Detroit and then attended the University of Michigan. While there he was prominent in Class, Collegiate and Inter-Collegiate activities. He was a member of the board of control of athletics and played in various college athletic teams. He graduated from the Literary Department with the degree of A.B. in 1897 and from the Law Department with the degree of LL.B. in 1899.

After his graduation, Lieut. Emmons located in Detroit and began to practise law, becoming a member of the law firm of Lucking, Emmons & Helfman, in January, 1903. In May, 1913, he left the practice of law and entered commercial life as an executive in a syndicate, referred to above. In January, 1917, he became a member of the law firm of Clark, Emmons, Bryant & Klein, from which he was called into Service.



Lt. Harold H. Emmons, U. S. N. R. F., A. S. A. P.

CAPTAIN CLIVE WARMAN GIVEN D. S. O. BY KING GEORGE

CAPTAIN WARMAN, who lived in Philadelphia, is an American subject who enlisted in Princess Patricia's Canadian Light Infantry at Valcartier on September 5, 1914, as a Canadian. He went to France with the 2nd Canadian Contingent, and was invalided back to England in 1915 and discharged. He then enlisted in the Canadian Mechanical Transport as a Staff Car Driver and served in England, Scotland and Ireland. He was in Ireland during the Rebellion of 1916, stationed near Dublin, and was slightly wounded in the cheek by a Sinn Fein Bullet whilst driving near College Green, Dublin.

Upon discharge from hospital, he applied for transfer to the Royal Flying Corps with a Commission. He was gazetted on 18th August 1916 and went to Oxford and Salisbury Plain for instruction as a Flying Officer.

Whilst training he was given leave to proceed home for three months, returning in February 1917 to complete his training. The medical authorities would not then categorize him for General Service in the Field, with the result that he spent April and May of that year flying in Scotland.

Early in June, 1917, Lieut. Warman was passed by the medical boards as Fit General Service, and immediately proceeded to France, where he was posted to a scout squadron of the Royal Flying Corps in the Field.

He immediately commenced to distinguish himself and within a few weeks was recommended for the Military Cross.

His special hobby was the German Albatross Scout aeroplane and practically all of his victims were machines of that type.

Both distinctions were gained by this officer whilst he was a Second Lieutenant, which greatly adds to their value.

Capt. Warman has up to date accounted for twenty-two Boche Aeroplanes in Flanders (five two-seaters and seventeen scouts).



Capt. Clive Warman, of Philadelphia, has won every military honor that the British Government bestows on airmen

He was flying the French Spad aeroplane fitted with Hispano-Suiza engine of the type used by the two great French Ace of Aces, Capt. Guynemyer and Lieut. Fonck.

One of Capt. Warman's victims was brought down after his Bickers machine gun had jammed and could not be fired. He dived for the Boche aeroplane at a speed which the indicator could not register (an Albatross D.5. enemy aeroplane) until in its endeavors to get away also by diving the enemy broke to pieces in the air.

On another occasion this officer was harassing enemy troops in the trenches with his machine gun when a 9-inch high explosive shell hit the right hand top plane (wing) and exploded, peppering the tail and fuselage with big holes. Instead of immediately landing his machine, which was the safest thing to do, this officer brought the Spad back to his own aerodrome, himself unhurt.

When a Boche machine came over one morning from the enemy lines at dawn and commenced harassing the British troops round Zillebeke Lake, Capt. Warman went up and shot it down. During this fight he was operating the gas lever when a bullet took it clean out of his hands, only bruising his fingers. He did not break off the fight however until successful, as the engine controls were adjusted to keep the gas levers full open if broken.

When he was eventually severely wounded by an explosive bullet in the shoulder joint during the course of an air fight in which the patrol became outnumbered twelve to three, this gallant officer flew his Spad machine back to his own aerodrome, a distance of some fourteen miles and landed the machine. He was found in his seat unconscious.

Capt. Warman's career as a fighting pilot is not finished. He is now with Col. Bishop, V.C., and will be in the Canadian Air Force on its return.

VALUE OF PLYWOOD IN AEROPLANE FUSELAGE CONSTRUCTION

By LIEUTENANT STEFANO D'AMICO, Italian Aviation Mission

RECENTLY aeroplane construction has undergone some very radical changes, in part due to the exigencies caused by the war, in part to the natural tendency to make a more and more organic machine out of the aeroplane, by employing in its design the same fundamental principles which guide the design of modern mechanical devices.

Often these two conditions have coincided so as to expedite the ultimate result.

Of all the parts of the aeroplane, the fuselage has undoubtedly undergone the most radical change. On the one end the development of aerodynamics and the necessity to get from the aeroplane the greatest speed coupled with the greatest mobility have changed its form and proportions, and on the other hand modern and more practical principles of construction have completely altered its make-up.

Until recently, the fuselage in all aeroplanes consisted of a

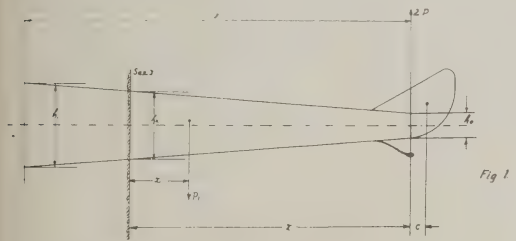


Fig 1

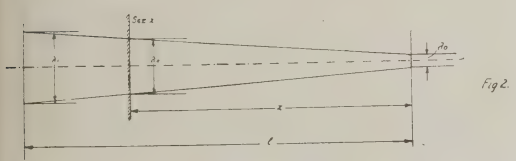


Fig 2.

frame suitable to withstand the stress and this was then covered with linen properly varnished.

The frame consisted of four longerons, running lengthwise of the fuselage with struts and steel wires latticing in both planes, vertical and horizontal, so as to divide it into panels.

The joints of the struts to the longerons were metallic fittings and the proper tension in the latticing was obtained by the use of turnbuckles.

The solid resulting by this method is capable of withstanding the stresses imposed from all sides but is a complicated structure, since it is made up of a large number of parts, has a great many wire connections, and must be frequently adjusted to the proper shape by giving the wires the proper tension.

The fuselage, because of the frequent landing, is subjected to violent dynamic stresses causing a stretching in the tension wires, a disarrangement of the whole structure, as well as a stretching of the linen covering. The elements also influence to a great extent the stretching of the covering and this impairs to a large degree the aerodynamic property of the machine.

The war then has developed it to such an extent, that while the fuselage has forfeited a little the advantage in weight, the machine has gained in life and efficiency.

At any rate, the abandoning of such a construction was desirable because of the ever-increasing scarcity of metal fittings of alloy steel, as well as for the excessive cost and the lack of labor which is felt more each day.

The use of plywood, which had already been used in large quantity in the construction of hydroaeroplane boats, appeared to be very appropriate since it eliminated a great many of the disadvantages enumerated.

In as much as the only advantage of the old type was its lightness, all the builders tried very hard to make the best use possible of the material in order to eliminate this disadvantage which, in some cases, is considerable.

In its most common form the modern fuselage is made of four longerons, tied together by means of diaphragms and then covered by plywood. The shearing stresses are taken care of by stiffening the outside covering with ribs of wood.

The transverse stiffness is attained by means of transverse diaphragms in the rear while in the front, where this is not possible, since the passengers have to be accommodated as well as the tanks, motors, etc., this is done in special way for each case, utilizing to the best advantage the space resulting in distributing the various parts of the plane. The plywood is made to resist the moments due to deflection and principally shearing stresses. In this way the material is used to its full extent and its strength utilized to the best advantage. Therefore, since the material is used to its full value, the construction becomes light.

The maximum strain on the fuselage comes on it when the tail skid strikes the ground. The maximum reaction will nat-

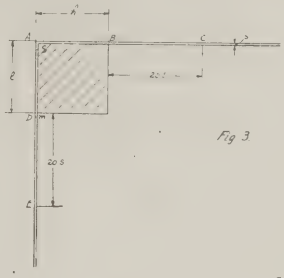


Fig 3

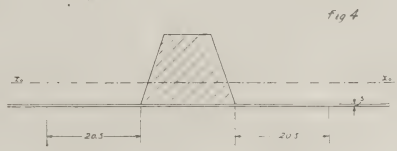


Fig 4

urally depend on the total load P, which comes on it at this point and in computing, it is customary to consider this as double; that is $2P$. (Fig. 1 and Fig. 2.)

Therefore, at the section X distant from the point where the load may be considered as applied the moment.

$$> Mx = {}_2P.X$$

From this moment must be deducted the moment due to own weight of the fuselage so that the resulting expression will be

$$M'x = 2Px - P'x.$$

In its vertical direction the fuselage suffers a *deflecting moment* due to the compound load coming on the rudder.

If this force be denoted by P'' then $Mx'' = P''(x + c)$ in which C is the distance from the axis of the tail and the center of pressure of the surface which makes up the rudder.

Considering the ordinary quadrangular form of fuselage, the distance Hx between the centers of gravity of the upper and lower longeron of the section Wx of the longerons may be considered variable and following the linear law. So that:

$$hx = ho + \alpha x;\ \alpha = \frac{> h_1 - ho}{l};\ \left[\frac{I}{y}\right]_1 = 2Wx\ [ho + \alpha x]$$

Also in the horizontal section the distance λx between the centers of gravity of the sections of the longerons may be considered in the same way as varying with straight line law.

Therefore in the same way we would have

$$\lambda x = \lambda o + \beta x;\ \beta = \frac{> \lambda_1 - \lambda o}{l};\ \left[\frac{I}{y}\right]_2 = 2\ Wx\ [\lambda o + \beta x]$$

Therefore at the longeron, with the greatest stress we will have the following united stress

$$\delta o = \delta_1 + \delta_2 = \frac{M'x}{2\ Wx\ [ho + \alpha x]} + \frac{M''x}{2\ Wx\ [\lambda o + \beta x]}$$

(*Continued on page* 1138)

THE KING-BUGATTI AVIATION MOTOR

By G. DOUGLAS WARDROP, M.S.A.E., A.S.M.E.

(*Continued from last week*)

Carburetion

Four specially designed Miller carburetors are used (Fig. 41) each supplying one block of four cylinders through separate water jacketed manifolds (Fig. 42). They are set low so that gravity feed may be used and all four are identical, there being no rights or lefts.

The throttle valve is of the barrel type, the axis of all valves being parallel with the center line of the engine, the two carburetors on each side of the engine being operated by one shaft which is connected to the valves at each end through adjustable couplings. The shafts on the two sides of the engine are connected so that all four valves move in unison, the valve opening being synchronized by means of the adjustable couplings.

Gasoline from the tank enters the carburetor through the elbow (Fig. 41), passing through the strainer B-16941, thence into the float chamber, flowing out through the four 5/32" holes in the lower end of the needle valve seat.

When the gasoline reaches the proper level the rising of the cylindrical brass float lowers the needle valve onto its seat, thus stopping the flow. From the float chamber the gasoline enters the lower 3/16" hole in jet holder. There are seven of these jets, drill sizes being as follows: No. 76, which is the idling jet, No. 76, No. 75, No. 71, No. 68, No. 57, No. 53. These jets progressively come into action as the throttle is opened.

Gasoline is drawn into the jet through the small hole in the bottom of the threaded end, mixing with a certain amount of air sucked in through the four holes drilled in the barrel of the jet just above the threaded portion. This air is taken from the outside through the upper 3/16" hole in jet holder and passes down around the outside of the jet to the four holes mentioned above. The major portion of the air enters the carburetor through the lower end of the venturi, which is 3" in diameter, passes up around the jet bar holder, combining above this with the rich mixture from the jets to form the proper mixture for combustion.

Assembly of the altitude valve is shown on drawing (Fig. 43). This valve operates by turning the lever which is attached to the altitude control valve. This valve has two openings in its seat which when in the open position register with two similar openings in the stationary cover, thus making two free passages to the outer air, the size of this passage being governed by the position of the lever.

There are four outlets (Fig. 43), one of which connects to each of the four elbows, opening directly into the top of the float chamber. The float chamber is always in direct connection with the venturi through a 5/64" drilled hole opening into the venturi about ¼" above the jet holder and into the float chamber well above the gasoline level. Opening the altitude control valve decreases the vacuum in the float chamber thus increasing the flow of gasoline through the jets.

Ignition System

Ignition is by four Dixie 800 magnetos, two on each side of the engine, driven from the vertical camshaft driving shaft by bevel gearing as shown on drawing Fig. 44. All magnetos turn clockwise.

Two Titan A C spark plugs are used per cylinder located in the side of the combustion chamber.

The rear magneto on the right hand side supplies current to the rear plug in each of the eight left hand cylinders, the front magneto on the right hand side supplying current to front plug in each of the eight right hand cylinders.

The same arrangement is followed with the magnetos on the left hand side so that the two magnetos on either side will fire all sixteen cylinders.

Magnetos are set for a maximum advance of 38°.

The bevel gear on the magneto shaft, Fig. 44, is fitted on a taper with a key. The gear has eight keyways, six spaced 48°, one spaced 42° and one spaced 30°. This in combination with the gear teeth allows the magneto to be set within 1½° on the crankshaft.

The magneto advance and retard mechanism is shown in Fig. 45. Gear B-16042 meshes with the gears on the magneto shafts. This gear has four internal spiral grooves sliding over splines on the sleeve which is keyed to the driving shaft but may be moved along the shaft by lever. The movement of this sleeve revolves the magneto driving gear in relation to the shaft driving gear, thus advancing or retarding the magnetos. The levers on the two sides of the engine are operated from one shaft located above the crankcase between the cylinder blocks, the connections to the levers being through adjustable yokes so that the magnetos may be synchronized.

Oiling System

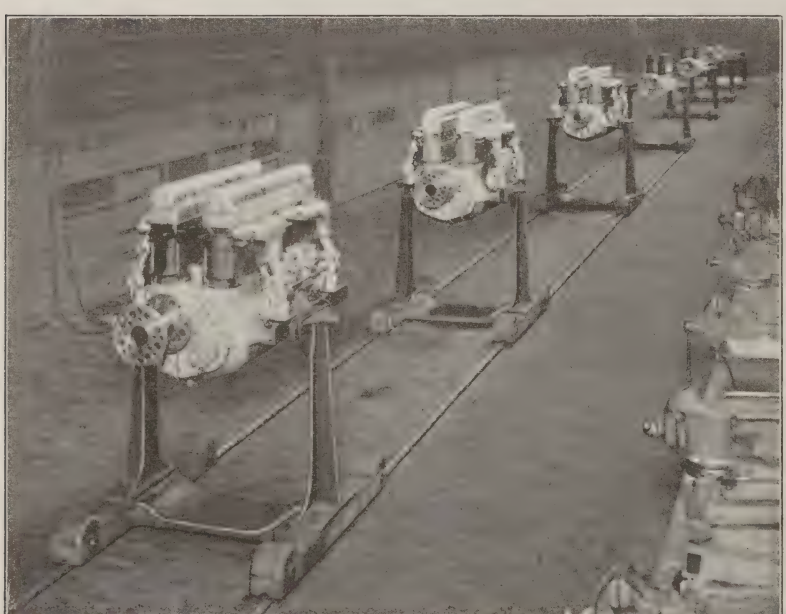
Oiling is by means of pressure feed and spray. There is one pressure and one scavenging pump both of the rotary gear type. These are located at the front of the engine, driven directly from the crankshafts through a pin and slotted coupling, Figs. 46 and 47. This coupling is squared to the pump shaft, but is not pinned, thus relieving the shaft of any end driving pressure. The gears in both pumps are the same except that the scavenging pump gears have a wider face.

Oil, after passing through a strainer, is drawn from the supply tank by the pressure pump which is driven from the right hand crankshaft. This oil is forced into the pressure line running the entire length of the crankcase as indicated in Fig. 48. An adjustable pressure regulating valve is located in the crankcase front gear cover. It is of the poppet valve spring seated type and discharges the excess oil directly onto the propeller shaft driving gears. This valve is generally set so that the pressure gauge which is connected to the rear end of the main oil line in the crankcase registers about 30 lbs. This valve has holes drilled through the head so that there is always a certain amount of oil discharged onto the gears.

From the pressure line the oil passes up around the studs which hold this line in position to an oil passage cut along the top surface of the crankshaft bearing cap, see Fig. 48. For the center crankshaft bearing this oil is carried through a drilled hole as indicated in Fig. 51. These passages carry the oil to all the main crankshaft bearings. All the main crankshaft bearings and pins are hollow. Main crankshaft bearings No. 2, No. 4, No. 6 and No. 8 have a 3/16" radial hole drilled entirely thru them. All the crank pin bearings have a 3/16" radial hole drilled from the inside to the central hole. A 13/64" hole is drilled in the web both sides of main crankshaft bearings No. 2, No. 4, 6 and 8 connecting the central hole in the main and pin bearings. A copper shell is placed in these central holes and the ends spun over making an oil-tight joint. These shells are necked in the central portion so that a tubular oil space is left as indicated in Fig. 48.

Oil from the passages in the crankshaft bearing cap is forced into this tubular oil space through the 3/16" holes which register with this passage twice per revolution. From here the oil passes to the pin bearings, the leakage from these bearings being thrown on the cylinder walls and gudgeon pins, thoroughly lubricating these parts.

Four vertical holes are drilled in the crankcase web connecting with the oil passages in the crankshaft bearing cap No. 3 and No. 7. These holes register at the top of the crankcase with copper tubes which pass through the cylinder water jacket space, registering at the top of the cylinder block with four holes drilled in the webs of the crankshaft housing. These holes register with an oil groove of 3/64" radius cut entirely around camshaft bearings No. 3 and No. 8, right and left hand. A No. 35 drill hole connects the oil grooves with the interior of the hollow camshaft. Oil is thus carried under pressure to the hollow camshaft. From the hollow camshaft, the oil passes to camshaft bearings No. 1, No. 2, No. 4, No. 5, No. 6,



A series of King-Bugatti engines being made ready for Shipment

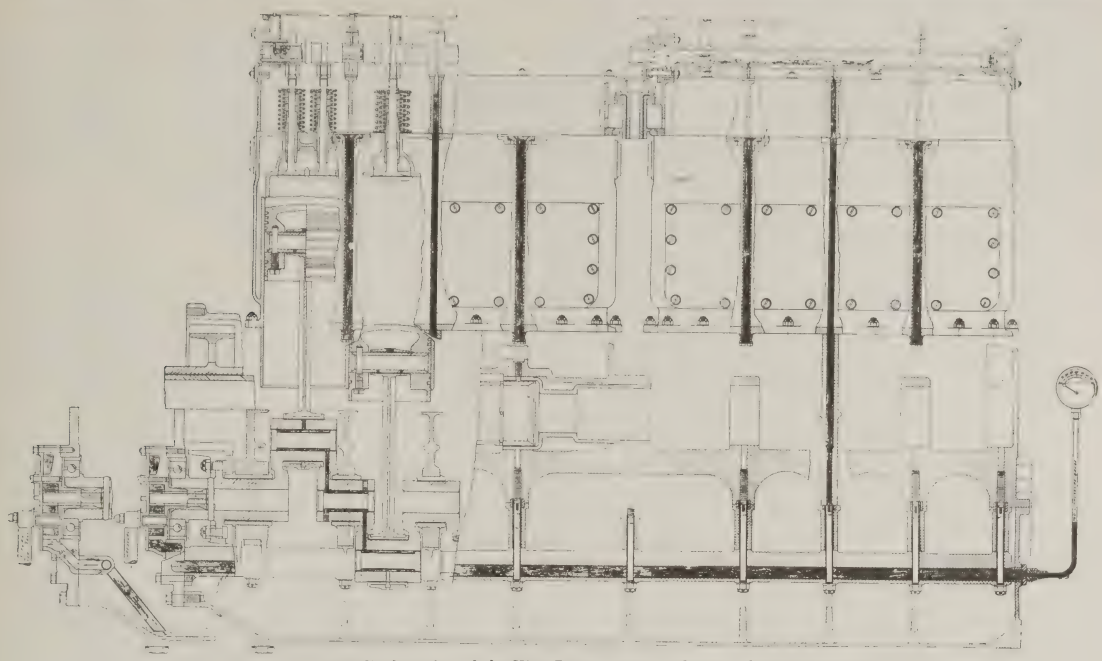


Fig. 48—Longitudinal section of the King-Bugatti engine, showing the oiling system

No. 7, No. 9 and No. 10 through a No. 35 drill hole. Camshaft bearing bushings No. 2, No. 4, No. 7 and No. 9 have a 3/32" 1/32" oil groove cut full length of the bearing surface, the drilled hole in the camshaft bearing registering with this groove once per revolution causing a small stream of oil to shoot out both sides of the bearing thoroughly lubricating the cams, valve rocher shaft, rollers and valve stems. Camshaft bearing bushings No. 5 and No. 6 have a 3/32" x 1/32" oil groove cut from ¼" of the outer edge to the inner edge, the drilled hole in the camshaft bearing registering with this groove once per revolution. Oil from this groove in the rear bearing lubricates the thrust surface of the camshaft bevel gear while the small stream from the front bearing thoroughly lubricates the camshaft and camshaft driving gears and the camshaft driving gear bearings.

A 3/16" hole is drilled in the crankcase web connecting with the oil groove in No. 6 crankshaft bearing cap and registering with a 1/16" drilled hole in the propeller shaft rear bearing bushing. This thoroughly lubricates this bearing. The oil flowing from this bearing returns to the sump by gravity.

The camshaft and magneto driving gears in the crankcase are lubricated by spray. The gearing in the camshaft housing is packed in grease.

The crankshaft and propeller shaft ball bearings are lubricated by spray.

Oil which drains to the bottom of the camshaft housing is returned by gravity to the crankcase through twelve pipes passing through the cylinder water jacket space.

Oil which drains to the front end of the sump is returned to the oil tank by the scavenging pump.

Oil which drains to the rear end of the sump is returned to the oil tank by gravity.

Cooling System

Cooling water is circulated through the engine by means of a centrifugal pump, see Fig. 49, driven from the rear end of the left hand crankshaft by a pin and coupling the same as used on the oil pump.

The cooling system from the pump inlet to the outlet elbows on the front cylinders holds four and one-quarter gallons of water.

The pump impeller is 5⅞" diameter with eight vanes, the web being drilled with eight

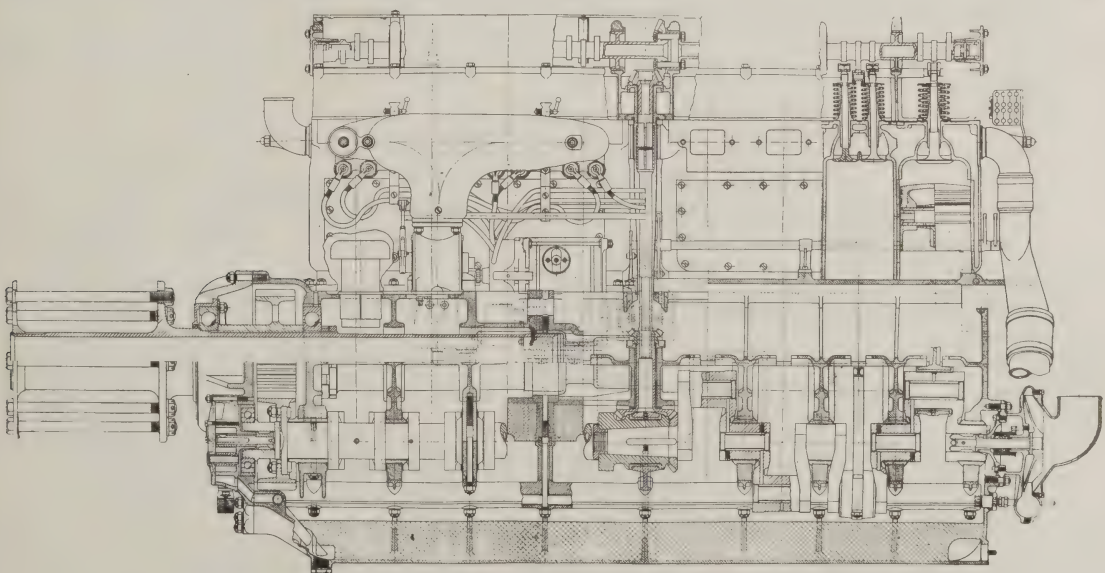


Fig. 44—The 410 H.P. King-Bugatti engine—longitudinal section

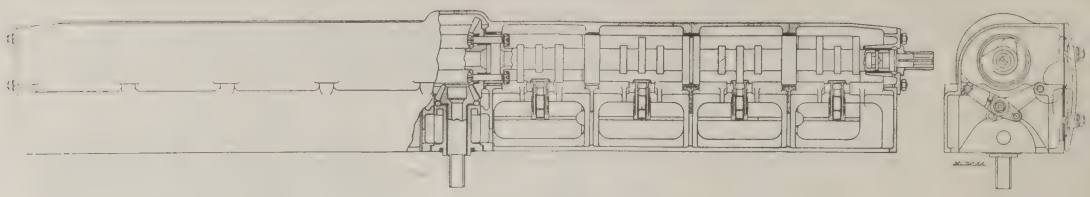
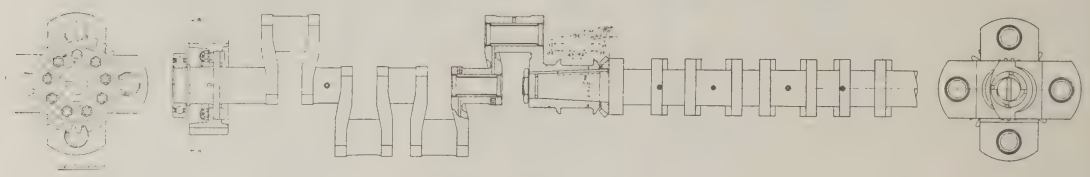


Fig. 52—Camshaft Housing Assembly—right



Crankshaft Assembly—right hand

3/8" holes on a circle of 2" diameter to equalize the water pressure.

The pump shaft is packed with a graphited asbestos rope packing, automatically held under compression by a coiled spring acting on the gland.

The pump shaft is hollow, the rear end being in direct communication with the water in the pump case. Water entering the shaft is forced out to the shaft rear bearing surface through a 1/8" hole. Any leakage of water past the asbestos packing is drained outside of the crankcase through a 5/8" cored hole in the water pump body. The front bearing on the pump shaft is lubricated by spray from the crankcase which collects on the shaft bushing support and drains down into a 1/8" hole leading to the bearing. Any oil leakage from the front end of this bearing returns to the sump, any slight leakage from the rear end of the bearing is drained outside of the crankcase with the water leakage from the rear bearing.

There is one water inlet to the pump 2 1/4" inside diameter while the single outlet is 2 3/16" diameter. Water from the pump is forced up into an aluminum pipe with one branch leading to the rear end of each of the rear cylinder blocks, water entering the cylinders at the top of the water jacket on the exhaust side. A certain amount of the water circulates thru the inlet manifold jacket, the remaining filling the cylinder water jacket space.

Cylinder blocks are cast with integral water jackets except the sides below the inlet and exhaust ports which are covered by an aluminum water jacket plate held in position by screws.

The construction of the water passages in the head of the cylinder is such that the valve stems and exhaust passages are very thoroughly cooled.

All four cylinder blocks are identical, the water passing from the rear to the front cylinder blocks through openings located similar to the inlet opening, leaving the front blocks through another similar opening.

Propeller Shaft

The propeller shaft is driven through a spur gear splined to the shaft meshing with a gear on the front end of each of the crankshafts, both the crankshafts turning clockwise. The propeller shaft is hollow. Provision is made for mounting a 37 m.m. cannon at the rear end of the crankcase, the barrel of the cannon passing through the hollow propeller shaft. This shaft is carried in three bearings, a ball bearing either side of the gear and a plain bearing at the rear end.

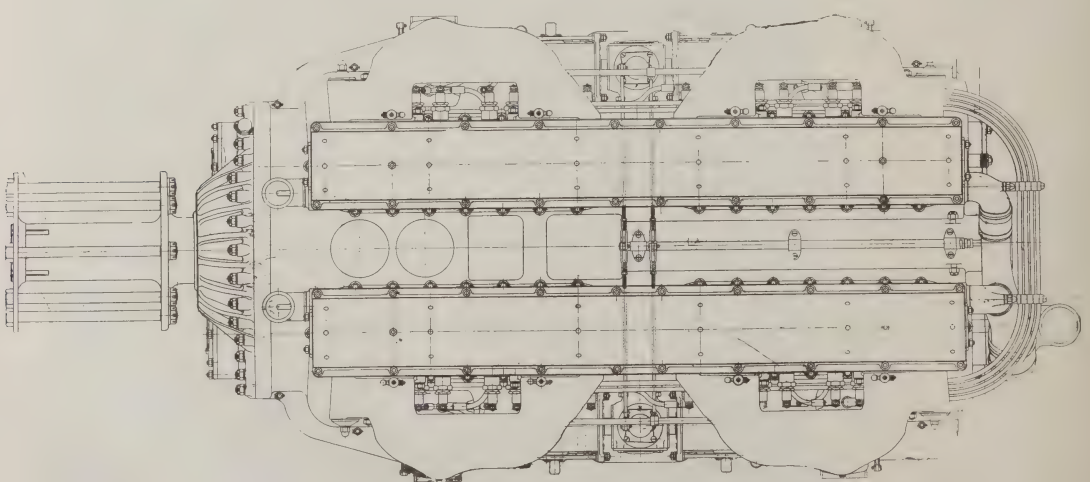
The front gear cover, the ball bearings and the gear are assembled complete as a unit before mounting in the engine. The ball bearings are No. 6219 Monarch Special, Width Hess Bright, being narrower than the standard bearing. The front bearing is mounted in the gear cover and takes all the propeller thrust as well as a certain part of the radial load. The rear bearing slides into a retainer in the crankcase, being free to move endwise, carrying radial load only. The hub of the gear acts as a spacer for the ball bearings, they being held in position on the shaft by two nuts with a locking plate between. Mounting is such that the ball bearings and gear are easily and positively assembled there being no danger of injuring the ball bearings by screwing the retaining nuts too tight.

Camshaft Drive

There are two overhead camshafts, each one running full length of the two cylinder blocks. Each shaft is made of two separate shafts joined near the center by six bolts passing through flanges on the shafts. These bolts also hold the camshaft gear in position. Each complete shaft is carried in ten plain bearings in a removable camshaft housing. The two housings are of aluminum and each one is bolted directly to the top of the cylinder blocks without the use of a gasket by twenty 1/4" studs.

The first camshaft housings had a sheet aluminum cover as indicated on Fig. 51, a later housing is made entirely of cast aluminum with a cast aluminum cover plate at the side running the entire length of the housing. See Fig. 52.

Each camshaft is operated through a bevel gear driven by a vertical shaft between the two cylinder blocks which in turn is driven by a bevel gear on the crankshaft. The gear on the crankshaft is pressed in position and in addition is held by a key. The keyway is cut in a definite position with relation to a marked tooth. The thrust of this gear is taken by the crankshaft center bearing. This gear meshes with a bevel gear which drives the vertical shaft; the thrust of the gear being taken on a bronze Babbitt lined bushing pressed into the aluminum crankcase. This gear has a long shank which acts as a bearing for the gear and has a fine external thread cut at its upper end. This upper end has a square broached hole, the hole having a definite relation to a marked tooth of the gear. The bearing for the upper end of the shank of this gear is a bronze bushing Babbitt lined pressed into the crankcase. The upper end of the bearing is cupped to form an oil well which catches the spray in the crankcase which is led to the bearing. The magneto driving shaft driving gear, see Fig. 44, is screwed into the thread at the upper end of the shank, the adjustment of the gear being obtained by means of the thread. This gear has a square broached hole the same size as the hole in the shank of the gear it is screwed to and is locked in position by dropping the camshaft driving shaft into position, this shaft having a squared section at both ends, the lower end fitting into the square hole in the magneto driving shaft driving gear and the square hole of the shank of the camshaft driv-



King-Bugatti 410 H.P. Engine—top view

General Data

Number and arrangement of cylinders	16 vertical, 2 rows of 8 in blocks of 4
Material	Cast iron
Bore	4.33" 110m.m.
Stroke	6.3" 160m.m.
Stroke-bore ratio	1.45 : 1
Area of one piston	14.725 sq. in.
Total piston area	235.6 cu. in.
Swept volume of one cylinder	92.768 cu. in.
Displacement of motor	1484.288 cu. in.
Compression ratio	5 : 1
Normal brake H. P.	410 at 2,000 R.P.M.
Type of valve gear	Overhead camshaft and valve rockers
Number of carburetors	Four Miller special
Ratio propeller to crankshaft speed	.666 : 1

Valves

Number per cylinder	Two inlet and one exhaust
Outside diameter, Inlet	1.535
Outside diameter, exhaust	2.263
Port diameter, inlet	1 27/64"
Port diameter, exhaust	2 3/64"
Width of seat, inlet	.057"
Width of seat, exhaust	.108"
Angle of seat	10°
Valve lift, inlet	.653"
Valve lift, exhaust	.700"
Diameter of stem, inlet	.357"
Diameter of stem, exhaust (large	.591"
Diameter of stem, exhaust (small)	.4355"
Length of valve, inlet	5 17/64"
Length of valve, exhaust	5 13/32"
Number of springs per valve, inlet and exhaust	2 concentric
Length of spring in position, inlet (small)	2 7/64"
Length of spring in position, inlet (large)	2 15/64"
Length of spring in position, exhaust (small)	2 27/64"
Length of spring in position, exhaust (large)	2 27/64"
Mean diameter of coils, inlet spring (small)	.57/64"
Mean diameter of coils, inlet spring (large)	1 9/32"
Mean diameter of coils, exhaust spring (small)	1 9/32"
Mean diameter of coils, exhaust spring (large)	1 23/32"
Clearance inlet valve stem	.015"
Clearance exhaust valve stem	.015"
Valves parallel to center line of cylinder bore.	

Cylinders

Overall height of cylinders	10 27/64"
Length of projection in crankcase	3 1/16"
Width of cylinder casting at head over water jacket space	5 7/16"
Width of cylinder casting at barrel over water jacket space	5 1/16"
Length of cylinder casting over water jacket	19 5/32"
Thickness of flange (base)	7/16"
Number of studs per block of four cylinders	20
Diameter of stud	5/16"
Thickness of water jacket wall side and head	5/32"
Thickness of combustion chamber wall	13/64"
Thickness of cylinder barrel, above flange at water jacket	3/16"
Thickness of cylinder barrel, above flange below water jacket	7/32"
Thickness of cylinder barrel below flange	9/64"
Thickness of valve ports	5/32"
Diameter of port at valve, inlet	1 27/64"
Diameter of port at valve, exhaust	2 3/64"
Inlet port at flange (for two cylinders)	2 9/32" x 1⅜"
Exhaust port at flange (for one cylinder)	2 3/64" x 1 31/64"
Number of spark plugs per cylinder	2

Pistons

Type of piston	Crowned
Material	Aluminum
Length of piston	4 1/16"
Length to diameter ratio	.918 : 1
Number of rings per piston; placed two in a groove lower ring beveled acting as wipe ring	4
Position of rings	Above gudgeon pin
Width of rings	⅛"
Width of land	¼"
Distance from bottom to center of gudgeon pin	2 1/6"
Thickness of head at center	¼"
Thickness of head at edge	⅜"
Thickness of wall at bottom	⅜"

Gudgeon Pin

Diameter of gudgeon pin	1 5/64"
Thickness of wall	.164

Connecting Rod

Type	Plain
Length between centers	10 7/16"
Ratio length to crank throw	3.313 : 1
Small end bearing	Bronze Bushing
Outside diameter of bushing	1 5/16"
Length of bushing	2 3/32"
Length of small end of rod	2 3/32"
Outside diameter small end rod at end	1 11/32"
Outside diameter small end rod at center	1¼"
Type of section	Eye
Depth (small end)	1⅛"
Depth (large end)	1 7/32"
Width	¾"
Thickness of web	5/32"
Thickness of flange (small end)	5/32"
Thickness of flange (large end)	13/64"
Large end bearing	Bronze babbit lined
Inside diameter bushing	2 3/16"
Outside diameter bushing	2½"
Length	2 9/64"
Thickness of babbit	3/64"

Crankshaft

Number of crankshafts	2
Number of bearings (Plain) per crankshaft	9
Number of bearings (Ball) per crankshaft	1
Cylinder centers (in block)	4 17/32"
Cylinder centers (between blocks)	7 15/32"
Crank pins, outside diameter	2 3/16"
Inside diameter	1⅛"
Length	2 11/64"
Main Bearings:	
Outside diameter Nos. 1, 2, 3, 4, 6, 7, 8, 9	2 3/16"
Outside diameter No. 5	2⅝"
Inside diameter, Nos. 1, 2, 3, 4, 6, 7, 8, 9	1⅛"
Length, Nos. 1, 2, 3, 4, 6, 7, 8 Bearing Bushings	19/16"
Length No. 9 Bearing Bushing	2 19/32"
Length No. 5 Bearing Bushing	1 31/32"
Ball Bearing	Hess-Bright Monarch No. 6211
Crank Webs:	
Width	3 17/32"
Thickness	43/64"
Radius of fillets	3/32"
Weight of one complete shaft, for 8 cylinders, with propeller drive gear bolts and nuts, bevel gear and oil passage shells	96½ lbs

Camshaft

Diameter of shaft	1"
Inside diameter	11/16"
Number of bearings	10
Diameter of Bearings Nos. 1 and 10	1"
Diameter of Bearings, Nos. 2, 3, 4, 5, 6, 7, 8, 9	2⅛"
Length of Bearings Nos. 1 and 10	1 5/16"
Length of Bearings Nos. 2, 4, 7, 9	⅝"
Length of Bearings Nos. 3 and 8	¾"
Length of Bearings Nos. 5 and 6	27/32"
Width of cam face	5/16"
Number of cams per cylinder	3

Camshaft Bevel Gear

Pitch Diameter	3¾"
Number of teeth	30
Pitch	8
Width of face	⅝"
Diameter of bolt circle	1 23 32"
Number of bolts	6
Diameter of bolts	5/16"

Camshaft Housing

Material	Aluminum

Camshaft Driving Shaft

Diameter	¾"
Wall thickness	⅛"

Crankcase Upper Half

Material	Aluminum
Thickness of wall	3/16" to 5/16"
Thickness of supporting flange	⅜" to 7/16"
Center distance of motor support bolts	24¾"
Number of motor support bolts	12
Diameter of motor support bolts	⅜"
Center to center of crank shafts	10¼"
Height of case	9.055"

Crankcase Lower Half

Material	Aluminum
Thickness of wall	3/16"

Lubrication

Type	Forced feed and spray
Type of pump	Rotary Gear
Number of pumps	One pressure, one scavenging
Oil pressure	30 #

Pressure Pump

Number of teeth	7
Pitch	6
Outside diameter	1½"
Width of face	13/16"
Ratio of pump speed to crank shaft speed	1 : 1

Scavenging Pump

Number of teeth	7
Pitch	6
Outside diameter	1¼"
Width of face	1¼"
Ratio of pump speed to crank shaft speed	1 : 1

Ignition

Type	Magneto
Number	4
Make	"Dixie 800"
Firing order	1L, 7R, 5L, 4R, 3L, 8R, 7L, 2R, 4L, 6R, 8L, 1R, 2L, 5R, 6L, 3R
Number of plugs per cylinder	2
Type of plug	Titan A. C.
Advance	38°
Magneto Rotation	Clockwise

Cooling Systems

Type	Water Cooled
Pump	1 Centrifugal
Inside diameter of inlet and outlet elbow to cylinders	1½"
Number of inlets	2
Number of outlets	2
Water temperature inlet	150° F.
Water temperature outlet	160° F.

Water Pump

Material	Aluminum
Inside diameter of inlet	2¼"
Inside diameter of outlet	2 3/16"
Diameter of impeller	5⅞"
Number of blades	8
Ratio pump speed to crankshaft speed	1 : 1

Reduction Gears

Crank shaft propeller drive gear:	
Pitch diameter	5.6"
Pitch	5
Number of teeth	28
Width face	2⅛"
Diameter bolt circle	3 17/32"
Number of bolts	9
Diameter of bolts	7/16"
Propeller shaft gear:	
Pitch diameter	8.4"
Pitch	5
Number of teeth	42
Width face	2⅛"
Number of splines	48
Width of splines	.405
Height of splines	.094

Propeller Shaft

Number of bearings	3
Type of bearings	Two ball, one plain
Ball Bearings	No. 6219 Special Width, Hess-Bright
Plain bearing	Bronze babbitt lined
Diameter of bearing	3 7/16"
Length of bearing	1½"
Thickness of babbitt	1/32"
Outside diameter at gear (over splines)	3¾"
Outside diameter at rear end	3 5/16"
Outside diameter at propeller	3 31/64"
Inside diameter	2 61/64"
Diameter propeller flange	9¾"
Thickness flange	7/16"
Thickness loose flange	9/32"
Length of bearing loose flange on shaft	¾"
Diameter of bolt circle	7⅞"
Diameter of bolts	⅝"
Number of bolts	8

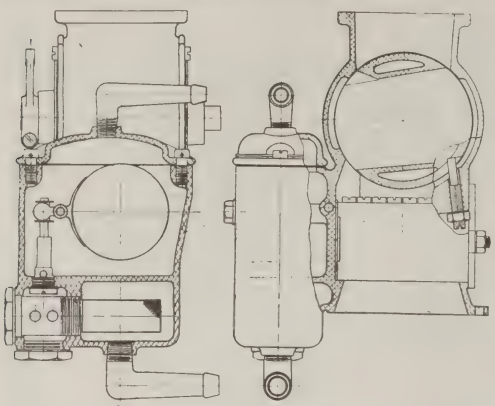


Figure 41—Carburetor Assembly

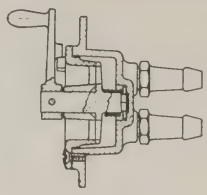


Figure 43 — Altitude Control Valve Assembly

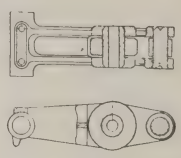


Figure 50—Valve Rocker Assembly

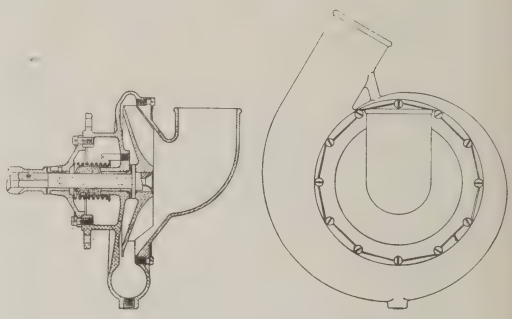


Figure 49—Water Pump Assembly

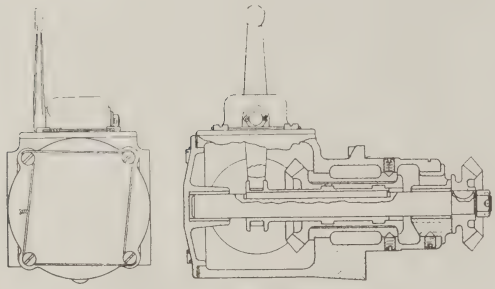


Figure 45—Magneto Gear Housing Assembly

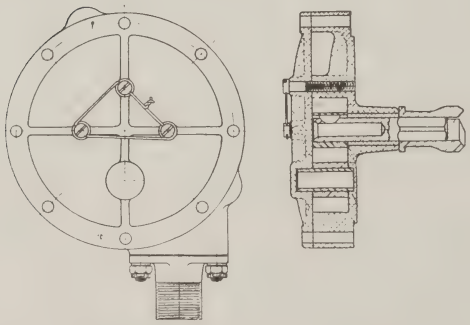


Figure 46—Oil Pressure Pump Assembly

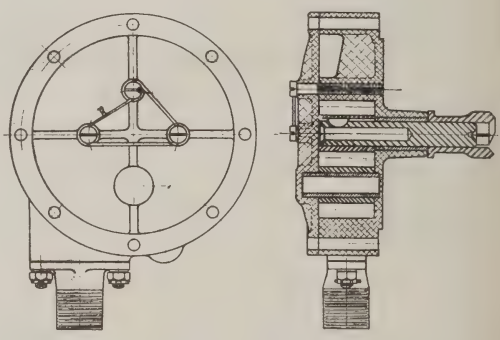


Figure 47—Oil Suction Pump Assembly

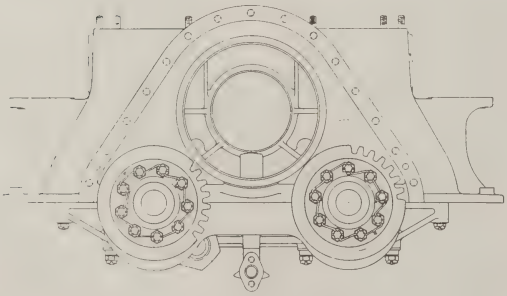
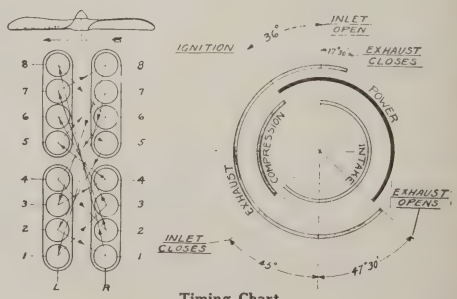


Figure 51—Crankshaft Assembly Chart



Timing Chart

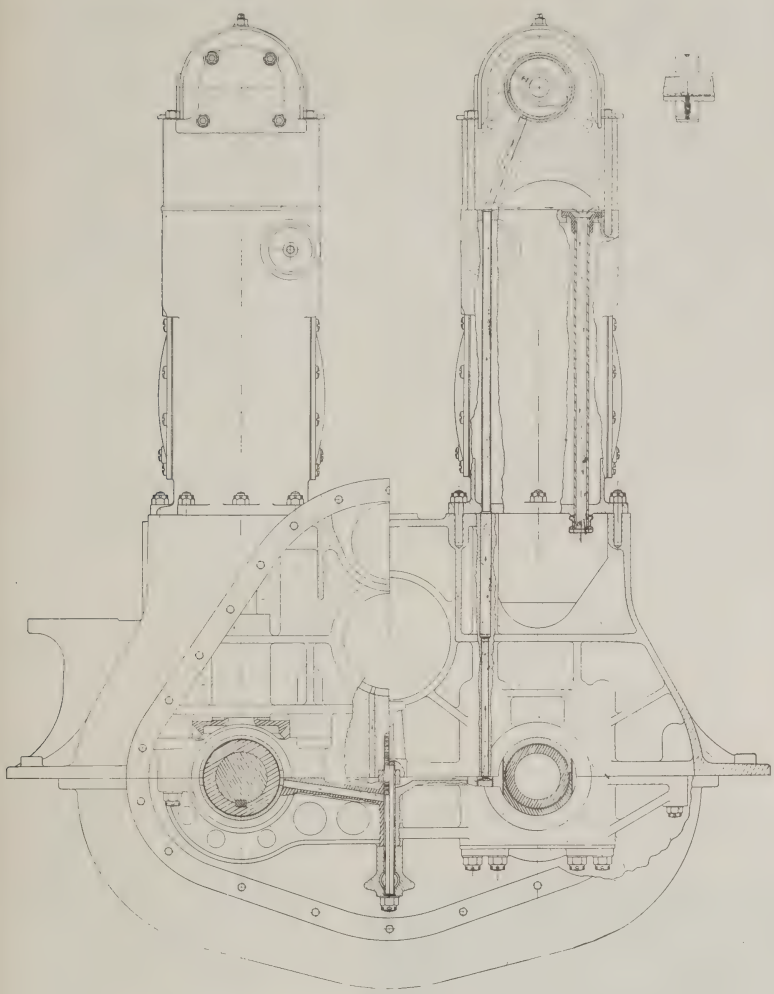
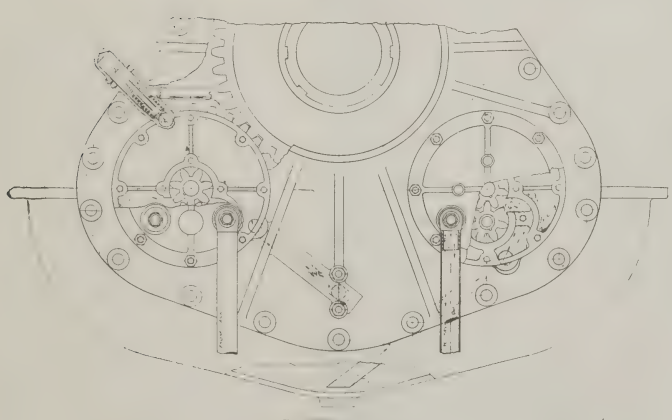


Fig. 51



Section showing oiling system—King-Bugatti Engine

ing shaft gear. The gear on the camshaft meshes with a gear having a long shank with a squared section at its lower end, the square being cut with a definite relation to a marked tooth on the gear. This gear takes a bearing in an aluminum Babbitt lined bushing which is held in position in the camshaft housing by a large flat head screw. This bushing also takes the thrust of the bevel gear. The upper end of the vertical camshaft driving shaft and the lower end of the camshaft driving gear are connected by a coupling consisting of a square piece of steel with a square broached hole fitting over these square ends.

The teeth of all the gears being marked for the meshing position they may be easily assembled in the proper positions for correct timing.

Valve Mechanism

The valves are operated by an overhead camshaft through a rocker arm. These rocker arms, Fig. 50, are pivoted on steel shafts which are slid into drilled holes along both sides of the camshaft housing as indicated in Fig. 50. There are four of these rods to each housing, each one-half the length of the housing. The ends of the rods butt together at the center, the outer ends being flush with the ends of the camshaft housing and covered by the end bearing support for the camshaft when this is bolted in position. The rods are thus prevented from moving lengthwise. They are of a tight enough fit in the drilled hole in the camshaft housing so that there is no turning motion. The outer end of each rod is tapped for a wrench to be used in withdrawing the rods from the housing.

Each rocker arm operates one valve, they are forgings and the pivot bearing of the arm on the rod in the camshaft housing is not bushed. The cam operates on the large roller, Fig. 50, which is of hardened steel taking a bearing on a hardened steel pin. This pin is held in the rocker arm by spinning the metal of the rocker arm around the beveled end of the pin as clearly shown in Fig. 50. The small roller operates directly on a cap placed over the end of the valve stem. This roller is of hardened steel and takes a bearing on a hardened steel pin the ends of which are soft and spun over into a bevel at the outer edges of the hole in the rocker arm.

The end of the valve stem has a cap slipped over it as is indicated in Fig. 44, the upper end of the cap being hardened. The proper clearance .015″ for both the inlet and exhaust valve between the end of this cap and the roller in the rocker arm is obtained by placing shims in the cap. Three different steel shims are used of .003″, .005″ and .010″ thickness, the first being octagonal, the second hexagonal and the third round, so that the different thicknesses may easily be picked out by eye.

The upper valve spring retainers have a central tapered hole, the large end of the hole being on top. The vale stems are necked and a tapered split collar is slipped into the necked portion of the stem, large end up. This taper is the same as the hole in the spring retainer. The pressure of the valve springs forces the retainer against the tapered collar which is prevented from moving by the shoulder on the valve stem thus locking the retainers into position.

Valves

The inlet and exhaust valves work in cast iron guides pressed into the cylinders. Liberal water space is provided in the cylinder head in the neighborhood of these guides so that the valve stems are well cooled.

The exhaust valve stem is hollow from the head to within a short distance of the necked portion at the upper end. The hole is closed at the head end by a short threaded plug screwed in below the surface of the valve, the recess then being filled level with the surface of the valve by welding. This closes the hole tightly and locks the plug in position. The lower end of the exhaust valve stem is of larger diameter than the upper end. Both the large and small diameters take a bearing in the valve guide as indicated on Fig. 44. At the shoulder formed by the junction of the two sizes of stem three 3/32″ holes are drilled at an angle of 30° with the axis of the stem sloping towards the head of the valve and connecting with the drilled hole in the stem. At the upper end of the stem just below the necked portion a 5/32″ hole is drilled through the wall of the stem. The movement of the valve up and down in the guide causes a pumping action, the transfer of air within the valve stem being thought to cool the steam to a certain extent. This drilling also lightens the valve.

Piston

The piston is of aluminum and has two ring grooves above the gudgeon pin. Two ⅛″ wide rings are placed in both of these grooves. The rings require a pressure of ten to twelve pounds applied on a diameter at right angles to the slot to bring the ends of the 30° slot to within .010″ of the closed position. The lower ring is beveled, being placed in the groove with the sharp edge down so that it acts as a

wipe ring forcing the oil on the down stroke into an oil groove cut just below the ring groove. The land between the bottom of the ring groove and the oil groove is 1/64" wide and it is 1/32" smaller diameter than the land above this ring groove. This forms a free passage for the oil to the oil collecting groove. Eight 3/32" holes are drilled around the piston connecting the oil groove with the interior of the piston. These holes slope down at an angle of 60° with the axis of the piston carrying the oil wiped from the cylinder wall to the interior of the piston. A slot ⅛" wide x 1/16" deep is cut from the oil groove to the gudgeon pin hole at both ends thus lubricating these bearings. Two ½" wide x 1/32" deep oil distributing grooves are cut around the piston, one about 3/16" above and one about 5/16" below the center line of the gudgeon pin.

Gudgeon Pin

The gudgeon pin floats in both the connecting rod bushing and the piston. Bearing in the piston is directly on the aluminum. It is held from endwise motion by an aluminum plug pressed into each end. See Fig. 44. These plugs are drilled axially with a ⅜" hole, which allows a certain amount of oil from the cylinder wall to enter the hollow gudgeon pin. The ends of these plugs where they bear against the cylinder wall are turned to a spherical seat of a radius equal to the radium of the cylinder bore. In operation the gudeon pins turn more or less. Two ⅛" holes, in line, one ¾" each side of the center of the pin, are drilled through the wall of the pin. These holes when in a certain position register with an oil groove in the connecting rod bushing allowing a certain amount of oil to enter the hollowed gudgeon pin and when in the lower position allow the oil which is pocketed in the pin to run out onto the connecting rod bearing.

Connecting Rod

The connecting rod is a steel forging machined all over. It is of eye cross-section.

The small end bearing is a bronze bushing pressed in position, having one straight oil groove, 3/32" x 1/32" deep running to with ½" of the ends of the bushing. This groove is in communication with a 13/32" drilled hole in the connecting rod through a ⅛" hole. Oil collects in the pocket formed by the 13/32" hole, and is led to the bearing through the ⅛" hole.

The big end of the connecting rod is fitted with a bronze bushing which is babbitt line. This end is split at right angles to the rod on the center line of the bearing, the cap being held in position by two ⅜" chrome nickel-steel bolts. The bushing is relieved at the line by 5 grooves, 3/16" wide, about ¾" long, 3/64" deep, at the parting line cut on a 7/16" radius with a center on the parting line. The rod half of the bushing has no oil groove, the cap half has a circular oil groove entirely around it cut on the center line of the bushing and registering with the oil feed hole in the crank pin. This groove is ⅛" wide x 1/32" deep. The bushing in the cap is kept from turning by a dowel pin with an enlarged head. This head enters a countersunk hole in the cap, the small end entering the hole in the bushing when it is placed into position. This end is of such a length that it does not project through the bushing. The pin is thus locked in position and cannot drop out or rub on the shaft.

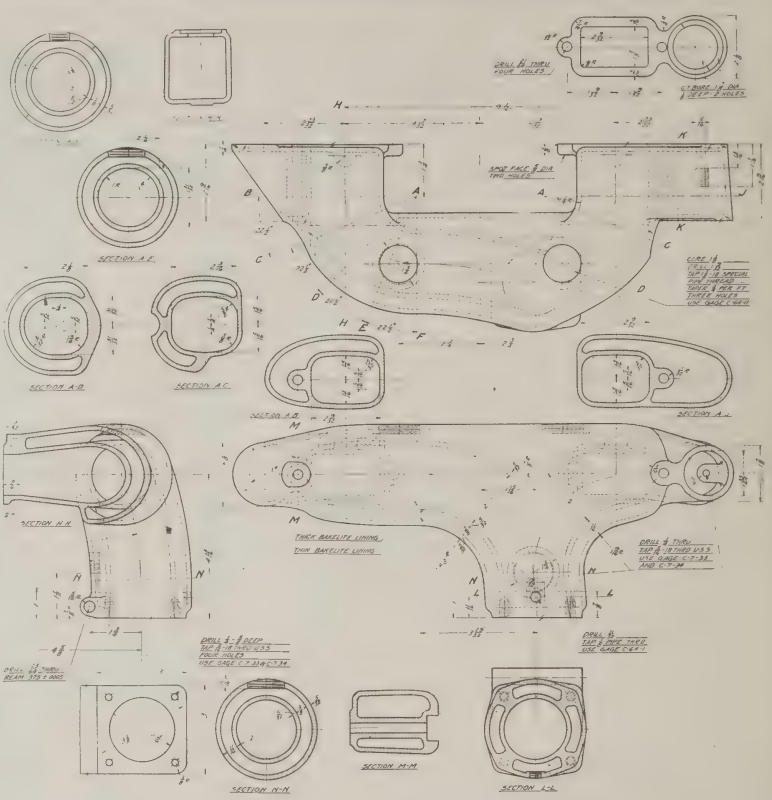
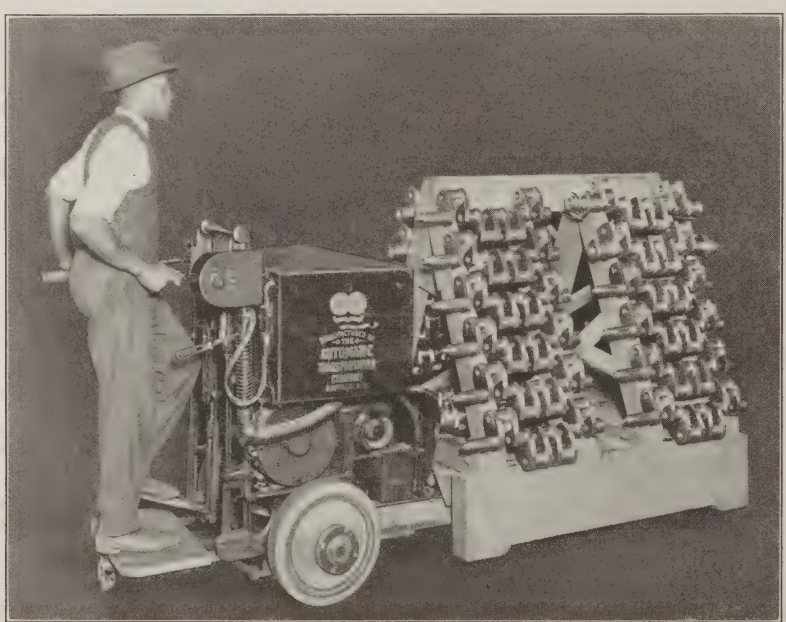


Fig. 42—Details of Gas Inlet Manifold—Front right and rear left



Crankshafts for the King-Bugatti Aviation Motor

Crankshaft

The crankshaft is made in two pieces connected at the center by a taper and key drawn up with a nut. Each section of the shaft forms a four cylinder shaft with the throws all in one plane, the throws of the two sections being assembled at right angles. In assembling, the rear end of the front half is immersed in boiling water, the tapering end of the rear section which is cold is then slipped into position and the parts drawn together by the nut using a long handled wrench.

The rear end of each complete shaft has clutch teeth cut on it for attaching a starter.

All end thrust coming on the shaft is taken by the center or No. 5 bearing all the other bearings having about 1/16" clearance at both ends.

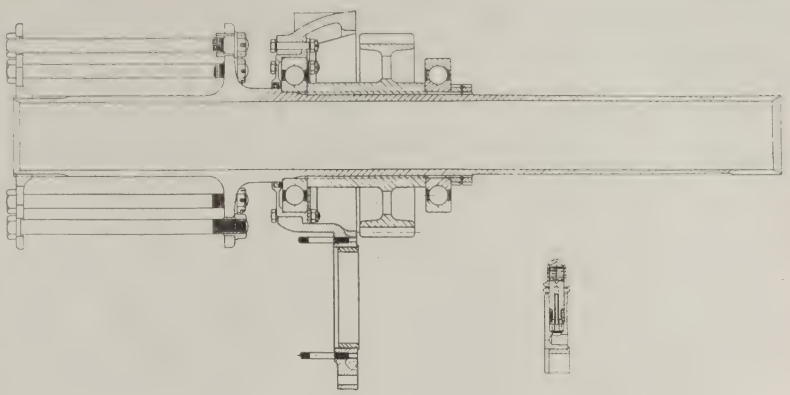
All bearings, including the connecting rod bearings, with the exception of the center main bearing are undercut. This results in a total shortening of the shaft of approximately 4 31/32". This of course results in a considerable saving in the weight of various parts while still allowing ample bearing surface.

The crankshaft main bearings are bronze bushing, babbitt lined. These bearings are not relieved at the parting line and there are no oil grooves excepting in the lower half of bearings No. 1, No. 2, No. 3, No. 4, No. 6, No. 7, No. 8. These have a 3/32" wide x 1/32" deep circular oil groove entirely around them. This groove registers with the oil into the hollow crankshaft

bearing. As this oil hole is drilled through both walls of the bearing on a diameter and as the oil groove in the bushing extends through 180° there is always a free passage for the oil from the bearing into the hollow crankshaft.

In assembling the completed crankshafts in the crankcase, they are placed in such a relation to each other that if No. 8 throw left is on top dead center No. 8 throw right will be 45° past bottom dead center. Both cranks turn clockwise viewed from the rear of the engine.

The propeller driving gears are bolted to the crankshaft with nine bolts equally spaced, the bolt holes being drilled in a certain relation to the gear teeth. This makes it possible to use the same gear on either shaft with a maximum error in the setting of the shafts of 20 minutes. The flange on the crankshaft and the gears are marked as indicated in Fig. 51 for the proper position of assembly of the gears on the shafts.



Propeller shaft and front cover assembly

Cylinders

The cylinders are of iron cast in blocks of four. They are bolted directly to the top of the crankcase without the use of a gasket. The water jacket is cast integral with the exception of the sides of the cylinder block below the inlet and exhaust ports, which are covered with a cast aluminum plate attached with screws. A gasket is used between these plates and the cylinder.

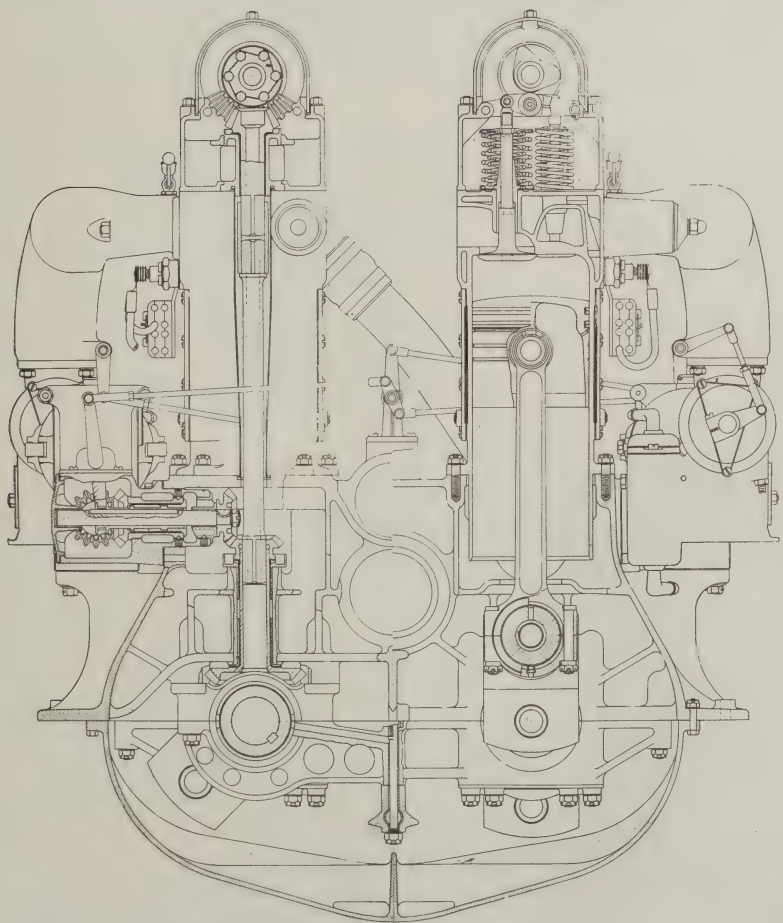
Cylinders are cast with separate exhaust ports. One inlet port supplies two cylinders. Two outlet and one exhaust valves are used.

The entire combustion space is machined with the exception of a very small recess near the inlet valve seat.

The tops of the cylinder blocks are machined, making an oil tight joint with the camshaft housing without the use of a gasket.

Provision is made for a liberal circulation of water in the neighborhood of the valve ports, seats and guides overcoming valve trouble.

Spark plugs, of which there are two per cylinder, are located at the side of the combustion chamber in close proximity to the inlet valves and are well cooled by the circulating water.



Bugatti 16 cylinder 410 H.P. engine—Sectional view

Crankcase

The crankcase and oil pan are of cast aluminum. The case is well ribbed. All bearings are supported from the upper part of the case, the bearing bushings being held in place by caps which extend almost the full width of the case. Each cap supports two bearings. They are all of cast aluminum with the exception of the center bearing cap, which takes all the thrust of the crankshaft. This is a steel forging.

The oil pan has a web running its entire length along the center line of the engine. This greatly assists in preventing the current of air caused by the revolving crankshafts from drawing up the oil which is constantly draining into the pan. There is also a cross web between each cylinder block which runs well up the sides of the oil pan. There cross webs have an opening at the bottom at their center, allowing the oil to drain to the ends of the pan on either side of the web running lengthwise.

A breather is attached to the top of the crankcase near the front end between the cylinder blocks.

Provision is made at the rear end of the case for attaching a 37 m.m. cannon, the barrel of the cannon projecting through the hollow propeller shaft.

Gun Control

Provision is made for attaching two gun control mechanisms, one at the rear end of each of the camshaft housings driven directly from the camshafts through a slotted coupling. When this control mechanism is used it is inserted in place of the camshaft housing end bearing cover.

Tachometer Drive

The tachometer drive may be taken from either end of the two camshafts. It operates at camshaft speed through a slotted coupling as indicated in the illustration.

When the gun control mechanism is used the tachometer drive is taken from the rear end through the same type of coupling as when driven directly from the end of the camshaft.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

ABC—Report to Army Balloon School, Arcadia, Cal.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
ARV—Report to Aviation Supply Depot, Richmond, Va.
BFT—Report to Barron Field, Fort Worth, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonia, Texas.
CRI—Report to Chanute Field, Rantoul, Ill.
CWT—Report to Call Field, Wichita Falls, Tex.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EOT—Report to Ellington Field, Olcott, Texas.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GLC—Report to Gerstner Field, Lake Charles, La.
HHM—Report to Hazelhurst Field, Mineola, L. I., N. Y.
KST—Report to Kelly Field, San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses.)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PWM—Report to Payne Field, West Point, Miss.
RSD—Report to Rockwell Field, San Diego, Cal.
RWT—Report to Rich Field, Waco, Tex.
TFT—Report to Taliaferro Field, Fort Worth, Tex. (When specified in the order, the number of the field is given in parentheses.)
TMA—Report to Taylor Field, Montgomery, Ala.
UTA—Report to School of Military Aeronautics, University of Texas, Austin Tex.
WDM—Wire Director of Military Aeronautics upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.
Note 2—Report to Buffalo, N. Y., to 2050 Elmwood Avenue.
Note 3—Report to U. S. Army General Hospital, Presidio, Cal.
Note 3—Report to U. S. Army General Hospital No. 1, Williamsburg, N. Y.
Note 5—Report to Army and Navy Hospital, Hot Springs, Ark.
Note 6—Report to 25 South Main Street, Dayton, Ohio.
Note 7—Report to Aberdeen Proving Grounds, Aberdeen, Md.
Note 8—Report to Little Building, corner Boylston and Tremont Streets, Boston, Mass., to Dist. Mgr. Aircraft Finance, and wire DAP.
Note 9—Report to 239 West Albama Street, Houston, Texas, to district supervisor Southern District.
Note 10—Report to General Hospital No. 11, Cape May, N. J.
Note 11—Report to Army Balloon School, Lee Hall, Va.
Note 12—Report to Military Hospital, Cooperstown, N. Y.
Note 13—Report to Richmond, Va., to commanding officer aviation general supply depot.
Note 14—Report to 360 Madison Avenue, New York City, to district Manager Aircraft Finance and wire DAP.
Note 15—Report to Pittsburgh, Pa., to Keenan Building, and wire DAP.
Note 16—Report to General Hospital No. 2, Fort McHenry, Md.
Note 17—Report to Letterman General Hospital, San Francisco, Cal.
Note 18—Report to commanding officer aviation general supply depot, San Antonio, Texas.

A

Armstrong, James F.....PMT
Alger, Edward E.....FSO
Anglin, Charles H.....KST

B

Boess, Murray R.....EOT
Barker, James R.....EOT
Beverly, Efford A.....DMA
Boxell, Earl F.....AGC
Barrett, Carl H.....PMT
Blades, Fred H.....PMT
Bigelow, Joseph S., Jr.....ABC
Bettis, Cyrus.....KST
Boyle, Frank J.....Note 13
Baker, Frederick A.....Note 15
Brown, Ray A.....Note 15
Brannon, Fred R.....EOT
Buser, Albert E.....AGC
Ball, Clarence S.....PMT

C

Chamberlain, Clarence D.....CAF
Canfield, Dwight J.....PMT
Crozier, Raymond L.....MAC
Carrico, Isaac B.....EOT
Christiansen, Ove C.....PMT
Cook, Frank L.....KST
Culp, Alexander B.....MDO

D

Dundore, Charles H.....KST
Duke, Thomas W. D.....PMT
Dallas, Burnie R.....PMT

E

Eidson, Charles G.....MDO
Emmons, Delos C.....MDO
Eckstrom, Lawrence J.....FRF
Elsey, George W.....MDO

F

Freeman, Orville B.....KST
Ferguson, Charles H.....Note 6
Fisher, Floyd C.....KST
Fries, John R.....AGC
Franklin, William E.....Note 5
Fleet, Reuben H.....MDO
Fry, G. Kenneth.....MDO

G

Grimm, Alfred.....ABC
Gibson, George W.....DMA
Gamble, Henry C.....KST
Geier, Philip E.....Note 3

H

Hayhurst, Alfred J.....Note 18
Hoobler, Harold H.....AGC
Heald, David.....Note 8
Hinkle, Stacy C.....EOT
Heinrichs, Waldo H.....Note 4
Hunting, Carol S.....KST
Hammond, Reginald G.....KST
Hurja, Emil E.....DAP
Holmes, Beverly W.....ABC
Higginbotham, William H.....ABC
Haggarty, Stewart A.....Note 4
Hewitt, Leland R.....KST
Hutchinson, William T.....KST
Harris, Harold R.....MDO
Heine, Henry W.....DMA
Holland, Maurice.....MDO
Harmon, Ernest E.....MDO

J

Jones, William F.....MDO
Johnstone, Clifford.....Note 6

K

Kay, Harold T.....DAP
Keyes, Charles S.....MDO
Kidwell, Verro B.....EOT

L

Leigh, Ben.....AGC
Lane, David W.....AGC
Lake, Harley W.....MDO
Leonard, Leonard R.....KST
Lutes, Herschel.....DMA
Lucas, Malcolm.....Note 13
Little, Archibald.....Note 9

M

Moore, William Cadwell.....AGC
Meister, Louis G.....DMA
Miller, Charley.....DMA
Murphy, Harry J.....KST
Merriman, Frederick.....CAF
Morrow, Joseph C.....Note 12
Morser, Clarence W.....Note 2
Moyer, Max F.....Note 7
Monteith, Darrell M. D.....AGC
Mathews, George C.....PMT
Muhlenberg Henry C. K.....MDO
Modlish, Gus P.....MDO

Mc

McIlvaine, Arthur D.....DMA
McGee, Earl G.....AAD

N

Noonan, Thomas F.....ABC
Newhall, Albert W.....EOT

O

O'Brien, Matthew H.....DMA
Opel, Selmar T.....AGC

P

Pfeifer, Carl B.....MDO
Patterson, George B.....MDO
Pease, Robert A.....PMT
Price, Albert C.....MDO

R

Rodgers, Benjamin G.....PMT
Reynolds, John N.....DMA
Robinson, Paul D.....KST
Rummey, Raymond C.....CAF
Rouse, Charles L.....PMT
Ramsay, Joseph W.....KST

S

Stoll, Hugo L.....DAP
Sieg, Bine W.....KST
Sylvia, Earl D.....PMT
Snow, Lorenzo L.....MDO
Schroeder, Rudolph W.....MDO
Stearns, Francis A.....DMA
Slater, Francis C.....Note 17
Smith, Junius A.....Note 11
Sherwood, Horace M.....PMT

T

Thompson, John F.....AGC

U

Upston, John E.....TFT

V

Van Zandt, John P.....DMA
Von Harten, Anthony.....Note 13

W

Wright, Wilbur F.....DMA
Walsh, John.....Note 10
Windham, Jesse M.....AGC
West, Stewart N.....MAC
Winner, William L.....Note 16
Webber, Charles L.....KST
Wriston, Roscoe C.....EOT
Webb, William H.....PMT
White, Earl F.....MDO
Wehrle, Howard F.....CAF
Webster, Robert M.....KST
White, Edward O.....KST
Wash, Carlyle H.....MDO
Woodward, Mark R.....CAF

Cited for Bravery

First Lieut. Hermon C. Rorison, Aviation Section, 22d Aero Squadron. For extraordinary heroism in action near Beaumont, France, November 3, 1918. While on a bombing mission with five other pilots, Lieut. Rorison's patrol was attacked by 18 enemy planes (Fokker type). Three of his comrades were immediately shot down, but he continued in the fight for 30 minutes and destroyed two Fokkers, which were attacking the other two members of his patrol. With his plane badly damaged and himself wounded, he succeeded in shooting down another Fokker just before one of his guns was put out of action. By skillfully maneuvering he shook off the rest of the Fokkers and reached his lines, 15 miles away, in safety. Home address, Charles C. Chadbourn, uncle, Wilmington, N. C.

Air Heroes Returning from Abroad

January 22nd—Lieutenant W. P. Erwin of Chicago, winner of the Distinguished Service Cross, the French War Cross and the Aero Club of America Gold Medal, who has been officially credited with downing nine enemy planes, returned from France aboard the S. S. George Washington.

Major M. A. Hall, Wing Commander of the First Army who served with the British forces prior to America's entry in the war was also on the S. S. George Washington. He has been honored by a Croix de Guerre with a palm, the Distinguished Service Cross, twice given the Belgian War Cross and also the Order of Chevalier of the Order of the Crown. Major Hall took part in fighting at Chateau-Thierry, the Marne, the Vesle, St. Mihiel, the Argonne and at Verdun.

Ensigns Ludlow and Hamman, members of the American Naval Air Service, returned aboard the S. S. Giuseppi Verdi. These aviators distinguished themselves in air fighting on the Austrian front.

Secretary Daniels Commends Lieut. Gates for Rescue of Two Britons

Lieut. A. L. Gates, former Yale football player, who was taken prisoner by the Germans after having been forced to descend while on an air raid with a French squadron last October, has been commended by Secretary Daniels for his gallant conduct in rescuing two aviators from a British machine which had been wrecked off Ostend on August 22, 1918.

When word came to the American naval air station that the British fliers were down, Lieut. Gates immediately set out in his seaplane to rescue them. That he might have greater passenger-carrying capacity, he went up without gun layers, although he thus made it impossible to defend himself against enemy attack.

Vice Admiral Sims, commanding the American naval forces in Europe, recommended that Lieut. Gates be given a medal of honor. He inclosed with his report letters received from the British air ministry giving the details of the exploit and stating that the American lieutenant on several occasions had rendered very valuable assistance to British machines.

Lieut. Gates' home is in Clinton, Iowa. He was released from Germany after the armistice was signed.

Reserve Officers Training Courses to Continue

A recent report of the Committee on Education and Special Training shows that the educational institutions of this country are ready and eager to co-operate with the War Department in the training of reserve officers for the Army. Requests for the privilege of establishing units of the Reserve Officers' Training Corps have been received from more than three hundred and fifty institutions, including practically all the larger universities and colleges as well as many of the smaller schools and high schools. About two hundred and fifty of these schools have been authorized to maintain these schools, and officers are being assigned as Professors of Military Science and Tactics.

Attention will be given to keeping every young man physically fit by the establishment of a physical training system that will give every young man an opportunity for development. Summer camps to last for a period of six weeks will be maintained at Government expense.

Wood Urges Preparedness for the Next War

Topeka, Kansas, January 23rd.—In arguing for Universal Military Training, Major-General Leonard Wood made a strong appeal for preparedness for defense in the next war. His plan is to train youths for not more than six months, with a view to maintaining the smallest necessary standing army yet creating a huge reserve for national and international emergencies.

Dr. Thomas Eldridge Speaks On Aeronautics In Peace and War

Philadelphia, Pa., January 30th.—Dr. Thomas Edwin Eldridge, President of the Philadelphia Aeronautic Recreation Society, and prominent member of the United States Aeronautic Reserve, spoke before the Franklin Institute on Ballooning and Aviation in Peace, War, and Commerce, on January 30th.

The lecturer presented a brief history of Ballooning and Aviation, after which he described various types of aircraft from the earliest glider to the heavy armored battleplane, and took up development of aerostatics from the days of the early free balloon to the high-powered dirigibles of today.

Dr. Elderdige's talk was illustrated by excellent slides and punctuated by interesting reminiscences of his own experience.

Book Review

Model Making, Including Workshop, Practice, Design & Construction of Models. For Amateur and Professional Mechanics, by Raymond F. Yates.

This book does NOT describe the construction of toys. Its pages are devoted to model engineering and the mechanical sciences associated with it. It contains descriptions with illustrations of the complete models made by some of the leading model engineers in this country. It is the only book published on this important subject.

The first part of the book is devoted to the mechanical sciences and processes related to model engineering and mechanics in general. To the inexperienced workman, who wishes to make models but is untrained in the fundamental mechanics, this book will afford all the information necessary. For the experienced mechanics, there are many hints and shortcuts that will be found helpful.

Few model builders are familiar with pattern making; a portion of the book is therefore devoted to explanation of fundamental principles. There is a practical discussion on the utilization of abrasives in the home shop. In a like manner, all phases of construction for the model builder are thoroughly covered, and no model builder will fail to gain some labor-saving ideas from a perusal of the volume. The book is full of suggestions for those who like to make things, amateur and professional alike. It has been prepared especially for men with mechanical hobbies. Some may be engineers, machinists, jewellers, patterns makers, office clerks or bank presidents. It tells them "how-to-do" and "how-to-make" things in simple, understandable terms. It is full of good, clear working drawings and photographs of the models and apparatus described. Each model has been constructed and actually works if it is made according to directions.

Chapters: I, The Model Engineers' Workshop; II, Lathes and Lathe Work; III, Drills and Drilling; IV, Soft and Hard Soldering; V, Hardening and Tempering Steel; VI, The Use of Abrasives; VII, Pattern Making; VIII, Electroplating; IX, A Model Slide Crank Steam Engine; X, A Model Slide Crank Steam Engine; XI, A Single Cylinder Engine; XII, A Model Twin-cylinder Marine Engine; XIII, Flash Steam Plants; XIV, A Flash Steam Plant for Large Model Aeroplanes; XV, A Flash Steam Plant for Small Model Aeroplanes; XVI, A Model Steam Turbine; XVII, Design and Construction of Model Boilers; XVIII, Model Boiler Fittings; XIX, A Record Breaking Model Hydroaeroplane; XX, A Model Lake Freighter; XXI, A Sharpie-Type Model Boat; XXII, A Model Submarine Chaser; XXIII, A Model Submarine with Radio Control; XXIV, A Model Crane; XXV, An Electric Double Drum Hoist; XXVI, A Model Gasoline Engine; XXVII, A Model Electric Locomotive; XXVIII, A Model Steam Locomotive; XXIX, A Model Gyroscope Railroad; XXX, A Model Caterpillar Tank; XXXI, A Model Siege Gun.

This book can be purchased at The Aeronautic Library, Inc., 299 Madison Ave., N. Y. C., at the price of $3.25 postpaid.

Gen. Kenly Talks to Aviator in Plane from Washington Office

Communication between an aeroplane in the air and a regular telephone on the Washington city line was established recently at the office of Major General William L. Kenly, Director of Military Aeronautics. Although regular radio telephonic conversation frequently has been held with planes in the air at flying fields, this is the first demonstration of the combination of the radio-phone and regular land telephone.

General Kenly, Colonel F. R. Kenney and Colonel C. C. Culver were present in the office of the Director of Military Aeronautics and talked with Lieutenant Lucas, who was piloting a plane from Bolling Field. The two links in the line were the radio-telephone from the plane to the small station at Bolling Field, and the city telephone system from Bolling Field to General Kenly's office. The conversation of radio to direct wire was made automatically at the Bolling Field station with apparatus devised by members of the Air Service Radio Branch under the direction of Colonel Culver.

With the audibility of the modern trans-continental system, Colonel Culver believes that there is no limit to the distance over which a man in a plane in the air can speak with land telephones.



An Italian Observation Balloon with two smaller balloons for carrying cables

FOREIGN NEWS

Chili Establishes Air Service

Valparaiso.—The first consignment of aircraft, a purchase from the British Government, has reached Valparaiso. The entire contract calls for 14 seaplanes and 50 aeroplanes. Major Huston of the Royal Air Force will be instructor for the new force, and Lieutenant Solano will be in charge of Technical Engineering.

Farman "Goliath" Bomber Refitted for Commerce

Paris.—The Farman "Goliath" bomber ready for trial the day the armistice was signed, equipped with two Salmson Motors giving 540 H.P. and a speed of 90 M.P.H., has been refitted for commercial use. Heating apparatus is provided, and there is accommodation for thirty passengers. It is probable that it will be used in London-Paris service.

German Air Routes in Operation

London.—A dispatch from Copenhagen states that aerial mail and passenger routes are in daily operation between all the large cities of Germany. A fare of 2½ marks per mile is charged. The machines fly at a speed of 80 miles an hour, and the journey from Berlin to Munich, Cologne or Konigsberg takes 4½ hours. The Schutte-Lanz Company is constructing a new type of aeroplane to carry 40 passengers.

Air Service for Prince Edward Island

At a meeting of business men at Charlottetown, it was resolved to organize an aerial transport service between Prince Edward Island and the mainland for handling mail and express matter.

The initial route is to be via Moncton, Summerside, Charlottetown, Georgetown, Pictou, New Glasgow and Halifax.

Zeppelin Contemplating Transatlantic Service

From information transmitted from Switzerland through Paris, it is learned that the Zeppelin Company is considering the establishment of a dirigible service from Hamburg to New York. The ships are to provide for 80 passengers and luggage and fly at 56 M.P.H., thus accomplishing the journey in 85 hours.

Major-General Sykes, Chief of Air Staff, Gives Out Air Service Figures

London—In an address before the London Chamber of Commerce, General F. H. Sykes alluded to the greatly increased safety of flying, and to support his statement said that despite the strenuous conditions of military flying and training, only one fatal accident occurred in every 1,170 hours of flying. The total flying done since January, 1916, amounts to more than 1,000,000 hours or 114 years. A short distance high speed passenger service was inaugurated during the war for the transportation of staff and diplomatic officers, consisting of two flights of De Haviland 4's. During the four months of July, August, September and October of this year 227 trips were made, 8,085 miles crossed and 1,843 passengers transported. Of the 123 days of the period, cross channel flying was possible 71 days or approximately 60 per cent. One pilot in this service had made no less than 287 cross channel flights.



A Voisin pusher, used for photography and bombing in 1916

German Order Reveals Effectiveness of Voice Conrtolled Aircraft

Following the announcement of the Director of Military Aeronautics that the War Department had developed successful radio telephones for aircraft, permitting the direction of combat squadrons by the commander of the flight as perfectly and quickly as a squad of men, it was learned that so great an advantage had this proven in combats with German squadrons that an order was issued to shoot down a plane equipped with radiophones at any cost.

Holt Thomas Organization Strengthening

Mr. Holt Thomas is gathering into his organizations the best brains of the aeronautic world. Mr. Thomas has controlling interest in Aircraft Travel and Transport, Ltd., Aircraft Manufacturing Company, Ltd., Airship, Ltd., and the British Gnome and Le Rhone Engine Company.

Major-General Sir W. S. Brancker has recently become identified with the Thomas interests. Mr. Thomas' department heads include Lieutenant-Colonel M. O'Gorman, technical consultant; Captain Goefrey de Haviland, chief designer, who designed the DH4 and DH9 machines; Mr. Alfred Turner, financial director, late Director of Aeronautical Contracts, War Office; and Mr. Hugh Burroughes, general manager, late of the Royal Aircraft Factory.

Winston Churchill Made British Air Secretary

London, England.—Winston Churchill has been appointed to both the portfolio of Secretary of State for War and for Air.

Major-General J. E. B. Seely has been appointed Under-Secretary for the Air and presides over the Air Ministry.

Germans Slow in Surrendering Aircraft

The Germans have been delaying the turning over the requisite number of aircraft and motors in accordance with the armistice terms. They are 600 aeroplanes and 4,736 engines short of what should have been delivered within a month of the signing of the armistice.

Prince of Wales Flies Over Rhine in American Plane

During his visit at Coblenz, while visiting an American aerodrome there, the Prince of Wales flew over the Rhine with Colonel Mitchell, in command of the camp.

Chaplain-in-Chief, Royal Air Force

Rev. H. D. L. Viener, formerly chaplain in the Royal Navy, organized the Chaplain's Department in the Royal Air Force. He has been gazetted Chaplain-in-Chief for the R.A.F.

War Production in England

As an example of the tremendous output of the British industry for war purposes, a British trade publication announces that Messrs. Armstrong, Whitworth & Company, in addition to constructing 1,075 aeroplanes and three airships, used their spare time in turning out 13,000 guns, 12,000 gun mountings, 14,500,000 shells, 18,000,000 fuses, 21,000,000 cartridge cases, 47 warships, 22 merchant ships and fitted with armament 583 war vessels.

Allied Air Victories Summarized

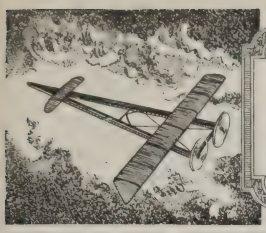
According to figures recently compiled, 227 Allied Aces obtained 2,895 victories, while the Central Powers had 101 aces with an aggregate score of 1,629 victories; France being second with 77 Aces and 847 victories; Italy third with 14 Aces and 193 victories; United States, 14 and 121; Belgium, 8 and 77; Russia, 3 and 28.

Mexican Air Service Aids in Suppression of Revolts

Mexico City. — General Candido Aguilar, Chief of Military Operations in the Gulf Regions, is using aeroplanes in his operations against the rebels in the Vera Cruz district. Not only have the aviators done valuable reconnaissance work, but have engaged in bombing expeditions against parties of bandits who have considered themselves safely hidden in recesses of the Orizaba Mountains.

Restrictions On Hydrogen Removed

London.—The Hydrogen Order of 1918, which stipulated that the manufacture, sale and supply of compressed hydrogen in the United Kingdom should be controlled by the Deputy-Controller for Armament Production of the Admiralty and requiring returns to be made, had been cancelled.



ELEMENTARY AERONAUTICS and MODEL NOTES

By John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Model Aeroplane Building as a Step to Aeronautical Engineering

THE next step would be to assemble the machine for its tryout. Before doing this each part must be examined and tested. Brace wires looked after, controls must be free and easy working, engine must be fastened securely to its bed and every wire and turnbuckle in the body must be tight and rigid because many forces act on a machine in the air and it is well to remember that an aeroplane like everything else is only as strong as its weakest point.

After looking these important things over we can assemble the machine.

The engine is set in place in the body as the first step and connected up to the ignition and gas controls, etc., the radiator is then bolted on. The landing chassis is next put in place and fastened, after which the propeller is bolted to the propeller hub. The engine covering can then be fastened with small screws, and the false work or turtle deck put in place.

The tail works and rudder must now be carefully set up and fastened to the body. Be sure that they line up properly. This can be judged fairly accurate by standing in front and facing the machine to see that the tail is horizontally correct and fastened securely to the control arms.

The wings are now attached. The center section first and then the outer sections.

When attaching the wings, fasten the lower sections in place first and place some kind of a support at the outer end so the plane will be on a line with the lower part of the body where it butts into, then fasten the top plane in place and put two outer struts in between them, after which the other struts can be inserted, and the same for the other side.

When this operation is finished the wings should be trued up. You will remember that the wings have a dihedral of 3 degrees, which means that the outer end of the wing must be about 2½" higher than the inside, where it fastens to the body.

When all brace wires are drawn up tight and you are sure nothing has been forgotten connect up the ailerons and see that they work properly.

The machine is assembled and we can see if our theoretical balance was correct by placing a couple of wooden horses or other supports on each side of the body and placing a beam on these supports at a point on the body where we thought our balance should be. Of course a person must be sitting in the pilot's seat or the machine won't balance properly.

If when this test is made the machine shows to be heavier on the nose you need not worry as a little nose heaviness will not matter much, but if on the other hand it is heavier on the tail, then it means a hard job to control the machine as it will be sluggish when trying to get the tail up.

Perhaps a few words can be said in regard to flying the "bus." I need not suggest that an experienced pilot should try it out first because everyone knows that a new machine is cranky and unless the pilot has had a good deal of flying experience trouble might be encountered.

If it is impossible to get an experienced pilot to test the machine, the builder should practice very carefully by taxying the machine over the ground very slowly with engine throttled low, so that there will be no danger of the machine lifting clear of the ground. In this way the very peculiar foot bar rudder control can be mastered. When this has been done a half dozen times the engine should be speeded up a little more and short hops a trifle off the ground should be made by pulling the control stick back gently a short distance and then letting it go back to normal again. In a very short time you will find that you are getting confident and that you can do lots of things, and before you realize you will be making long hops and a little later low flights. Don't rush this part of the flying course, as it is best to go slow, getting wise to every feel of the machine when the control stick or rudder bar is moved. A person learning to fly is much like an infant learning to walk, and the same patience that it takes to assist and teach a child to walk must be exercised with the budding air pilot. Remember that practice makes perfect and many times a smash up helps us to generate more nerve than if nothing like that occurred.



Perspective sketch of the Ford Motored Aeroplane of which the series of articles describing its construction is concluded in this issue



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Byng!

Byng! Byng! Byng!!!
With your smashin'
Of the 'Un upon the wing—
And your chargin' and your shootin'
And your dashin' and your scootin',
And your yellin' and your hootin'—
That's the thing.

When you start to advancin',
With a punch in left and right,
We all feel safe in chancin'
All we've got upon your fight.

Biff! Bang!! Byng!!!
Your orders always have
The proper ring.
And we tell you, on the level,
All the 'Uns think you're a devil,
When you get into a shindy,
You're a greater man than Hindy,
Mister Byng.

Manoeuvers at Mineola

Up the wind, coasting, you come,
Straight, with the sweep of a gull;
On, on, with your heart athrob,
And wide wings, grayly dull.

Turning, a dragon-fly skims,
Flashing her silvery tail;
Circling. . . .then with a dip,
Lost where the soft clouds trail.

MARGARET L. SEAMAN.



From Ellington Field Tale Spins

"The Reason Why"

One hundred German aeroplanes flying in the sky,
Along comes a Yank ace, and now they're one shy.
Nine and ninety battle planes still hovering on high,
But a bullet from an "Anti" keeps one from getting by.
The ninety-eight were scudding along above the rye,
When one fell a victim to a rookie's lucky try.
Now seven and ninety Taubes are getting mighty "nigh,"
But an Allied squadron hits them and twenty-seven die.
Seventy Huns are winging to the rear on the fly,
Pursued by the victors with their lusty battle cry.
Popping machine guns pick off the slower fry,
Until upon the ground full forty of them lie.
The thirty planes remaining think they're pretty sly,
Until a squadron bombed them and that spelled good-bye.
If for this mighty victory you seek a reason why,
Just ask in Portland, Oregon, for that spruce-producing guy.

—*The Peavey.*

Air Knights

The horrors of war as seen from the air
Are few, 'tis well worth the thrill
For the battles are clean, and the fighting is fair,
Death is dealt or prevented by skill.

The hum of the motor, sing of the wires,
Furnish music of highest art,
And the rattling beat as the machine gun fires
Is dear to the bird man's heart.

Like knights of old enclothed in steel,
But mounted on winged steeds
They fight, and dive or soar and reek
To accomplish valorous deeds.

When the days of peace come to the earth,
And the knights of the air return,
The country will see their truest worth,
In making the fires of industry burn.

G. M. Hickok.

Oh You Aviation Vocabulary!

Mechanic (reading magazine): What does this here "Danse du derriere" mean?

Crew Chief: Why, you simp, that's French for "tail-spin"!

He Wants a Penguin

One of the older ground officers remarked the other day: "There's no earthly use in my learning to fly a plane!"—*Rockville Field News.*

Those who are closing their military careers as lieutenants may take heart from this remark of a distinguished clergyman to the writer of these lines in response to his statement that he was "only a lieutenant." The minister said: "Lieutenant, why that is the most honorable rank in the army. You and I have heard every boat pilot and wharf lounger called 'captain' and every village store loafer 'major' or 'colonel,' and sometimes even 'general,' but we never heard anyone but a real soldier called 'lieutenant.'"

Little Mary Calls Him Up at Taliaferro Field

Operator: Taliaferro Field.

Little Mary: I want to speak to Sergeant S———; he's a hangar man, he hangs around the hangar."

—*Taliaferro News.*

NEW ENDURANCE RECORD

Established by Union Airplane Motor at U. S. Aeronautical Testing Laboratory, Navy Yard, Washington, D. C.

Best previous record exceeded by fifty per cent.

UNION GAS ENGINE CO.

Established 1885

OAKLAND, CALIFORNIA



MARTIN BOMBER

The Bomber Performance
Demonstrates Military Supremacy

The Martin Plane is First to Fulfill
Commercial Requirements

Our Freighter and 12-Passenger
Airplane soon to be announced

THE GLENN L. MARTIN COMPANY
CLEVELAND

Contractors to the United States Government

(*Continued from page* 1123)

from which would follow:

$$Wx = \frac{M'x}{2\ \delta o\ [ho + \alpha x]} + \frac{M''x}{2\ \delta o\ [\lambda o + \beta x]}$$

If we fix δo from the quality of the wood employed, and the factor of safety sought, the values α, β, λo, ho will also be determined so that the required section of the material will be obtained.

In order to find this section it is necessary to determine to what extent the plywood covering helps to resist the stresses.

Tests which have been made have shown that the section Wx may be considered as made up of the longeron m, n, r, s and of a portion A, B, C — A, D, E of the covering working in conjunction with the longeron itself and utilizing DE and BC may be considered equal to $20.S$, where S is the thickness of the plywood. (Fig. 3.)

$\therefore$ Wx may be obtained from the formula

$$Wx = [h \times l] + 2 \times 20.\overline{S}^{2}$$

In calculating the shearing stresses it is best to plot them. This evidently will depend on the distribution of the strains along the fuselage. Having once determined from such diagrams the value of the reaction T, and the sectional area on which this acts; it may be considered that one-half of this reaction will be taken care of by the plywood acting in tension and the other half by the diagonal bracing at the sides which stiffens the structure.

Therefore the stress on the plywood will be

$$\delta = \frac{\frac{T}{2}}{h\ [2 \times S]}$$

For the stress in the diagonals, it will be easy to find the value along the diagonal in compression which we will call T_1 (this value being for both diagonals).

The minimum moment of inertia will be (Fig. 4)

$$Ixo = Ix - \frac{\overline{S}^{2}}{A}$$

where S is static moment of the section with respect to XX, and A the area of section of the diagonal as well as that of the plywood acting with it.

The diagonals may be considered as being completely fixed at both ends. Therefore it will be easy to determine the stress at the proposed section.

The more detailed and exact is the analysis of the stresses made, the more advantageously will the material be utilized resulting in a great saving of weight.

The plywood fuselage which has already found complete use in the small and medium sized machines has encountered some difficulty in the large machines and this because of the large resulting weight. However, it may be foreseen that in the very near future, these difficulties will be eliminated.

Recently tests have been conducted on fuselages made of wood, in which the longitudinal longerons running the full length of the fuselage have been eliminated as well as the stiffening ribs.

Such a fuselage would be made by moulding on mould representing the fuselage very thin sheets of wood with fibre running perpendicular to one another, and then removing the shell from the mould when completed.

These tests have already given good results and it seems as though they will lead to a practical result which would bring a great advantage in weight.



Member of Manufacturers' Aircraft Association, Inc.

Storm Does Not Halt the STANDARD Mail Plane!

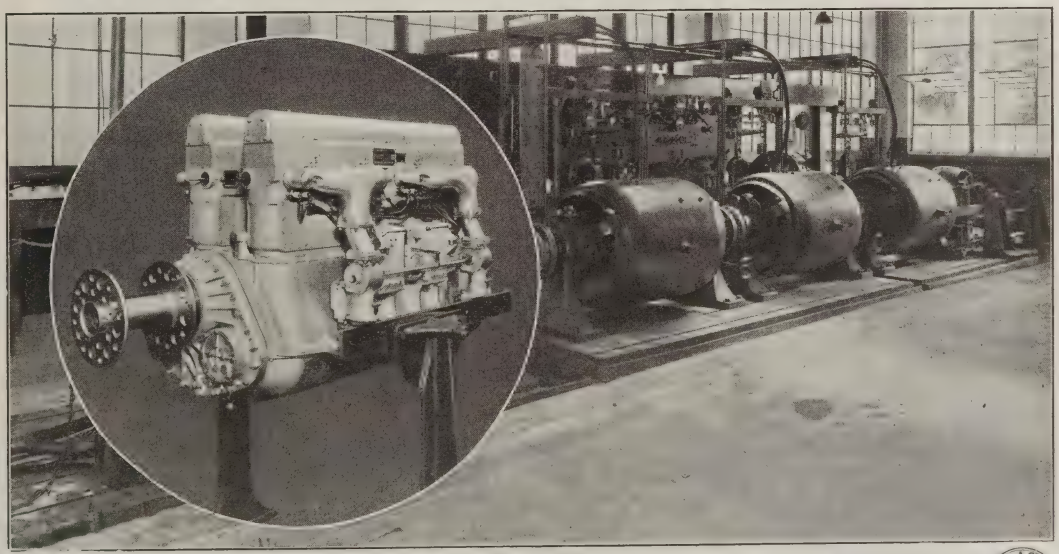
That the postal planes built by "STANDARD" have carried the air mail uninterruptedly through all kinds of weather is another demonstration of "STANDARD" superiority.

STANDARD AIRCRAFT CORPORATION

ELIZABETH NEW JERSEY

The Laboratory of the Duesenberg Motor Corporation, who developed and built the **BUGATTI ENGINE** in America is equipped with the

SPRAGUE ELECTRIC DYNAMOMETER



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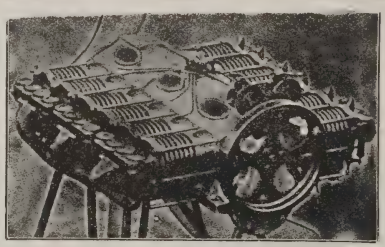
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(*Continued from page* 1121)

provide better contacts, and to prevent corrosion. Other contact parts are of hard brass silver or nickel plated. All of the springs employed are of phosphor-bronz. The electrical connections between the instrument base, and its cover are by means of substantial screws which act not only as binding posts, but as attachment members holding the cover in place. These are all protected by castelled nuts and cotter pins. Dielectric parts consist of bakelite castings. Owing to the extended development and tests involved, the instrument did not get into quantity production until December 1918.

It is claimed for the interrupter that it offers an insurance against those supplemental injuries to the machine which are sure to follow from propeller breaking in flight. These injuries range from concealed strains to a fatal crash. Forgetting for the moment the loss of life, however important, and viewing the subject from the point of the monetary loss only, with planes costing from $5,000 to $50,000 apiece with equipment, the comparative cost of this insurance is trifling.

While by no means the most frequent cause of fatal accidents, the danger of fire in the air, or after a crash, is without doubt the most feared by pilots and passengers alike, as it is the most difficult danger to guard against, and any instrument tending to lessen this hazard is of decided value and will accomplish much toward increasing confidence in the safety of aerial navigation, which must mean better morale among pilots, observers, gunners, etc., and for the ordinary passenger a greater feeling of safety and security.

The success of the commercial aeroplane will depend in a large measure upon engineering skill to minimize danger and upon the ability of aerial passenger companies to convince the public that a trip in the air is free from any extraordinary risk.

Cited for Bravery

First Lieut. Russell L. Maughan, Aviation Section, 139th Aero Squadron. For extraordinary heroism in action near Sommerance, France, October 27, 1918. Accompanied by two other planes, Lieut. Maughan was patrolling our lines when he saw slightly below him an enemy plane (Fokker type). When he started an attack upon it he was attacked from behind by four more of the enemy. By several well-directed shots he sent one of his opponents to the earth, and, although the forces of the enemy were again increased by seven planes, he so skillfully maneuvered that he was able to escape toward his lines. While returning he attacked and brought down an enemy plane which was diving on our trenches. Home address, Peter W. Maughan, father, Logan, Utah.

First Lieut. William J. Hoover, Aviation Section, 27th Aero Squadron. For extraordinary heroism in action near Verdilly, France, July 2, 1918. On the morning of July 2 his flight patrol encountered the famous Richthofen circus. Lieut. Hoover was simultaneously attacked by three of the enemy and cut off from his comrades. By skillfully maneuvering he avoided the effects of their concentrated fire and fearlessly attacked the three. Although his machine was seriously damaged, he killed one of the enemy pilots and destroyed his plane, drove down another, apparently out of control, and chased the third far into his own lines. He then continued his patrol until shortage of gasoline forced him to return. Home address, Mrs. William J. Hoover, Hartsville, S. C.

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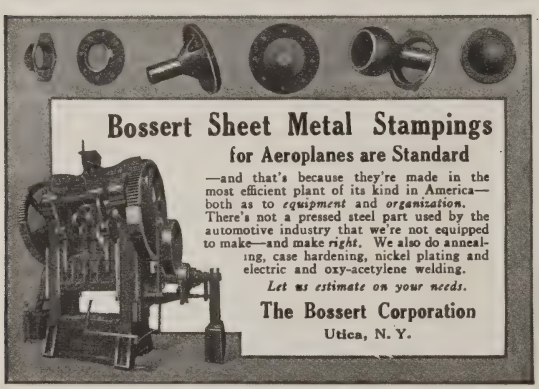
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AERIAL AGE WEEKLY

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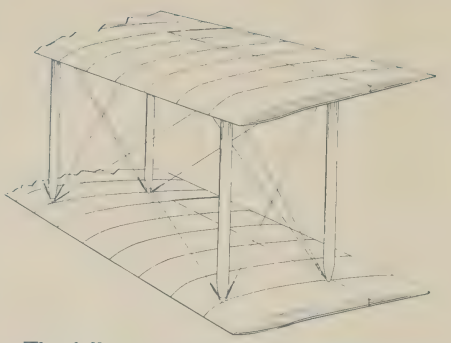
The Aeroplane De Luxe, a reconstructed De Haviland 4, used to transport Premier Lloyd George and Minister Bonar Law to and from London and the Peace Conference

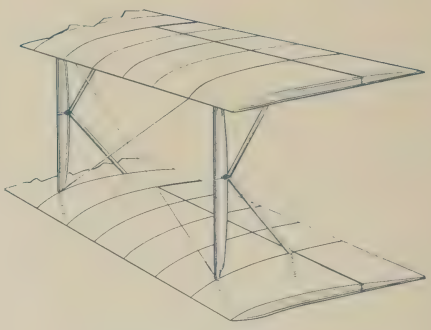
Aero Club of America Banquet Starts Movement to Develop American Aeronautics on Permanent Basis

LISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER B UILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
iption: Domestic $4, Foreign $6 Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879

EVERY FIRST CLASS AEROPLANE REQUIRES A RETRACTABLE CHASSIS

COMPARISON OF RESISTANCE AND WEIGHT OF K-BAR AND DOUBLE LIFT TRUSS SYSTEMS





The following is an exact Comparison of Resistance and Weight:

At a speed of 100 M.P.H.,
Wing loading of 9#/sq. ft.,
Safety factor of 8,
Aspect ratio of 6,
Gap/chord ratio of K-Bar Truss...1.143
Gap/chord ratio of Double Lift Truss...1.000

Resistance of K-Bar Truss is $\frac{97.2}{185.0}$ = 52.5% of resistance of Double Lift Truss.

Weight of K-Bar Truss is $\frac{106.45}{146.57}$ = 72.7% weight of Double Lift Truss.

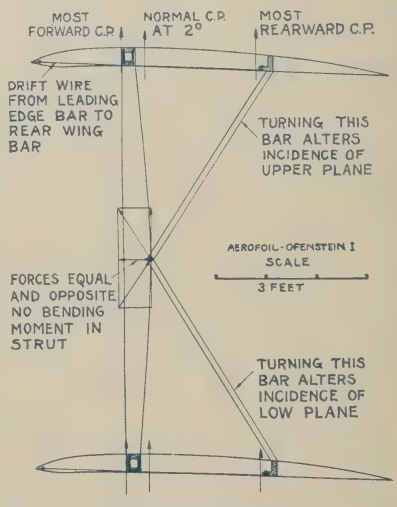
The K-bar Truss reduces interference by eliminating interplane struts and wires and also by affording increased Gap cord ratio. Normal C. R. always near central wing bar, only light forces at most rearward C. P.

RESISTANCE AND WEIGHT OF K-BAR TRUSS SYSTEM

Member	Size"	Length"	Area Sq. Ft.	Kx	No.	Rx#	Wt.#
Inner Panel Lift Wire	1/2	141	.49	.0026	2	25.4	19.1
Inner Panel Landing Wire	1/8	141	.306	.0026	2	15.9	9.55
Outer Panel Lift Wire	1/8	154	.334	.0026	2	17.3	10.4
Outer Panel Landing Wire	1/8	154	.2	.0026	2	10.4	3.9
Inner Strut	2.64	96	1.76	.0004	2	14.1	31.0
Outer Strut	1.98	96	1.32	.0004	2	10.5	17.5
Inner Upper K-Bar	7/8	56	.34	.0004	2	2.7	1.7
Inner Lower K-Bar	1 1/2	56	.583	.0004	2	4.7	5.2
Outer Upper K-Bar	5/8	56	.243	.0004	2	1.9	1.7
Outer Lower K-Bar	1 3/8	56	.535	.0004	2	4.3	6.4
						97.2	106.45

RESISTANCE AND WEIGHT OF DOUBLE LIFT TRUSS SYSTEM

Member	Size"	Length"	Area Sq. Ft.	Kx	No.	Rx#	Wt.#
Rear Inner Panel Lift Wire	1/2	131	.455	.0026	2	23.6	17.7
Rear Inner Panel Landing Wire	1/8	131	.284		2	14.8	8.8
Rear Outer Panel Lift Wire	1/8	147	.318		2	16.5	9.9
Rear Outer Panel Landing Wire	1/8	147	.191		2	9.9	3.72
Front Inner Panel Lift Wire	1/2	131	.398		2	20.7	13.7
Front Inner Panel Landing Wire	1/4	131	.228		2	11.8	6.5
Front Outer Panel Lift Wire	1/4	147	.256		2	13.3	7.3
Front Outer Panel Landing Wire	1/8	147	.128		2	6.6	2.4
Inner Panel Inner Wire	1/4	95	.166		4	17.3	9.1
Outer Panel Inner Wire	3/8	95	.124		4	12.9	1.8
Rear Inner Strut	2.42	84	1.41	.0004	2	11.3	22.8
Rear Outer Strut	1.74	84	1.01	.0004	2	8.1	11.8
Front Inner Strut	2.29	84	1.33	.0004	2	10.6	20.5
Front Outer Strut	1.64	84	.96	.0004	2	7.6	10.5
						185.0	146.57



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AERIAL AGE WEEKLY

VOL. VIII FEBRUARY 24, 1919 No. 24

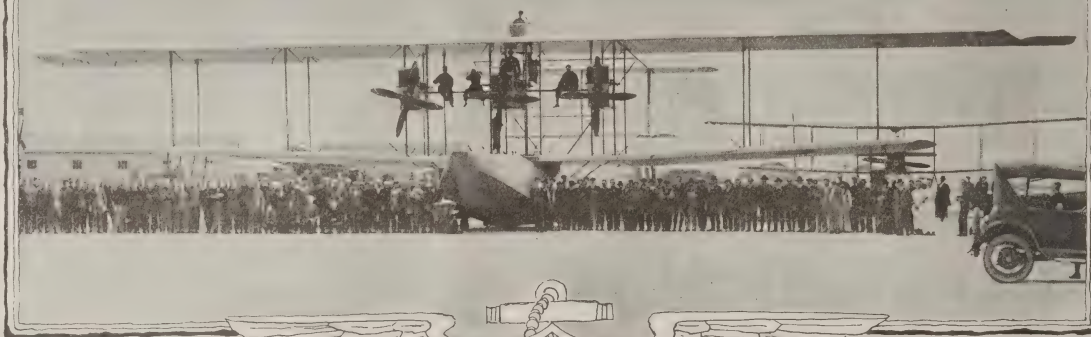
TABLE OF CONTENTS

PAGE

Aero Club of America Banquet Starts Movement to Develop American Aeronautics on Permanent Basis 1155
The News of the Week..... 1158
The Aircraft Trade Review 1160
U. S. Aerial Mail 1161
The Sunstedt-Hannevig Seaplane.. 1162
The Aeromarine Type L 6-cylinder Aero Motor..... 1164
Cited for Distinguished Service... 1165
Military Aerostatics 1166
Importance of High Thermal Efficiency in Aeroplane Engine Design and Construction 1168
Admiral Mayo's Airship Report...1170
Aeroplane and Seaplane Engineering 1171
Naval and Military Aeronautics.. 1174
Foreign News 1176
Elementary Aeronautics and Model Notes 1177
Aeronitis 1178

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

Subscription: Domestic, $4; Foreign, $6
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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, *at the Post Office at New York, N. Y., under the Act of March* 3, 1879

Copyright, THE AERIAL AGE CO., February 24, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, FEBRUARY 24, 1919 NO. 24

AERO CLUB OF AMERICA BANQUET STARTS MOVEMENT TO DEVELOP AMERICAN AERONAUTICS ON PERMANENT BASIS

A SUBSTANTIAL movement to start the development of American civilian aeronautics on an extensive scale, and prevent the United States from again falling behind other nations aeronautically was launched at the Thirteenth Annual Banquet of the Aero Club of America held last night at the Waldorf-Astoria, Wednesday, February 19.

One thousand people attended the banquet, including many prominent Army, Navy, Marine Corps and Allied aeronautic authorities and aces.

Sitting on the diaz were: Major-General Charles T. Menoher, Director of the United States Army Air Service; Colonel James A. Mars, Director of Aircraft Production, U. S. Army; Captain Lahauille, the French Ace, and one of the highest French authorities in military aeronautics, who was sent especially by the French Government to represent French aeronautics at the banquet; Rear-Admiral Bradley A. Fiske, U. S. Navy; Major General William L. Kenly, Director of Military Aeronautics, U. S. Army; Brigadier-General J. D. Cormac, Chief of the British Aviation Mission to the United States; Colonel A. L. Fuller, Chief of Balloon Section, U. S. Army; Colonel Milton F. Davis, Division of Military Aeronautics; Captain Carlo Tappi, Italian Ace, veteran of the Turkish-Italian War of 1911, and also the Great War, who was one of the first six aviators in the world to be employed in aerial warfare; Mr. Henry Fairfield Osborn, President of the American Museum of Natural History; Mr. F. H. Russell, President of the Manufacturers' Aircraft Association; Captain Robert A. Bartlett, the famous arctic explorer, who accompanied Admiral Peary to the North Pole; Mr. John Greenough, President of the American Geographical Society; Lieut. Colonel E. Lester Jones, Director of the U. S. Coast and Geodetic Survey; Brigadier-General Theodore C. Lyster, the head of the Medical Air Service, which supervised the examination of over 80,000 candidates for the Air Service, and classified them according to their physical fitness for flying; Hon. Francis M. Hugo, Secretary of the State of New York; Mr. John Hays Hammond, Jr., authority on Polar aerial radio surveying; Mr. Otto Praeger, Second Assistant Postmaster General; Mr. Rodman Wanamaker, Commissioner of Aviation Section, New York City Police; Mr. Alan R. Hawley, President of the Aero Club of America; Mr. Henry A. Wise Wood, Vice-President of the Aero Club of America; Mr. Henry Woodhouse, member of Board of Governors, Aero Club of America; Mr. Marcel Knecht, French High Commissioner; General Emilio Guglielmotti, Military Attache of the Royal Italian Embassy; Major Fiorello H. La Guardia, Member of Congress; Lieutenant De Carlo of the Italian Military Mission for Aeronautics; General Guy Livingstone, of the British Aviation Mission.

The banquet was the occasion for starting a number of movements and for the making of a number of announcements of great importance to American aeronautics.

W. K. Vanderbilt Gives $10,000 to the Bartlett Expedition

Some of the most important announcements were as follows:

(1) Mr. Alan R. Hawley, President of the Aero Club of America, announced that Mr. William K. Vanderbilt has given $10,000, and Mr. Charles H. Sabin has given $5,000 to start the $250,000 fund for the Roosevelt Aerial Arctic Expedition, which is to be commanded by Robert A. Bartlett, the famous explorer.

Hammond's Revolutionary Aero Radio Surveying

(2) Mr. John Hays Hammond, Jr., the noted inventor and radio expert, announced the completion of a plan whereby the work of making maps of the arctic regions, which the Roosevelt Expedition is to explore from the air, will be greatly simplified by use of radio devices. Two of these devices, which are very simple, will operate from the base, and by radio contact with the aeroplanes which will be flying over the unexplored regions will trace the movements of the planes on paper, so that when the aviators return to the base with their own sketches, they will find the tracings showing every movement they made. In other words, if the aviators follow the direction of an ice floe, or circle over a spot, which may look like land, the radio devices at the base will trace on paper the course which they followed, so that the aviators on returning can check their own sketches and get exact tracings of contours, etc., of the region which they have been exploring. At the same time, the people at the base, by following the tracings of these devices will know exactly where the aeroplanes are exploring.

This new conception of Mr. Hammond was pronounced as being revolutionary and greatly simplifying the work of exploration from the air, by the explorers present, including Captain Robert A. Bartlett; Mr. John Greenough, the Presi-

dent of the American Geographic Society, and Mr. Henry Fairfield Osborn, the President of the American Museum of Natural History.

Peary's Arousing Message

(3) The following arousing message was received from Rear-Admiral Robert E. Peary, the famous discoverer of the North Pole, and leader of the aerial preparedness movement, who could not attend the banquet owing to his illness:

"The United States is looking to the Aero Club of America to start a movement to develop aerial transportation and the employment of aircraft for general purposes, so as to prevent the United States from again falling behind other nations in this progressive line of human endeavor, which means so much to the future of the United States.

"Through the energetic and patriotic efforts of the Aero Club of America in arranging for the training of aviators at private expense in 1915-1916, there were 300 trained aviators ready for the U. S. Army and Navy when the United States entered into the war. The Club is to be congratulated for having continued the progressive work with the same foresight, in starting the movement to develop aerial transportation and the employment of aircraft for scientific and general purposes. The plan to send Captain Bartlett to explore the arctic regions from the air is an epoch-making event in the history of science and revolutionizes exploration, and the Club is to be commended for its very valuable contribution to science.

"Permit me to urge that you bring the attention of the country to the fact that today aeronautics offers even greater possibilities than the railroad field did to the Vanderbilts, Harriman, Hill, and other great railroad builders. The world is ready for aerial transportation and the men whose foresight leads them to put their efforts in establishing air lines will find aeronautics to offer greater possibilities than were offered by any other line of human endeavors.

"(Signed) Peary."

National Balloon Races

(4) Announcement was made that the arrangements have been completed for holding the national balloon races at St. Louis this year. The arrangements have been completed by Major A. B. Lambert of St. Louis, member of the Board of Governors of the Aero Club of America.

The International Races

(5) Mr. Alan R. Hawley read a cablegram from the Royal Aero Club of Great Britain, announcing that two entries have been received for the Trans-Atlantic flight, in competition for the $50,000 prize offered by Lord Northcliff for the first trans-Atlantic flight made within seventy-two hours from start to finish. The cable also states that the Royal Aero Club hopes to be able to arrange for the International Marine Flying contest for the $5,000 trophy and $5,000 prize, offered by Mr. Jacques Schneider, the French sportsman. If this arrangement can be made the Aero Club of America will arrange to enter a number of contestants to compete for this trophy.

(6) International conditions permitting, there will be held also international aviation and balloon races, one in France and one in the United States.

Pershing's Cable

(7) A cablegram was read from General Pershing, reading as follows:

"On the occasion of the Thirteenth Annual Banquet of the Aero Club, am glad to send the greetings of the Expeditionary Forces in France to the aviators of America. Four years of war have developed flying to a point beyond belief. American airmen have grasped their opportunity, have mastered the art and mechanics of flying, and have advanced still further the tactics of aviation our Allies taught us. We all take pride in their spirit of devotion, their gallantry, and their deeds of heroism. The Aero Club has an opportunity to bring peace time aviation to a dream of usefulness to the world which will in part compensate for the expenditure of blood and treasure during the war. "(Signed) PERSHING."

(8) The following cablegram from Paris, signed by Ambassador Sharp, Mr. Robert A. Bliss, Mr. Sidney B. Veit, Mr. John Weare, Dr. A. L. Hipwell, Mr. William S. Hogan, Mr. Louis D. Beaumont and Major Edmund L. Gros, and Mr. R. B. Price, was read:

"Ambassador Sharp, Bliss, Veit, Weare, Hipwell, Hogan, Price and Major Gros send hearty greetings to Aero Club and contgratulate men in active service for excellent achievement during war. Express deep sympathy and admiration for those whose self-sacrifice made victory possible. Urge continued efforts to sustain interest in future possibilities of aeronautics by actively participating in congress and in perfecting apparatus for aerial traffic.

"The first Trans-Atlantic flights should be America's credit.

"Please announce sailing March eighth French Government Aeronautical Mission of fifteen officers, Captain Lavergene, Chief, including Aces, Madon, Romanet; Marinouites, bringing latest models aeroplanes for competitive flights. Extensive exhibition, paintings, sculpture, films. Mission will visit all large cities by squadron flights and expect your patronage with active co-operation in regulating itinerary and arrangements for art exhibitions and lectures."

(9) General Menoher spoke hopefully of the United States maintaining a substantial air force and General Kenly expressed his appreciation of the splendid work performed during the past by the officers and enlisted men of the Division of Military Aeronautics. General Kenly's message reads as follows:

"To the Officers and Enlisted Men of the Air Service: It seems fitting at this time to express my appreciation of the splendid work performed for the past year or more of war activities, by the officers and enlisted men of the Division of Military Aeronautics. Many of you are now returning to civil pursuits with the regret that you were not among the more fortunate ones who experienced actual service overseas. To you who have labored night and day, undertaking hazardous duties in all weather, that the training of our fighting air men might continue without interruption, I express my sincere thanks for your steadfast devotion to a duty which so suddenly became apparent would involve little hope of commensurate reward. The interminable grind of performing the same hazardous duties over and over again in order that others less experienced might be fitted for the work in hand, and then to have your former students sent to the front while you "carry on"" requires a quality of pluck and steadfast determination which the fortunate few who have never experienced such heartrending disappointment can never understand.

"To those who serve overseas and return to this country with the satisfactory feeling of difficult duty well done, I offer my sincere congratulations for your worthy accomplishments.

"For those who met an untimely end in our service, I am sure we all hope that they may receive the reward they so justly merit for the extreme sacrifice.

"(Signed) W. L. KENLY,
"Major-General, U. S. A.,
"Director of Military Aeronautics."

Mackay Trophy Awarded to Rickenbacker

(10) The Clarence H. Mackay Trophy, offered through the Aero Club of America for Annual Army Competition, was awarded to Captain E. V. Rickenbacker, the Ace of American Aces. The award was made by a board appointed by General Kenly, consisting of: Colonel Townsend F. Dodd, Lieut. Colonel Byron Q. Jones; Lieut. Colonel Herbert A. Dargue and Lieut. Sidny T. Thomas. Captain Rickenbacker

could not be present at the banquet to receive the award, being prevented by military duties.

The Club's Medal of Valor and Diploma

(11) Announcement was made of the award of the Aero Club of America's Medal of Valor, together with the artistic steel engraved diploma, to the following Allied Aces and officers of the Allied Air Services:

United States

Major Raoul Lufberry, Corporal L. Norman Barclay, Corporal Julian C. Biddle, Corporal A. C. Campbell, Jr.; Corporal O. M. Chadwick; Lieut. V. K. Chapman, Sergeant Edmund C. Genet, Sergeant Ronald Hoskier, Sergeant James R. McConnell, Sergeant Douglas McMonagle, Lieut. Norman Prince, Sub-Lieut. Kiffin Yates Rockwell, Corporal Stuart Walcott, Lt. Col. William Thaw, Ensign A. D. Sturtevant, Ensign C. S. Read, Lieut. Douglas Campbell, Lieut. Frank Luke, Capt. Edward V. Rickenbacker, Capt. Frederick Libby, Lieut. Paul Pavelka, Lieut. Wm. Erwin, Lieut. Paul F. Baer, Lieut. Donald Hudson, Lieut. L. Holden, Lieut. James Knowles, Jr., Lieut. John McArthur, Lieut. Ralph O'Niell, Lieut. K. L. Porter, Lieut. Summer Sewell, Lieut. Wilbur T. White, Lieut. Harvey Cooks, Lieut. Edward Curtis, Lieut. James R. Healy, Lieut. M. Francis Simmonds, Lieut. Joseph Jehaner, Capt. Jas. Norman Hall, Capt. Harold B. Buckley, Capt. Reed M. Chambers, Major James A. Meissner, Capt. Hamilton Coolidge, Capt. C. J. Vasconcelle, Major Harold E. Hartney, Sergeant Frank L. Bayliss, Lieut. David E. Putnam, Major David McKay Peters, Lieut. L. W. Taylor, Lieut. L. C. Rehronbach, Lieut. Warren Higgs, Lieut. T. A. Rooney, Lieut. L. C. Bowers, Lieut. J. H. McDevitt, Lieut. C. J. Ross.

France

Capt. George Guynemer, Sub-Lieut. Rene Dorme, Adjt. Maxime Lenoir, Lieut. Jean Chaput, Lieut. Charles Nungesser, Lieut. Roland G. Carros, Capt. Rene Fonck, Capt. Alfred Herteaux, Lieut. Georges Felix Madon, Capt. Albert Leon Deullin, Capt. Armand Pineard, Sub-Lieut. Guerin, Sub-Lieut. Maurice Boyau, Sub-Lieut. Omer Demouldre, Lieut. Forest, Lieut. Marchal, Lieut. Coiffard.

Great Britain

Capt. Albert Ball, Capt. P. F. Fullard, Major William A. Bishop, Capt. James B. McCudden, Major Edward Mannock.

Italy

Major Francesco Barracca, Lieut. Olivari, Col. Jules Piccio, Lieut. Fulvio Barrachini, Major Gabriele d'Annunzio.

Belgium

Lieut. Thieffry, Lieut. Willy Coppens.

(12) Brigadier General Theodore C. Lyster, the head of the Medical Air Service, which supervised the examination of over 80,000 candidates for the Air Service and classified them according to their physical fitness for flying, spoke of the importance of the Aero Club of America continuing this supervision over civilian aviators. The work of the Medical Service was praised highly by the officers of the Aero Club of America.

(13) Major-General Leonard Wood, wrote from Camp Funston, Kansas, as follows:

"I earnestly hope that the Aero Club of America will push forward the work on aeronautics and put it on a sound basis in this country. We must never again be caught unprepared in the air."

(14) Mr. Hawley read a letter from Major John Henly, recommending the award of the Aero Club of America's Medal of Merit to army officers for notable achievements, as follows:

"The Director of Military Aeronautics."

"Aero Club of America, 297 Madison Avenue, New York, N. Y."

"Aero Club of America Medals of Merit."

1. A board of officers consisting of: Col. Townsend F. Dodd, M.A., A. S. A.; Lieut. Col. Herbert Q. Dargue, M.A., A. S. A.; Lieut. Col. Byron Q. Jones, M.A., A. S. A.; 1st Lieut. Sidney T. Thomas, A. S. A., has recommended that the Aero Club of America Medals of Merit be awarded to the following named officers for notable achievements in aeronautics:

Major Norman Boots, A. S. A.—Non-stop flight with passenger from Mt. Clemens, Mich., to Yonkers, N. Y., November 7, 1918.

Lieuts. Clifford Nutt and Ray Grantz, A. S. A.—Houston to Denver, Col. First aeroplane into Colorado under its own power. October 1, 1918.

Lieut. J. E. Davis, A. S. A.—Ellington Field, Texas, to Mt. Clemens, Mich., and return. Flying time 62 hours. October, 1918.

Major Albert D. Smith.—Transcontinental Flight, San Diego to Washington.

Mr. Caleb Bragg.—Dayton to Bolling Field, D. C., 430 miles.

Captain F. M. Bartlett, A. S. A.—Scott Field, Ill., to Kelly Field, Tex., 1,700 miles.

Major H. L. Armstrong, British Army, and Lt. Cyrus F. Smythe, pilot.—Flew over burning munitions plant at Morgan, N. J., directing fight against flames. Oct. 4, 1918.

Lieuts. C. M. Cone, Wm. B. Bancker, Jr., and Z. P. Lee, A. S. A.—Ellington Field, Tex., to Washington, D. C., 30 hours' flying time. October, 1918.

Lieuts. Grafton Wiggins and Charles M. Potter, A. S. A.—Aerial mapping and geographic work.

Lieut. Cyril Smith, A. S. A.—Aerial mapping of Ft. Sill.

Capt. Michael McKinney, A. S. A.—Aerial mapping of Washington, D. C.

Colonel C. C. Culver—Radio Telephone Research.

Lieuts. Paul R. Blair and Wm. T. Gobrecht, A. S. A.—Altitude 19,200 ft. Nov. 19, 1918.

Lieuts. W. H. Helmrich and A. W. Graham.—Altitude 18,000 ft. Nov. 6, 1918.

(*Signed*) W. L. Kenly,
Major General, U. S. Army.

Further award of Medals of Merit to officers of the Navy, Marine Corps, and others, was postponed pending the completion of the list of achievements for which the awards are to be made.

It is understood that a large number of the Club's Medals of Merit are to be awarded in the near future, and that when the announcements are made there will also be made announcements of marvelous technical and scientific achievements for which the Club's Medals are awarded.

Medals of Merit were also awarded to the following:

Commander P. N. L. Bellinger, for his flight of 667.92 miles without landing, in nine hours and one minute, carrying five passengers and 542 pounds additional weight, at Norfolk, Va., December 31, 1918.

Katherine Stinson, to commemorate her flight from Chicago to Binghamton, on May 23, 1918, when she established new duration and distance records of 10 hours 10 minutes, and 601,763 miles.

Capt. R. W. Schroeder, for having broken both the world and American altitude record, pilot alone. Sept. 18, 1918, attaining a height of 28,900 feet.

Major Bernard L. Smith, M. C., for making the first long-distance flight with the first twin-motored dirigible, "D-17," from Akron, Ohio, to New York, on the 22nd of October, 1918.

Lieut. R. A. D. Preston, U. S. N., R. F., for making the first long-distance flight with the first twin-motored dirigible, "D-17," from Akron, Ohio, to New York, on the 22nd of October, 1918.

Leading artists contributed greatly to make the event an inspiring one. Mr. Leon Rothier, the famous and celebrated tenor of the Metropolitan Opera Company, sang "La Marseillaise" in a most inspiring manner, and the Fort Slocum Post Band, in conjunction with Orlando's Orchestra, played appropriate pieces during the evening. The singing was led by Mr. Frederick Hall, who also played the large organ and a choir, led by Mr. John M. Fulton, sang selections during the evening. One of the greatest of hits was made by the inspiring aviation song, "Knights of the Air," written by the well-known playwright and composer, Lieutenant Earl Carroll, the "Composer of the Air." The invocation, at the beginning of the banquet, was delivered by the Rev. Doctor Percy Stickney Grant, of the Church of the Ascension.



THE NEWS OF THE WEEK



Captured Enemy Aircraft to be Exhibited at Aero Show

New York, N. Y.—It was announced that the War Department will exhibit several German aeroplanes, trophies of the war, at the Aeronautical Exposition at Madison Square Garden and the 69th Regiment Armory. There will be a late type of Fokker D-7, the combat craft of the enemy. Another machine is reported to be the German Rumpler. This is a reconnaissance type of machine, propelled by a 260 horsepower motor.

The Handley-Page bomber, the Spad and the S. E. 5 will be the English models shown; France will be represented by a Nieuporte and Breguet and Italy by a Caproni and an S. V. A.

In addition to displaying the accomplishments of aeronautical and automotive engineers during the last two years, the War Department's exhibit will show how the Air Service trained its aviators for foreign service. From March 1 to March 15—the period of the exposition—principles of training, equipment and instruments used, motion pictures of actual work, and the various machines which figured in the educational course of the pilot will be demonstrated.

The famous "whirling chair" will form part of this phase of the Army exhibit. It is used to test the prospective aviators' sense of balance and by its examining officers are able to determine if the applicant would be able to determine his position relative to the centre of gravity while flying through clouds. The chair will be at the disposal of all visitors who may care to use it.

Beginning with the medical tests and ending with the combat planes used on the other side, the exhibits will cover almost every phase of the pilot's instruction and work. Models of the war zone used in elementary ground schools will be operated by officers of the army to demonstrate to visitors just how these devices entered into the necessary curriculum; clothing and instruments used by aviators after they began actual flying will be shown, and ordnance—machine guns and bombs—will be demonstrated on the ships which have carried them in the war game.

Training ships, pursuit planes, reconnaissance machine and the big bombers will be included in the government's exhibits, and there will be types of English, French, Italian and German planes to compare with the American-made products.

The Division of Military Aeronautics will exhibit a Cacquot balloon, designed by Major Armand Cacquot of the French air service, and the accepted standard observation balloon. The Cacquot is distinguished by stabilizing finds and rudder at the stern, which are so designed as to keep the craft nosed into the wind.

"The Langley," the first American built Handley Page aeroplane is to be exhibited at the show. This plane is now near Washington, D. C., and will be flown to Long Island and brought to the 69th Regiment Armory by means of motor trucks.

The Navy Department will also exhibit a device whereby night landings are made safe for night commercial air traffic. Since any extensive use of aircraft for commercial purposes will involve a good deal of night landing, this device his important application in this field.

It has always been a problem in night landing to determine the exact time at which the aviator should "flatten out" to make an easy landing.

The Naval night altitude indicator consists of four spot lights whose rays are projected downward from the fuselage at such an angle that when an altitude of fifty feet is reached the two right and two left beams meet, forming a single spot on the ground. As the plane drops to a still lower altitude the beams again diverge, thus indicating the approximate distance from the ground. With a little practice the aviator is enabled to make very accurate landings with the assistance of this device.

The Navy Department will include a complete display of oxygen breather devices for high altitude flying. The Navy has developed a method of storing oxygen at high pressure in steel bottles from which the oxygen may safely be led into the aviator's mask without danger when the air pressure drops.

Aerial Passenger Line from New York to Atlantic City Being Organized

New York, N. Y.—Joseph M. Kahn, Vice-President and Treasurer of the Aero Transport Company recently stated that regular hydroaeroplane passenger and light freight service between New York and Atlantic City would be inaugurated on February 22. The round trip fare, according to Mr. Kahn, proprietor of the Aero Development Company, which company has recently acquired control of the Aero Transport Co., will be $50.

French Aviators Sail for Siberia

San Francisco.—Accompanying their own aeroplanes, aeroplane and food supplies, 100 French aviators and mechanics departed from San Francisco for Siberia recently. They were members of a party of 500 French aviators and troops which came here more than two months ago while on their way to the Siberian front. Three hundred departed Jan. 5.

The 200 remaining will return to France.

Australians Recommend Aeronautic Courses At Universities

Sydney.—The Sydney *Sun* advocates that aerial engineering, including practical flights, should be included in the curricula of universities, and urges the early return of Australian aviators from the various battle-fronts on which they have been operating in order to expedite commercial aeronautic progress in Australia.

Flies 200 Miles Standing On Wing

Hampton Roads, Va.—Ensign A. W. Gorton, aviator in the Hampton Roads Navy Aerial Mail Service, has won official recognition for his great courage in successfully holding open the throttle of a damaged mail seaplane through a 200-mile flight. At times it was necessary to grip the radiator to maintain his perilous position, and on one occasion the radiator cap came off, with the result that Ensign Gorton was scorched in the face. Nevertheless, for two hours and thirty minutes, until the completion of the 200-mile flight, Ensign Gorton "carried on."

Henry Woodhouse Lectures before American Geographical Society

That an American business man has offered to pay $50,000 for the privilege of being carried as mechanic in the first trans-Atlantic flight, was announced by Mr. Henry Woodhouse, Member of the Board of Governors of the Aero Club of America, during an address which he delivered before the American Geographical Society on February 11.

"This progressive business man," said Mr. Woodhouse, "happens to be experienced in gas engines and is anxious to have the privilege of attending to the motors of the first trans-Atlantic flyer. He has not authorized making his name public."

Mr. Woodhouse's subject was "The Trail of the Aeroplane." He reviewed the development of aircraft from, since the experiments made by the Romans and Chinese before Christ, and every important development in aeronautics, up to date.

He told of flights of allied aviators across the Great Atlas Range of Mountains of Northern



The Aero Club of America gave a banquet in honor of Captain Eddie Rickenbacker, the American Ace, who recently returned from France. Sitting, from left to right, are Major Gilles, Capt. Rickenbacker, Henry Woodhouse, Member Board of Governors of the Aero Club; Augustus Post, Secretary of the Aero Club. Some of the others prominent in the group are Jacques Boyriven, the French Ace; Lieut. P. Micelli, Lieut. Elsaser, Ensign A. W. Smith, Lieut. C. Weinstein, Rear Admiral Bradley A. Fiske, Lieut. M. Gilbert Whitman, Major H. Bubb, G. Douglas Wardrop, S. Cullinan, Col. T. Jefferson Thompson, and Evan J. David

Africa and across the Sahara Desert, across the Alps, the Macedonian and Asiatic Mountains, and the Andes.

"Caproni triplanes carrying sixteen passengers fly regularly over the Appenines," said Mr. Woodhouse, "an air line having been established to Florence.

"The flight of 28,900 feet of Major R. W. Schroeder, U.S.A., and of Captain Lang and Lieutenant Blower, British Royal Air Force, to 30,500 feet, have shown that man can fly over the highest mountains and that air lines across the Himalaya range are within the possibilities of the coming year. They may be established to establish faster inter-communication between the British forces on the Caspian Sea and Calcutta, Bombay and other important points in British India.

"Any aeroplane that could not fly higher than Pike's Peak did no service in the war zone."

Mr. Woodhouse spoke enthusiastically of the plans of Captain Bartlett's Arctic Expedition, which is to employ aeroplanes for exploration of the unknown Arctic regions.

He also stated that Great Britain has developed large dirigibles and that dirigibles capable of carrying 100 tons of useful load and of traveling 10,000 miles without stopping are being planned.

The lecture was illustrated with special films, showing the British passenger and aerial mail lines in operation.

Major T. W. Wrenn to Stay in Regular Army

Washington, D. C.—Major T. W. Wrenn, now on duty in Washington, has been ordered to report to Camp Meade to a board appointed to determine his fitness for a permanent appointment in the Regular Army.

Major Wrenn has for a considerable time been examining recruits in the Air Service at Washington. Major Wrenn's home is in New York.

Joy Rides In Army Aeroplanes By Civilians Not Permitted

The Director of Military Aeronautics has announced that civilians will not be permitted to make flights or take joy rides in Army aeroplanes without authority from the Secretary of War. Paragraph 1586 Army Regulations provides that:

"Flights in Air Service equipment for other than training or war purposes will be made only upon the express authority of the Chief of Air Service, and no person in the military service is authorized to permit other than the following to be carried as passengers in such equipment: Heads of executive and judicial branches of the Government, members of the Senate and House of Representatives, officers and enlisted men in the Army, Navy, and Marine Corps, and members and employees of the Air Service."

Gen. Kenly directs that no exceptions will be made to the above regulation by the Division of Military Aeronautics. Civilians who desire to take trips must first get authority from the Secretary of War before presenting themselves to the commanding officers of flying fields or the Division of Military Aeronautics with requests for flights. Applications for flights will not be forwarded to the Secretary of War through the Division of Military Aeronautics.

A. Leo Stevens Under Fire

Washington, D. C.—Captain Treat, Captain Fuller, Captain Saunders and Major A. Leo Stevens started on what was expected to be a most peaceful balloon flight recently, only to find themselves, after several hours, in the midst of a barrage of high explosive shells.

The party left Washington on February 12th, at 10 A. M., drifting in a northeasterly direction, passing Baltimore at 1:30 P. M. Later the balloon reached the Aberdeen Proving Grounds, where the large shells for the Army are tested. Suddenly heavy firing was heard and shells began to burst on all sides of the basket, causing it to be tossed from side to side as in a heavy barrage.

Orders were immediately given for increased altitude. Ballast was dropped overboard and the balloon rose to 5,000 feet, heading toward the Atlantic. A successful landing was made at Camp Columbia, 18 miles from Atlantic City.

General Menoher Receives Decorations

General Menoher recently received through the State Department, two medals from the French Government. One of them conferred the rank of Commander of the Legion of Honor, and the other was a Croix de Guerre with palm. The citations to accompany these medals have not yet been received.

Heads of A. E. F. Air Service Organizations

About the time of the signing of the Armistice, the American Air Service overseas was commanded by Major General Mason M. Patrick, Chief of Air Service, A. E. F., Headquarters, Tours. He had two chief assistants: Brig. Gen. William Mitchell, Assistant Chief of the Air Service, Army Group, or Zone of Advance, and Brig. Gen. Benjamin D. Foulois, M. A., Asst. Chief of the Air Service, Service of Supply.

On November 6th, the chief of the Air Service, First Army, was Col. Frank P. Lahm, J. M. A.; the Chief of the Air Service Second Army was Col. Thomas DeW. Milling, M. A.; when the Third Army Air Service was organized Brig. Gen. Mitchell took command and on January 8th, 1919, was stationed in Coblenz, Germany.

Col. Milling was chief A. S. 1st Army at Orquevaux, on January 8th, 1919, and Col. Lahm was chief of the A. S. 2d Army, at Toul.

Col. Charles deF. Chandler, J. M., Aeronaut was head of the American Balloon Service, A. E. F.

In Italy the Headquarters of the American Air Service was at Rome, where Major Robert Glendenning was in command.

In England the Headquarters Air Service, Base Section No. 3, was under the command of Col. C. R. Day.

Paris Headquarters were under the command of Lt. Col. H. Dunwoody.

Col. Aubrey Lippincott commanded the Air Service Repalcement Barracks at St. Maixent, where the complete organization and equipment of the squadrons was carried out, except the planes which were flown to the advance stations by the pilots from Orly, the Aviation Acceptance Park, commanded by Col. T. A. Baldwin.

Lt. Col. Hiram Bingham was in command of the 3d Army Instruction Center, at Issoudun, the largest flying school in the world, having 14 fields.

Col. W. G. Kilmer, J. M. A., was chief of Training, Hdqs. Tours, Lt. Col. E. V. Sumner was in charge of Air Service Production Center, No. 2 at Romorantin.

Col. Whitehead was chief of staff for the Air Service at G. H. Q. November 11, 1918.

Liberty Motor Test Flight Is Completed

Houston, Tex.—The Liberty motor test flight from Ellington Field to Detroit and return was completed recently when the aeroplane handled by Capt. L. J. Robinson and Lieut. A. A. Adams landed at the home field.

Capt. Robinson estimated the distance covered at between 4000 and 5000 miles and gave the flying time as 1650 minutes. The average speed was 110 miles an hour for the entire distance and the maximum 125 miles.

The trip was devoid of engine trouble.

The flyers left Ellington Field December 21.

Baker Makes Ruling As to Enlisted Men

Washington.—Secretary Baker recently submitted to the house a bill providing that enlisted men of the regular army who were discharged to accept commissions in the army during the war, shall be given the retired pay and allotments of master signal electricians when mustered out of the service. Secretary Baker said all of the enlisted men who were commissioned had performed valuable service and that the proposed reward was no more than a just recognition of their services.

War Department Warns Against Unauthorized Insignia

Washington, D. C.—Under the direction of the Secretary of War, circular instructions have been issued to post exchanges at military posts forbidding the sale of unauthorized insignia, such as service ribbons and gold and silver stars. Efforts are being made to induce stores located near cantonments and military posts to refrain from selling such insignia.

Colonel Thaw's Squadron Has Great Record

Lieut. Col. William Thaw assumed command of the Third Pursuit Group on August 1, 1918. Within a month this unit consisted of four flying squadrons and one park squadron, including what remained of the Lafayette Escadrille. The first active service of importance for this unit was in connection with the St. Mihiel drive. During the month of September and October alone these squadrons engaged in 165 combats and were officially credited with downing 52 planes. The figures for October show 99 combats with 40 victories. Of course there were many additional unrecorded victories, as well as the regular reconnaissance activities and bombing work of the Third Pursuit Group.

Divisional Insignia Worn By Casuals Returning Home

The Division of Military Aeronautics issues the following:

By order of the Secretary of War, officers and enlisted men returning from France as casuals for the purpose of discharge, will be permitted to wear insignia indicating the tactical division, Army corps, or Army with which they served overseas. This applies not only to those who are to be immediately discharged, but also to those retained in hospitals, pending discharge.



The first photograph to be published in America of the famous De Haviland 10, which is to be used in the London to Paris passenger service, to be established this Spring. The machine is equipped with two Rolls Royce motors, and has a maximum speed of 128 miles per hour

The AIRCRAFT TRADE REVIEW

Bartlett Hayward Co. Buys Hammered Piston Ring Co.

The Bartlett Hayward Company, of Baltimore, has purchased through the Fidelity Securities Company, of that city, the entire capital stock of the Hammered Piston Ring Company of America, whose plant is located on South 11th Street, Newark, N. J.

The Bartlett Hayward Company is a Baltimore concern, which manufactured munitions on a large scale and at the present time has almost unlimited capacity for the manufacturing of American Hammered Piston Rings.

They contemplate keeping the Newark plant in operation, but will take on the overflow from Newark; and all increases of business will be handled in one of their plants in Baltimore.

The active management of the business will remain in charge of Mr. C. F. Hockley, Vice-President and General Manager, who will make headquarters in Newark.

Navy May Use N C-1 for Trans-Atlantic Flight

Washington, D. C.—Commander John T. Towers, one of the foremost naval aviators in the service, has been ordered to duty "in charge of the development of plans and the assembly of material and personnel for the trans-Atlantic flight."

Plans for accomplishing this feat were fairly well under way last summer, but the necessity for conserving all material for purely military purposes did not permit the release of the necessary material for this purpose. It was proposed to start from Halifax, Nova Scotia, and it is assumed that this year's plans call for the same port of embarkation.

It is considered likely that the N C-1 will be used for this purpose. This boat recently carried fifty-one passengers, and its capacity for weight carrying makes it possible to load it with sufficient fuel, lubricants and supplies for the long flight. The ship is propelled by three Liberty motors and has sleeping compartments for three men. The crew consists of two or three pilots, three mechanics and a radio operator.

Smithsonian Institute to Hold Permanent Aircraft Progress Exhibit

Washington, D. C.—Charles D. Walcott, Secretary of the Smithsonian Institute, has requested an appropriation of $14,000 for heating equipment and repair on a metal building to the rear of the Institute, which was originally erected to house an exhibit of foreign aircraft for the benefit of the Signal Corps.

The exhibit will soon be opened to the public. It includes the latest type of aircraft motors and accessories developed during the war. The Bureau of Aircraft Production has been cooperating with the Smithsonian Institute in an endeavor to collect a comprehensive and complete exhibit.

United States Liquidation Commission Appointed

The Secretary of War has appointed a commission to liquidate America's indebtedness to the Allies for material, supplies, munitions, etc., and to dispose of movable and immovable property used by our forces in France and England.

Claims against Allied powers arising out of contracts made in the United States with the War Department will be settled and all types of foreign indebtedness liquidated. Mr. Chester W. Cuthell was recently designated by the Secretary of War for these duties. Hon. Edwin B. Parker of Houston, Texas, Hon. Henry F. Hollis of New Hampshire, Homer H. Johnson of Cleveland and Brigadier-General Chas. G. Dawes of Chicago are members of the commission.

Captain Sunsted's Boat Damaged in Launching

Newark, N. J.—The launching of Captain Sunsted's huge seaplane, on February 11, designed for the transatlantic flight, was marked by a slight accident, resulting in the damage of one end of the lower plane. Delay in getting a motor launch to tow the seaplane into the open waters of Newark Bay from its resting place on a huge float, caused Captain Sunsted to attempt to get off under his own power. The plane moved off the float successfully but upon hitting the water, the unequal speed of the motors, aided by the inshore wind caused her to turn diagonally toward shore. The motors were shut off, but not in time to prevent crashing into the end of a dock which extended one hundred feet into the bay. The repair of the damage will be accomplished without much difficulty and trials will be resumed within a few days.

It was stated that in the projected transatlantic flight, that Lieutenant Paul Micelli, an Army aviator, who received his first training in the French air service, will accompany Captain Sunsted as relief pilot. W. Harding and F. Baatz are reported as having been selected as mechanics.

Alfred Bartsch is Bosch Sales-Manager

Springfield, Mass.—Mr. Alfred H. Bartsch has been appointed General Sales and Advertising Manager of the New American Bosch Magneto Company.

Prior to America's entry in the War, Mr. Bartsch had been for more than seven years advertising manager of the Bosch Magneto Company, and for the past two years has represented a number of prominent firms in the automotive field as advertising and sales counsel.

Bureau of Standards on Solder for Aluminum

The Bureau of Standards Circular No. 78 discusses the use, serviceability, method of application, and composition of soldiers for aluminum. The information contained in the circular is the result of an investigation of commercial and other compositions of solder. It was found that soldered joints were subject to corrosion and are not recommended unless some form of protection is provided.

Naval Appropriation Bill Under Consideration

Washington, D. C.—The Naval Appropriation Bill H. R. 15539, reported in the House on February 1st carries appropriations totalling $745,000,000. Prior to the signing of the armistice, Secretary Daniels asked for $2,600,000,000, but, since that time reduced this figure to $975,000,000.

The present permanent authorized strength of the Navy calls for 350 men in the Naval Flying Corps. The Act of July 1, 1918, authorizes a temporary increase to 10,000 men. The bill now under consideration is not yet specific regarding increase in the permanent personnel authorized. Secretary Daniels does not recommend a permanent increase from the present authorization of 140,000 men for the entire Navy but a temporary increase to June 30, 1920, for 225,000.

The Bureau of Navigation recommends a temporary increase calling for a personnel of 350,000. The strength of the Navy on November 11, 1918, was 497,030 men and women. Whether the air personnel is to be reduced to the same proportion as the entire Naval Personnel is not known.

The appropriation for aviation last year was $220,383,119. The original recommendation for this year was $225,000,000. After the armistice officers in charge of aviation reduced this figure to $85,649,300. Secretary Daniels cut this figure to $36,000,000 and the committee, although feeling that aviation is a very important branch of the service, further reduced the recommendation to $25,000,000. The House further reduced this sum to $15,000,000, and added the proviso that none of this sum be expended for construction work on the naval aircraft factory.

Material Ordered According to New Army Program

Washington, D. C.—The Bureau of Purchase, Storage and Traffic is letting contracts for supplies needed in connection with the reduced Army program.

The Poole Engine and Machine Company has received a $145,000 contract for 37 mm. semi-automatic aeroplane cannon.

The A. O. Smith Corporation of Milwaukee has a contract for drop bombs.

The Holt Manufacturing Company is making caterpillar trailers for 4.7 inch anti-aircraft guns.

The Grant Motor Car Company is working on an anti-aircraft trailer contract amounting to more than $50,000.

The Remington Typewriter Company has a small contract for bomb release mechanism.

The Globe Metal & Stamping Company has a $7,500 contract for adapters for Browning machine guns to anti-aircraft service.

The Marlin-Rockwell Corporation of New Haven, Conn., has a $10,000 contract for hammer spring compressors for Marlin Aeroplane Machine guns.

Repair part orders ranging from small amounts to $9,000 have been received by the following companies: Standard Aero Corporation of Elizabeth, N. J., Wright-Martin Aircraft Company of New Brunswick, N. J., Ford Motor Company of Detroit, Mich., Ohio Rubber Company of Cleveland, and the Goodyear Tire & Rubber Company of Akron, Ohio.



The Aeromarine Model 40-T Flying Boat equipped with a 100 H.P. Curtiss OX engine

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service

PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

St. Louis Establishes Aero Landing Place

St. Louis, Mo.—If plans already under way are carried out, St. Louis will have an aerial landing place, intended not only for mail and government planes but for sportsmen aviators. $25,000 is being made available for grading the field.

"Aviators flying from Detroit or Chicago or Kansas City," said Mayor Kiel of St. Louis, "knowing that St. Louis has a fully equipped landing field, will come here. St. Louis will become a sort of transcontinental aeroplane terminus."

Plan for Aerial Service from Australia to London

Consul Henry P. Starrett, at Adelaide, Australia, reports:

Prominent business men of Sydney, Melbourne, and Adelaide, under the leadership of Mr. Reginald Lloyd of London have formed a company with £10,000 ($48,665) paid up capital for the purpose of developing an aerial route for mail and passenger service between Australia and London.

The purpose of the company is to explore the proposed route for landing sites which are to be approximately 300 miles apart. The route is to be from Sydney or Melbourne direct to Port Darwin in the northern territory of Australia, from which point there will be a 300-mile sea trip across to the island of Timor in the Dutch East Indies, thence from island to island through Java and Sumatra to Singapore and Calcutta, across India to Karachi, thence to Bagdad and Port Said, from which latter point the choice of several developed aerial routes to London are available.

Next month Mr. Lloyd will lead a surveying party from Australia through the Dutch East Indies, the Malay States, India, and Mesopotamia for the purpose of locating landing sites and to arrange for their lease or purchase. The organization of the present company is merely to provide for the expenses of this routing party. After the completion of this survey it is proposed to finance a company in London to operate the aerial service to Austrial which contemplates a complete journey in 150 hours between London and Sydney.

Le Pere Planes at Bolling Field

Washington.—Two of the latest type American-made scout planes, the Le Pere, have arrived at Bolling Field for test flights. These are the first two planes of this particular model made in the United States and were designed for use of American aviators at the front.

The aeroplanes are camouflaged green, blue and white, and have 12-cylinder Liberty engines. The planes, it was stated, weigh approximately 3500 lbs., with a wing spread of 24 ft. They can climb 22,000 ft. and attain a speed rate of 135 m. p. h.

Personal Pars

Captain H. E. Westmoreland, who has been adjutant of the Air Service Replacement Concentration Barracks No. 3 at St. Maxient, France, for the past eighteen months, is back in the United States. He was for a number of years Southwestern manager for the McQuay-Norris Mfg. Company, St. Louis, with headquarters in Dallas. His future plans are not yet determined.

Elmer Sperry, inventer of the gyroscope, will address the March meeting of the Detroit Section Society of Automotive Engineers.

Flying Circus at Rockwell Field

San Diego, Cal.—Rockwell Field staged a most pretentious "flying circuit" for the amusement of the San Diego populace. The events on the program not only included all manner of extended formation flights, aerial combats, hair-raising stunts, and aeroplane races, but such features as the bombing and destruction of a large model "German Castle," various vaudeville acts presented by individual units of the command and band concerts by eight military bands.

The day's program began at noon and ended at midnight. Several aviators just returned from overseas participated in the events of the day. The camp was thrown open to visitors and a huge success was scored.

UNITED STATES POST OFFICE AIR MAIL SERVICE

Monthly Report of Operation and Maintenance

DECEMBER 1918

Aeroplane No.	Gasoline	Grease and Oil	Office Force	Motorcycles, Trucks	Rent, Light, Fuel, Power, Telephone and Water	Miscellaneous	Pilots	Mechanics and Helpers	Repairs and Accessories	Interest on Investment	Departmental Overhead Charge	TOTAL	SERVICE AND UNIT COST: Gallon of Gasoline	Total Time Run	Total Miles Run	Miles Run per Gallon of Gasoline	Cost per Hour	Cost per Mile
														hr. min.				
1	$38.64	$12.24	$40.21	$63.04	$33.50	$119.76	$ 94.89	$110.46	$2.226.14*	$70.10	$85.31	$2,894.29	122	11 04	839	6.87	$261.53	$3,4496
2	129.98	22.24	40.21	63.04	33.50	119.76	202.65	134.40	249.76	70.11	85.31	1,150.96	413	23 38	1706	4.13	48.69	.6746
3	3.00	.....	5.56	63.04	33.50	119.76	.....	.73	.....	70.11	85.31	381.01	10	.....	.....	.....	.....	.....
4	41.73	6.05	40.21	63.04	33.50	119.76	114.18	92.21	7.70	70.11	85.31	673.80	133	13 19	872	6.55	50.60	.7727
5	46.05	11.41	13.89	63.04	33.50	119.76	73.59	67.32	3.40	70.11	85.31	587.38	150	8 35	223	1.48	68.43	2.6339
38262	131.88	26.15	40.21	63.04	33.50	119.76	224.92	169.11	217.18	70.11	85.31	1,181.17	416	26 14	1874	4.50	45.02	.6302
38274	41.96	7.56	40.21	63.04	33.50	119.76	70.45	102.99	157.66	70.11	85.31	792.55	133	8 13	558	4.19	96.46	1.4203
38275	40.35	5.64	40.20	63.04	33.50	119.76	21.44	88.88	14.50	70.11	85.31	582.73	128	2 30	266	2.07	233.09	2.1907
38278	34.06	7.33	13.88	63.04	33.51	119.76	28.15	127.10	24.02	70.11	85.31	606.27	111	3 17	238	2.14	184.65	2.5473
39362	55.82	15.52	40.21	63.04	33.51	119.77	23.15	153.89	10.00	70.11	85.31	670.33	177	2 42	253	1.42	248.27	2.6495
39363	119.19	17.17	40.20	63.04	33.51	119.77	93.31	131.48	9.00	70.11	85.31	782.09	374	10 53	804	2.14	71.86	.9727
39365	12.30	5.50	26.32	63.04	33.51	119.77	8.57	47.02	5.00	70.11	85.31	476.45	35	1 00	90	2.57	476.45	5.2938
39366	60.67	11.37	40.20	63.05	33.51	119.77	85.88	90.28	1.00	70.11	85.31	661.15	187	10 01	654	3.49	66.00	1.0109
39367	10.50	.54	5.56	63.05	35.51	119.77	.....	22.36	.....	70.11	85.31	410.71	35	.....	.....	.....	.....	.....
14872	129.93	20.43	40.21	63.05	33.51	119.77	91.51	133.56	15.15	70.11	85.31	802.54	412	10 39	962	2.33	75.35	.8342
24213	54.59	11.13	40.20	63.05	33.51	119.77	67.31	85.85	16.20	70.11	85.31	647.03	174	7 51	476	2.73	82.42	1.3593
Total....	$950.65	$180.28	$507.48	$1,008.68	$536.08	$1,916.23	$1,200.00	$1,557.64	$2,956.71	$1,121.75	$1,364.96	$13,300.46	3010	139 56	9815	3.26	$95.05	$1.3551

Cost per mile, overhead, $.4624; cost per mile, flying, $.2374; cost per mile, maintenance, $.6551.

*Repairs and accessories plane No. 1 include overhauling of damaged motor.

Note—Cost per mile, maintenance, on November report should read $.3277 instead of $.4007.

OTTO PRAEGER, Second Assistant Postmaster General.

THE SUNDSTEDT-HANNEVIG SEAPLANE

At the plant of the Wittemann-Lewis Aircraft Co., probably one of the largest seaplanes in the United States has been constructed by the prominent Swedish aviator, Capt. Hugo Sundstedt, and the well-known Norwegian financier, shipbuilder and shipowner, Mr. Christoffer Hannevig.

Capt. Sundstedt is one of the pioneers in aviation, having flown since 1900. In July, 1914, just before the war broke out, he made a non-stop flight from Buc, near Paris, France, to Stockholm, of about 1200 miles in a Henry Farman biplane in 13 hours and 20 minutes. During the war Capt. Sundstedt had been about two years in France and received several decorations. About two years ago he left France for the United States with the purpose of building an aeroplane for a transatlantic flight.

The Sunstedt-Hannevig seaplane has been designed for the specific purpose of long distance flying over the sea. In general, it has been designed with an extra heavy substantial construction, particularly on those parts subjected to the greatest amount of strain during flight and at landings, such as pontoons, wings, and the entire rigging.

In the design, however, only proved aerodynamical principles have been embodied, assuring a positively efficient machine, and Capt. Sunstedt has made a large number of improvements in structural details, affording the utmost strength and lightness of construction.

The seaplane is equipped for two pilots and two passengers in the cabin of the fuselage.

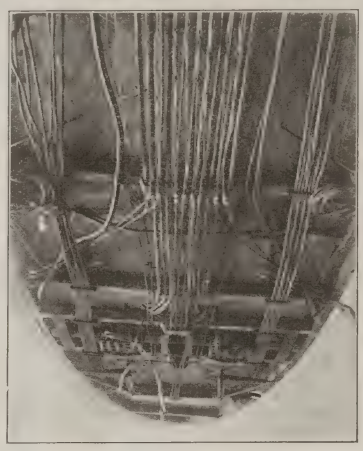
General Dimensions

Span, upper plane	100′-0″
Span, lower plane	71′-6″
Wing chord, lower plane	8′-0″
Wing chord, upper plane	8′-0″
Gap between wings	8′-72″
Length of machine over all	50′-6″
Height of machine over all	17′-7″
Dihedral angle, lower plane	2°
Wing curve	U. S. A. No. 5
Total lifting surface	1537 sq. ft.
Rudder area	22 sq. ft.
Elevator area	54 sq. ft.
Weight	10,000 lbs.
Loading per H.P.	25 lbs.
Loading per sq. ft.	6 lbs.
Speed, estimated, full load	80 m.p.h.
Climbing speed, estimated	3000 ft. in 10 min.
Horsepower, total	440

Pontoons

The pontoons are of special Sundstedt design, embodying the highest developed features of streamline and follow the most accepted construction practice. They are made of Capt. A. P. Lundin's special three-ply Balsa wood veneer, covered with linen, and are each divided into eight watertight compartments, painted and varnished with torpedo gray enamel. They are 32′-0″ long, spaced 16′-0″ apart from centers, and are light in weight, being 400 pounds apiece, including fittings.

Each pontoon is equipped with an emergency food locker accessible from the deck by means of a handhole.



The underside of fuselage showing control connections on the Sunstedt-Hannevig Seaplane. It is covered by an aluminum cowling

The pontoons are braced to the fuselage and wings by a series of steel tubing struts with Balsa wood streamline fairing. These tubes are of large diameter and fit into sockets mounted on the pontoons and wing spars. The entire assembly is amply braced by steel cables and tubing connecting struts.

Fuselage

The fuselage is of streamline design, and is flat sided in order to provide sufficient vertical surface necessary for good directional stability. It has a curved streamline bottom and hood running fore and aft. The construction is of white ash and spruce, consisting of four longerons and ash and spruce compression struts fastened thereto with light universal steel fittings, to which are also fastened and connected diagonally the solid steel brace wires and turnbuckles.

The front end of the fuselage is fitted up much after the style of a closed motor car, with comfortable upholstered seats for the pilots and passengers. This cabin is accessible by a door on each side at the rear end of the cabin. A very complete field of vision is obtained through a series of glass windows around the front of the pilots' seats, forming a recess in the upper deck forward of the windows.

Directly behind this cabin, and balancing with the center of pressure is the main gasoline tank, with a capacity of 750 gallons, sufficient for 22 hours of full speed flying, and to the rearward of this is the adjustable open trussing, with a detachable hood and covering for access and inspection.

The forward section is covered with a thin three-ply mahogany veneer up to the rear of the cabin doors, and aft of these, it is covered with linen, doped, painted and varnished.

Control

The control system operates on the standard wheel and rudder bar method, and is of special Sundstedt design, whereby all cables are located beneath the floor, leaving a clean control column and rudder bar without any wires in the way of the passengers or pilots. Dual control is fitted, side by side, directly connected, so that the machine can be controlled by either pilot at will.

All engine controls and switches are located on the dashboard, operative from both seats.

Instruments

A substantial dashboard is fitted in front of the pilots' seat in a plainly visible position, and is equipped with tachometers for both motors, clock, altimeter, speedometer, radiator thermometers, oil pressure gauges, shut off valves, ignition switches, and so forth, which are located in within easy reach of the pilot.

Power Equipment

The power plant consists of two Hall-Scott Model "L-6" H.P. engines, directly connected to two bladed pusher propellers. Each are mounted on a specially constructed bed by the Vee method of interplane struts, with the engine beds, housings, and radiators all securely braced to the wings, pontoons and fuselage.

The engines are supplied with gasoline by turbine driven Miller gasoline pumps which maintain a pressure of 3 lbs. in a special reservoir of the pump itself, under automatic adjustment, and eliminating all of the difficulties and dangers of the gravity and pressure feed systems. These pumps are regulated from the cabin and within easy reach of the pilots.

Wings

The wings are built up of five sections in the top plane and three in the lower. The center section of both the upper and lower planes are 18′-10″ long, and so designed that the pontoons, the power plant, and the fuselage can all be assembled completely before adding the remaining outer wing sections, thereby taking up a minimum amount of space in assembly during manufacture.

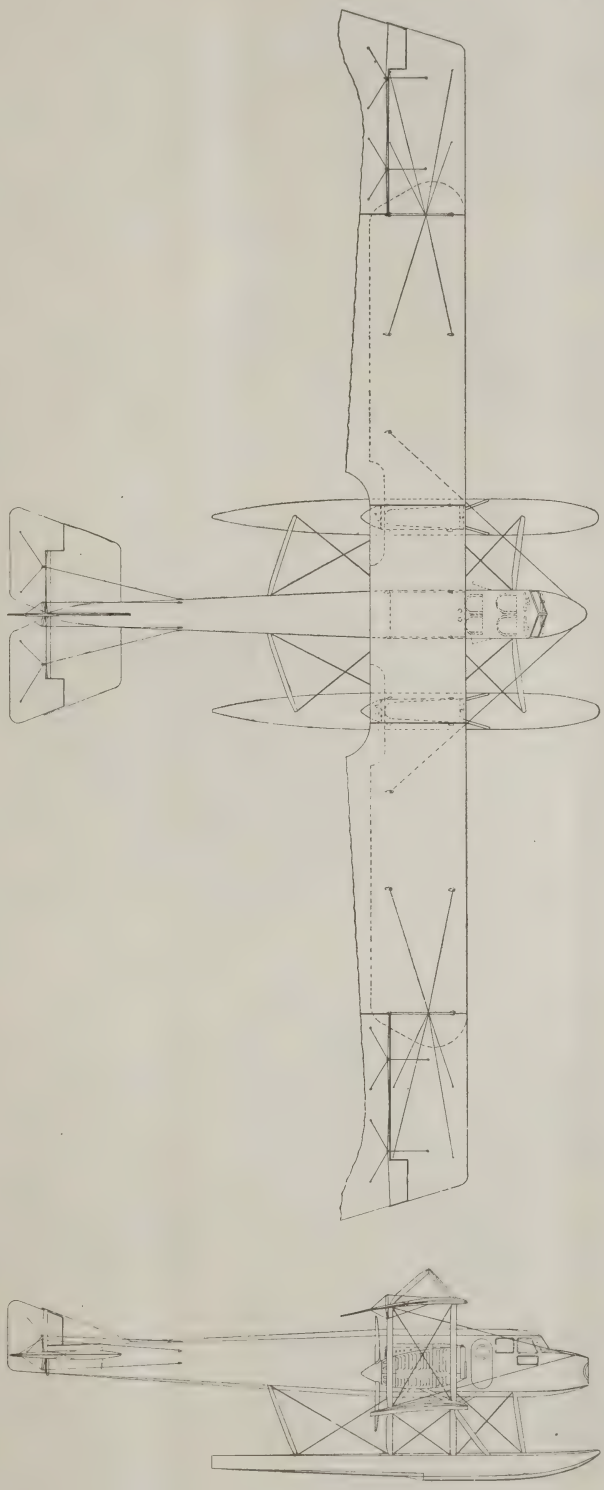
The main spars are of laminated built up section, serving to give a very high strength and exceptionally light construction of a combined I-beam and a box beam section.

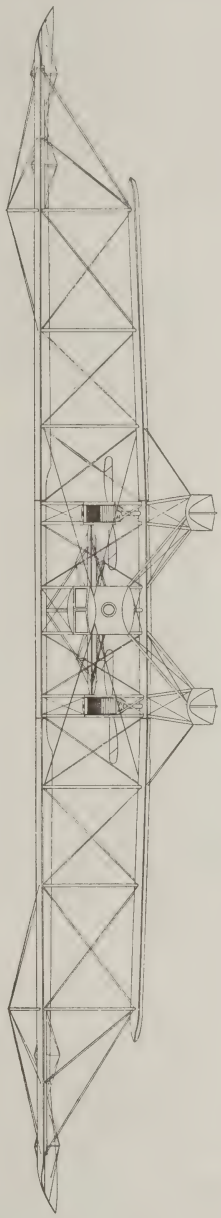
The upper wing has a chord of 10′-0″ at near the junction to the center section, and narrows down to 8′-6″ at the inside of the aileron cutout. Of this, 8′-0″ is well constructed web form of rib, while beyond this distance the cap-strips are

(*Continued on page* 1183)



The Sundstedt-Hannevig Seaplane equipped with two Model "L-6" Hall-Scott Engines





SUNDSTEDT-HANNEVIG
TWIN MOTORED
SEAPLANE

Scale of feet

THE AEROMARINE TYPE L 6-CYLINDER AERO MOTOR

THE Aeromarine Plane and Motor Company, of Keyport, N. J., have supplied us with the following data concerning their Type L. 6-Cylinder aero-motor.

General Description

This motor is a six-cylinder, four-cycle, water cooled valve in the head type..

Bore, 4.25 inches. Stroke, 6.5 inches. Weight, 375 lbs. With electric starter and generator, 405 lbs. Rated horsepower, 130 at 1625 R.P.M.

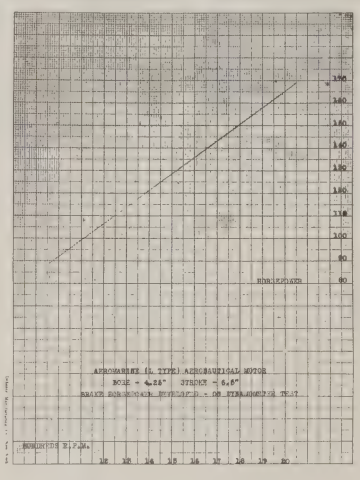
This motor was designed and has been developed in all its stages with the sole object of producing a power plant suitable for training and sporting machines. Simplicity, accessibility and durability, without undue weight, have been the objectives in the design of this unit.

Crank Case and Cylinders

The main portion of the crankcase and cylinder jackets are integrally cast of aluminum alloy. This type of design eliminates a multitude of bolts, screws and fittings, and as well gives an extremely rigid structure. The cylinder sleeves are alloy steel forgings, machined all over, to give a uniform wall thickness. After machining, the sleeves are heat treated, and the working surfaces ground. The outside of these sleeves are in direct contact with the cooling water over their entire surface. The cylinder head gasket, of copper and asbestos, makes a tight joint against the top flange of each cylinder sleeve, the water joint at the bottom of each sleeve is by individual cork gasket, which allows freedom for expansion, and at the same time makes a perfectly satisfactory joint.

Cylinder Head and Valve Gear

The cylinder head and valve gear form a complete self-contained unit, which can be removed from the motor in a few minutes, allowing inspection of the valve combustion chamber and making it possible to remove the carbon or grind the valves within the very shortest possible time. The removing and replacement of this head may be accomplished without retiming the motor, due to a special arrangement of the splined shaft which drives the camshaft gear. The head is of aluminum alloy with gray iron valve seats cast in position. The combustion chambers are machined. The water cooling of the spark plugs, exhaust valve guides and valve seats is exceptionally complete. The cams and rollers are housed in, precluding possibility of oil reaching the combustion chambers through valve stem guides. There are four valves for each cylinder, two exhaust and two inlet. A special design of valve gear, embodying flat multiple leaf valve springs, effects a great reduction in length and weight of valves and valve levers, and also reduces the over-all height of the motor. Each valve spring actuates two valves. By a special design of the valve adjusting screw, a rolling contact is obtained between it and the end of the valve, thus eliminating the possibility of any side motion being transmitted from the valve levers to the valve stem. There is an oil return passage from each end of the cylinder head to the crank sump. The whole valve gear is enclosed in a quickly detachable aluminum cover, so that when the motor is in operation, there are no moving parts visible and the possibility of a pilot being annoyed by oil from the valve gear is entirely eliminated. The camshaft is hollow with integral cams and is driven by bevel gears and vertical shaft from the power delivery end of the motor.



Oil System

This motor is of the dry sump type, a dual pump being used to deliver the oil pressure to the working parts and to draw the surplus oil from under the sump, discharging the same into the auxiliary reservoir. This system avoids sooting of plugs and excessive oiling in the alternate ends of the motor as the aeroplane glides or climbs. It has a further advantage in that the oil in its passage to and from the auxiliary tank is cooled. All bearing surfaces in the motor, except valve stem guides, lubricate by pressure fed oil.

Crank Shaft

This is an alloy steel drop forging, heat treated, machined all over and dynamically balanced. It is of three main bearing type with additional propeller bearing. The bearings are of liberal size, the crank pins being 2½ inches in diameter by 2⅝ inches in length.

Pistons

These are of aluminum alloy, ribbed under head, and are fitted with two sealing rings above piston pin and an oil scraper ring below. The piston pin oscillates directly in piston pin bosses.

Connecting Rods

The connecting rods are alloy steel drop forgings, heat treated and machined all over, are of "I" beam type with four-bolt type cap. High class Babbitt metal is used, and is tinned directly into the rod.

Ignition

The ignition is by double Delco instruments driven directly from the end of cam shaft. There are two spark plugs in each cylinder.

Starter

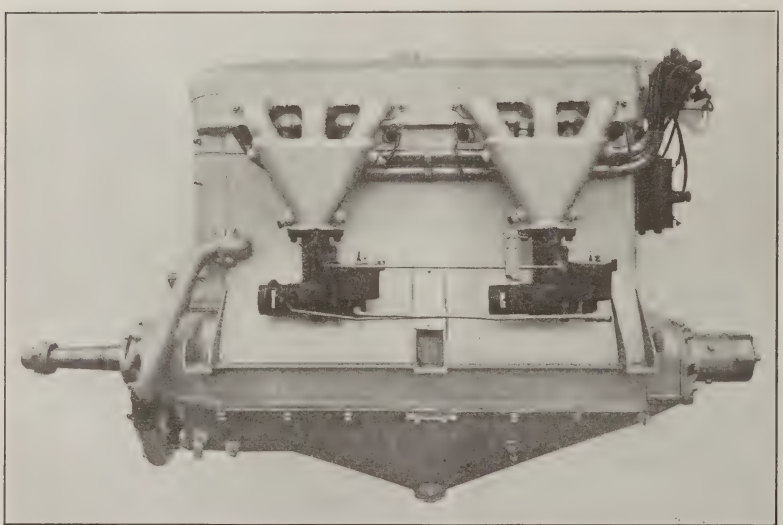
A Bijour electric motor starter is arranged to drive the motor through the rear end of the crankshaft, by means of a special automatic engagement and planitary reducing gear which has a ratio 56 to 1.

Generator

The Bijour generator is driven from the rear end of the camshaft. The motor and generator are built into the design in a neat and efficient manner.

Carburetor

Two carburetors are used to supply the six cylinders and are now arranged on the side of the



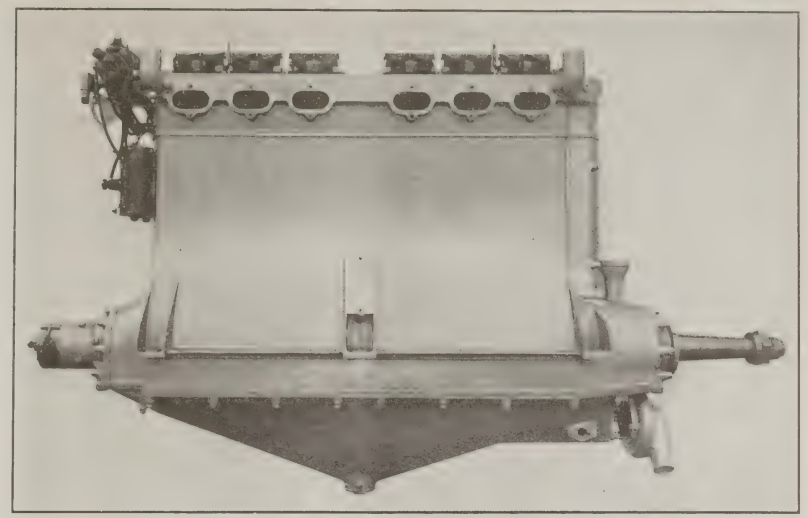
Intake side Type L Aeromarine 6-cylinder engine

motor above the beds as shown in the accompanying photographs. It is considered possible that a dual carburetor may be placed back of and behind and below the motor with a dual feed pipe in the event that it is desirous to use a gravity feed.

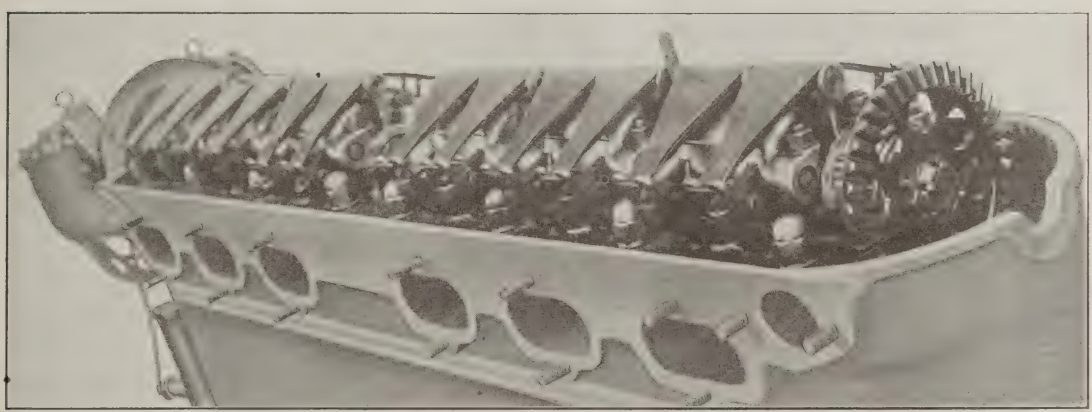
This motor has been run to speeds in excess of 2500 R.P.M. for some considerable period of time, and even at this excessive speed, the peak of the power curve had not been reached. (See chart.)

Fuel Consumption

Tests extending over a period of more than 100 hours indicate that the fuel consumption of this motor is, approximately, 495 pounds per H.P.



Exhaust side Type L Aeromarine 6-cylinder engine



The cylinder head and valve gear form a complete unit on the Type L Aeromarine 6-cylinder engine

CITED FOR DISTINGUISHED SERVICE

THE commander in chief, in the name of the President, has awarded the distinguished service cross to the following-named officers and soldiers for the acts of extraordinary heroism described after their names:

First Lieut. Howard T. Fleeson, Signal Corps observer, 12st Aero Squadron. For the following act of extraordinary heroism in action near Buzancy, France, October 30, 1918. Lieut. Fleeson is awarded a bronze oak leaf, to be worn on the distinguished-service cross, awarded him October 3, 1918. This officer accompanied a formation of nine planes on a photographic mission in German territory, six planes turned back before reaching the enemy line, and the remaining three were attacked by 18 Fokker-type planes when they had penetrated 12 kilometers into the enemy country. After his two companions, whom he tried to assist, were shot down, Lieut. Fleeson fought his way back to his own lines, destroying two enemy planes in the combat. Home address, W. H. Fleeson, brother, Sterling, Kans.

First Lieut. Hugh D. Broomfield (deceased), pilot (Air Service). For extraordinary heroism in action near Cunel, France, October 21, 1918. Responding to an urgent request for a plane to penetrate the enemy line to ascertain whether or not the enemy was preparing a counter attack, Lieut. Broomfield immediately volunteered for the mission. Obliged to fly at a very low altitude on account of the unfavorable weather conditions, he was under terrific fire of the enemy at all times, but by skillful dodging he managed to cross the enemy lines. Next of kin, Thomas Broomfield, father, 527 Tacoma Avenue, Portland, Ore.

Second Lieut. Clinton Jones, Air Service (pilot), 22d Aero Squadron. For the following act of extraordinary heroism in action near St. Mihiel, France, October 10, 1918. Lieut. Jones was a member of a patrol which succeeded in hedging a fast enemy biplane. Approaching the enemy plane Lieut. Jones signaled the enemy to give up and land. The reply was a burst of machine-gun fire, which cut his wind shield and set fire to his plane. Lieut. Jones then closed in and shot the German pilot and sent the plane crashing to the ground. He landed his own plane and extinguished the flames. Home address, Mrs. Clinton Jones, mother, 2617 Buchanan Street, San Francisco, Calif.

Capt. Hamilton Coolidge, deceased, 94th Aero Squadron. For extraordinary heroism in action near Grandpre, France, October 27, 1918. Leading a protection patrol, Capt. Coolidge went to the assistance of two observation planes which were being attacked by six German machines. Observing this maneuver, the enemy sent up a terrific barrage from antiaircraft guns on the ground. Disregarding the extreme danger, Capt. Coolidge dived straight into the barrage and his plane was struck and sent down in flames. Next of kin, J. R. Coolidge, father, 10 West Hill Place, Boston, Mass.

First Lieut. William H. Vail, Air Service, pilot, 95th Aero Squadron. For extraordinary heroism in action at Stenay, France, November 6, 1918. Lieut. Vail, while on patrol, engaged four hostile pursuit planes which were about to attack an accompanying plane. Almost immediately he was attacked by five more enemy planes, all of which he continued to fight until he was severely wounded and his plane disabled. He glided to the ground, abandoning the flight only when his machine fell to pieces near the ground. Home address, Mrs. Fred E. Vail, mother, 1535 South Paulina Street, Chicago, Ill.

Capt. Edward V. Rickenbacker, Air Service, 94th Aero Squadron. For the following act of extraordinary heroism in action near Billy, France, September 25, 1918, Capt. Rickenbacker is awarded an additional bar to be worn on the distinguished-service cross awarded him October 16, 1918. While on voluntary patrol over the lines, Capt. Rickenbacker attacked seven enemy planes (five, type Fokker, protecting two, type Halberstadt). Disregarding the odds against him, he dived on them and shot down one of the Fokkers out of control. He then attacked one of the Halberstadts and sent it down also. Home address, Mrs. William Rickenbacker, 1334 East Livingstone Avenue, Columbus, Ohio.

Second Lieut. Glen A. Preston, Field Artillery observer, 99th Aero Observation Squadron. For extraordinary heroism in action near Andevanne, France, October 29, 1918. Becoming separated from his protecting planes while on a photographic mission, Lieut. Preston continued alone, and, although he was attacked by seven enemy planes, type Fokker, he drove them off and secured numerous photographs. For the following act of extraordinary heroism in action October 30, 1918, Lieut. Preston is awarded one bar to be worn with his ditinguished-service cross. Lieut. Preston successfully accomplished his mission in spite of encounters with four separate enemy formations, one of 38 machines, another of 6, type Pfalz, another of 7, type Fokker, and a formation of biplane planes. He shot down one of the enemy and returned with valuable information. Home address, Mrs. Perry C. Davidson, mother, Howe, Ind.



MILITARY AEROSTATICS

By LIEUT. H. K. BLACK, R. F. C., C. F. A.



Free Ballooning

(*Continued from page* 811)

EVER since war broke out practically all the free ballooning which has been done has been for the purpose of training military and naval balloon pilots. The free balloon flights and parachute drops of the county fairs and the captive balloon of the amusement park and exposition have disappeared under the stress of military necessity.

With the return of peace, however, free ballooning will no doubt come into its own again, as the beginning of commercial aeronautices. It is the opinion of most people who should know, that the next decade will be the decade of commercial aeronautics, and that the next ten years will see as great or greater advancement in commercial aeronautics as the past ten years has seen in the advancement of wireless. Balloons and more particularly dirigibles will play a very large part in this advancement. Free ballooning will no doubt be revived to a great extent as a sporting proposition and as an aid to science. Therefore, a few points of how it is carried out may be of interest to the amateur aeronaut as well as to the layman.

To begin with, a suitable flying field from which to make an ascent is necessary. It should be sheltered without being cramped; sheltered to facilitate inflation and to eliminate the necessity of a larger crew to handle the balloon in a wind; uncramped so that the balloon may rise without danger of striking nearby objects, such as buildings, smoke stacks, trees, etc. Electric, or in fact any wires are a particular abomination to a flying field. If a hangar or building sufficiently large to house the balloon is available, inflation may, of course be carried out at leisure, but facilities, such as these, are more or less rare, so we will take into consideration only the outdoor flying field.

A smooth platform is greatly to be desired. A cement one is specially good, but it must be kept very clean, as small pieces of grit play the very deuce with a balloon envelope. Proximity to the gas supply is, of course, essential.

About a hundred sand bags, each filled with about fifty pounds of fine, loose sand and a filling hose will be necessary. The filling hose should be at least ten inches in diameter. It is made of canvas treated with rubber solution and is of low permeability. The envelope of the balloon is unrolled and laid out in a circle. The appendix or inflation sleeve is attached and the envelope pulled over until the valve hole is directly over the appendix, which can be seen through it. Care must be taken, however, when "pulling the envelope over" that strain is only applied at the seams and that the envelope is pulled firmly but without jerking—otherwise the fabric will tear.

The envelope at the point where the appendix is attached is propped up off the ground by three or four sand bags with the appendix running between them. The reason for this is that when inflation commences the gas must have free passage into the balloon. When the envelope has been pulled over and folded evenly in a circle, the net is pulled over the envelope. The net is made of light cordage, the meshes being fifteen to eighteen inches in diameter. It covers the entire balloon, being fastened to the valve at the very top of the envelope. From the net the basket is suspended and so to insure evenness in riding and ease in manipulation, great care must be taken that the net be put on evenly. Attention to this point is necessary from the time the net is pulled over the envelope until the inflation is nearly complete. Failure to put the net on evenly imposes additional strain on some parts of it, causes the appendix at the bottom to be off to one side, the basket does not ride evenly, the maneuverability is increasingly difficult, and the safety of the flight decreased. Before the net is pulled over, the valve and rip cords which enter the balloon through the appendix, are pulled well into the envelope, the red one, being the rip cord, fastened securely to the lug of the rip panel and the white valve cord to the spider of the valve. The valve is adjusted, tested, properly lubricated to make it gas tight, and fastened in its place by its bolts. The net is then tied around the valve. The lower part of the net should be pulled well out from the envelope and a few sand bags hooked on to it. The balloon is now ready for inflation.

The inflation hose may be connected with the appendix by its thimble, but before it is attached to the gas supply the gas should be turned on slowly to blow out the pipes and to be sure that there is no air remaining in them. The inflation hose is then attached to the source of supply and the gas turned on slowly. It is inadvisable to turn on the full head of gas for the few first minutes because it is in those few first minutes that the opportunity for adjusting and straightening the net occurs. When the net has been straightened and enough gas has entered the balloon to raise the valve off the ground, the flow may be increased gradually to full pressure. Care must be taken, however, that the flow is not enough to get ahead of the crew, for it will be found as the balloon rises like a yeasty pancake that the net with its attached sand bags will tend to hold down the balloon. As more gas enters, it will be necessary to add more sand bags to the net, and with a large flow of gas quick work will be



The new U-Type dirigibles packed and ready for shipment

necessary. The crew must keep letting each sand bag down another mesh, so the balloon may rise. It is also necessary that each sand bag be let down the same amount, otherwise the net will be crooked. A bit of judgment is required to know just how tight the balloon should be kept, for if the inflation is done in a wind, and the sand bags are let down too far, the wind will tend to get underneath and blow the envelope about and maybe overturn the whole business. On the other hand, if the sand bags are not let down far enough, the increasing pressure on the material of the balloon will retard the flow of gas or even stop it. If the flow of gas, however, be very strong, it will lift the sand bags right off the ground or if their weight be too much, burst the balloon. Experience alone will teach one how tight the balloon should be kept.

As the balloon rises above the equator, the lower half will fill increasingly quick, and it is then that the work of shifting sand bags must become more snappy. In a wind at this juncture also, considerable care must be taken that the balloon is heavily enough sand bagged to keep it on the ground. Just before it is fully inflated, the gas flow should be reduced somewhat, and while the balloon should be entirely filled with gas, the gas must be turned off instantly when this occurs. The filling hose should be disconnected and the appendix tied loosely with a bit of tape. In the meantime, the basket should have been rigged, the aneroid barometer adjusted, the compass and the barograph placed in position, the ballast pocket filled, maps and other impediments packed in their respective places. The drag rope should have been coiled, attached to the basket suspension, and hung on the basket. The anchor likewise. In the bottom of the basket there should be from six to ten sand bags as ballast. The basket is then carried to its position underneath the balloon and fastened carefully to the net by its suspensions. This should be supervised by some responsible party. In the meantime, sand bags are hung on the lowest mesh of the net. Now, they are one by one transferred from there to the short basket suspensions, and from thence to the long basket suspensions. As this is being done the balloon gradually rises, till when the sand bags have been transferred from the long basket suspensions to rings on the exterior of the basket, the balloon has assumed a position a few feet above the basket and in flight position.



Here is one on the energetic Colonel C. G. Brant of the Division of Military Aeronautics. He went up for his first balloon trip recently and thought he could "get away with it." But a strange plane came along and snapped him. Here is how it came out. The air isn't safe any more. Those pesky magazine photographers are ubiquitous

The pilot, his aide and the passengers now take their place in the basket and approximately their combined weight in sand bags is removed from the exterior rings of the basket. Bag after bag is taken off until, as is generally the case, they are all removed. Then a rather delicate and important procedure is necessary. This is known as "weighing off," and it consists in removing sand from the interior of the basket until the lift of the balloon is just equal to the weight of itself and its passengers. Theoretically, this means that if the basket is on the ground it will stay there, but one might lift the entire balloon off the ground with one finger and if it is raised six inches from the ground it will remain in that position. Then the balloon is said to be "balanced."

As it very seldom is the case that there is no wind, the crew must retain their hold on the balloon.

The expenditure of one handful of sand will cause the balloon to rise. However, as it is generally advisable to make a fairly steep ascent, the pilot spills overboard a few pounds of sand, shouts "Let go," and breaks the tape which is holding the appendix closed, the crew releases the balloon and it rises at a very steep angle dependent, of course, on the strength of the wind.

A detailed description of a free balloon trip from the time the balloon leaves the ground until it lands and is packed up ready for its return to its station will appear in an early issue.



Balloon crew at the manifold's opening cocks, allowing gas to flow from cylinders into the feeding tube



Balloon in the hangar, with crew on the tube, being inflated with gas. The sand bags are in place along the tube as a precautionary measure

IMPORTANCE OF HIGH THERMAL EFFICIENCY IN AEROPLANE ENGINE DESIGN AND CONSTRUCTION

By CHARLES W. BURRAGE*

IN any engine it is desirable to obtain as much useful power from a given amount of fuel as possible, but in practically all of these machines the question of efficiency is purely a matter of expense—the cheaper one having the advantage over its competitor. In an aeroplane engine, however, not only is it important to have the engine operate as cheaply as possible, but it must also be *efficient* in order to have the quantity of fuel, and therefore the weight carried, a minimum. This has been particularly important in military machines, where long non-stop excursions into the enemy's country, together with the return flight, has been of the greatest advantage. But even in times of peace it is hardly conceivable that fuel stations will be established so thickly over the entire world that a machine can land near one of them in a half hour's notice.

One of the greatest advantages of the aeroplane is its ability to navigate over any kind of surface that the earth presents, as it needs no track nor roadway, and there will always be large areas where landings will be extremely difficult or impossible. Even if this were not so, the less fuel required for a given distance, the less weight would be taken up and the more freight or passengers could be carried. This question of economy is very prominent among the problems of trans-Atlantic flight, where it is desirable to fly from one continent to the other without any stop to take on fuel.

While it is perfectly obvious that a plane fitted with an engine having a low fuel consumption, etc., can travel further with the same weight of fuel than if fitted with one less economical, yet the extent of the saving is not always apparent. Fig. 1 has been prepared with the object of showing graphically the differences between a few representative aeroplane power plants. Weight per brake horsepower has been ploted as ordinates against duration of flight in hours as abscissae. On the ordinate of zero time has been plotted the weight of the engine plus radiator, water, piping; etc., or what is known as the metal weight of the engine. Distances on succeeding ordinates represent metal weight plus the weight of fuel, lubricant and tankage for the time considered. Using these co-ordinates, all engines having the same fuel and oil economy will be represented by parallel lines, their relative positions being governed by the metal weight of the engine alone, so that the engine with the lighter metal weight is lighter under all conditions of flight.

With engines of different metal weights, however, the one with the lower fuel consumption will be the lightest for long flights no matter what its original weight per H.P., provided, of course, the distance considered is great enough. This is shown on the plot by line *M* crossing *G* after a little more than an hour's flight. The former is the weight per H.P. line of the German Maybach engine, which has a metal weight of 3.31 lbs. per B.H.P., while the latter is that of the Gnome, which is lighter in metal weight (2.8). But when fueled for a six hours' flight, the Gnome weighs 9 lbs. per B.H.P., while the Maybach has a weight of only 6.72 lbs. per B.H.P. Thus it is seen that the engine of low metal weight and high fuel economy is lighter only for comparatively short flights, or at the end of longer ones. Accordingly, if the addition of metal weight improved economy, it would pay to do so on an engine designed for long endurance flights. But on the other hand, unless the improved economy was quite marked, nothing would have been gained. This is shown by a comparison of lines *M* and *A*—the latter of which is the line obtained from the operating characteristics of the Liberty 12, Model A. The economy of the Maybach is slightly better than the Liberty, but in order to place them on an equal weight basis, the respective planes would have to be equipped for more than 17 hours' flight, and for all times when the plane had a quantity less than sufficient for this length of time, the Liberty would be superior because of its less metal weight.

If all the engines considered had the same horse-power, vertical distances between any two points on the lines multiplied by the horse-power would give the difference in weight of the two power plants with accessories and supplies for the distance under consideration. Similarly, horizontal distances between any two lines indicate the difference in cruising radius for the same total weight. In plotting the lines *A, B, C* a plane has been assumed that has a maximum capacity for fuel, etc., of 10,000 lbs. and uses for motive power engines totaling 1,000 B. H. P.

In the case of engine *A* (the Liberty 12) the metal weight including the cooling system is 2.8 lbs. per B.H.P., the actual value, and the thermal efficiency 25%. Engines *B* and *C*, however, have been figured with a weight of but 2 lbs. per B.H.P., a value that has already been obtained by one or two manufacturers. The thermal efficiency of engine *B* has been taken as 30%, a value certainly obtainable, and that for *C* as 38%, a quantity that the writer believes possible of attainment.

Using these values the following results have been obtained:

Engine	A	B	C
Specific consumption (lbs./h.p./hr.)	.545	.454	.358
Total metal weight (lbs.)	2,800	2,000	2,000
Weight per B.H.P.	2.8	2.0	2.0
Lbs. fuel per hr.	545	454	358
Lbs. oil per hr.	35	26	22
Tanks (lbs. per hr.)	20	20	20
Total wt. per hr., supplies	600	500	400
Wt. per B.H.P. for 10 hrs.	8.8	7.0	6.0

Figured on this basis, the plane fitted with engine *B* could fly 4 hours longer than would be possible if engine *A* were installed, and if engine *C* were used, a flight of 9½ hours in excess of that with engine *A* could be maintained. On a mileage basis this would mean about 400 to 760 miles increase in cruising radius, or a 20 to 61.5% gain. If cargo carrying capacity was what was desired, the plane fitted with engine *C* could fly as far as if fitted with engine *A* and carry 3,800 lbs. more of freight or passengers. Economy then, both in metal weight and more particularly in the use of fuel and lubricant, is necessary in an aeroplane engine if it is to compete successfully for use in anything but very short flights.

As is now well known, the maximum efficiency that can be expected for engines operating on the Otto Cycle is expressed mathematically by the equation $E = 1 - \left(\frac{1}{r}\right)^{n-1}$ where: r = the ratio of the total volume of the cylinder to the compression space and $n = 1.408$.

While the above definition for the compression ratio (r) is the one almost universally used, no allowance has been made for the retarded closing of the inlet valve. Aeroplane engines which have inlet valves timed to close 50 or more degrees past bottom center do not actually start compression until these valves are closed so that the true compression ratio is more exactly expressed by the ratio of cylinder volume at the closing of the inlet valve to that of the compression space. The correction factor for the first ratio would be approximately $\frac{1+\cos a}{2}$ where a is the angle of inlet valve retard. And the corrected ratio R would be obtained from $R = r\left(\frac{1+\cos a}{2}\right)$ Thus for an engine whose compression ratio figured on total cylinder volume was 6 and which had a 50° retarded inlet valve, would have a corrected value of 4.92, which partly explains why some of the high ratios used today work satisfactorily when it seems they would fail.

An inspection of the above equation shows that the theoretical efficiency depends solely upon this compression ratio and that the higher this ratio the more efficient the engine.

Fig. 2 is a curve showing the change in efficiency with change in r, and is plotted from points computed from this formula. It is obvious that we cannot hope to exceed the values thus indicated. This efficiency is that developed by the cylinder itself and does not take into account the losses between the cylinder and propeller. As the efficiency we are interested in is the ratio of the work done at the propeller hub to the power available in the fuel, it is necessary to multiply these values by the mechanical efficiency of the engine. Furthermore, we can never hope to get engines whose pistons fit so tightly that there are no leakage losses nor cylinders that do not require cooling. Therefore perfect adiabatic compression and expansion cannot be expected. The maximum value for n is therefore taken at 1.35. Considering these losses, a new curve has been drawn showing efficiencies which it certainly seems impossible to exceed, but which it may reasonably be expected to be approached. At present, aeroplane engines are operating on efficiencies varying from 20 to 30 per cent, averaging about 23, so it would seem that there is some slight room for improvement, although any considerable increase cannot be expected in an engine whose efficiency is now as high as it is; yet it seems inexcusable that aeroplane engines should not operate at efficiencies equal to the best and every effort should be made to improve upon the now best obtainable values.

It has been said above that the theoretical efficiency is improved by an increase in the compression ratio and actual tests confirm this theory. Accordingly, it is to be expected that the proper choice of compression ratio is one of the most important points in design. Unfortunately, however, there is an upper limit to this ratio, a limit imposed by the heat resulting from the compression of the mixture itself. If the temperature of this mixture remained absolutely uniform throughout as the compression increased, it would finally reach a value where the whole would ignite instantaneously and detonation would result. The exact temperature at which this would take place has never been accurately determined, but is not more than 985°F. In the engine itself there is always some part that is hotter than the others, with the result that when these high temperatures are approached one section of the mixture ignites, setting off the rest, so that in estimating the maximum allowable final compression temperature an allowance must be made, depending on how evenly it is believed the cylinder temperature will remain, something nearly impossible to estimate exactly.

As the only limit to compression is the increase in temperature due to its pressure rise and contact with the heated engine parts, it follows that if by some means the charge could be compressed isothermally, the efficiency could be greatly improved. But obviously with high speed engines this is impossible.

If the fuel used by the engine were pure air, the temperature of compression at the inner dead center would be represented by the expression $T_2 = T_1 (r)^{n-1}$ where $n = 1.408$. Actually, however, the charge is a mixture of gas and air, which has a changing specific heat with a change in temperature, and as there is an appreciable

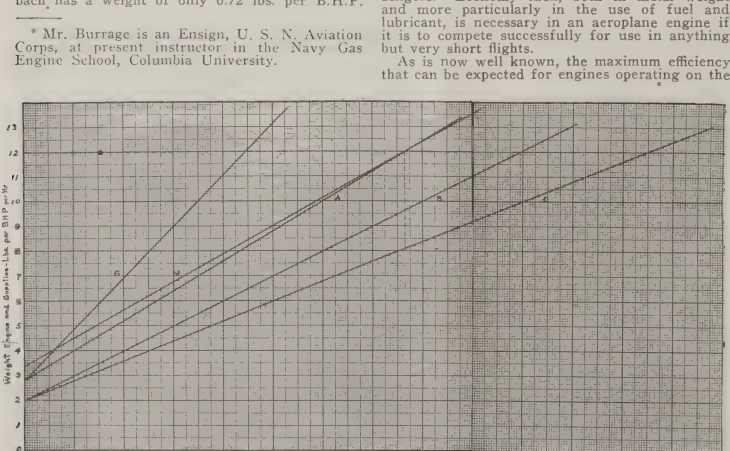


Figure 1.—Graph showing differences in characteristics of representative aeroplane power plants

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time between the beginning and the end of compression there is some loss of heat during compression, so that a value of 1.35 for n expresses more nearly the real compression curve. Using this value, a family of curves have been drawn, showing the final temperatures attained for different compression ratios and for different initial temperatures.

Inasmuch as dry, homogeneous mixtures can hardly be expected with an initial temperature of less than 100° F. with the present day fuels, it is impracticable to consider anything below this value. What is more nearly the real initial temperature is in the neighborhood of 300°F. Keeping this value in mind an inspection of the curves shows that a real compression ratio of from 5 to 6 seems all that could be expected without obtaining self-ignition of the charge. Of course, if by some means, we could obtain initial temperatures at the start of compression in the vicinity of 200 or 250° the ratio could be increased to 7 or 7.5 but at this time it seems unbelievable

As engines are now operating with an apparent ratio of 6.55 the limit seems to have nearly been reached, unless a new fuel is introduced that permits of higher temperatures before self-ignition. Furthermore, as these highest ratios are approached, the gain in efficiency is not as great. There are several reasons for this, all of which depend on the increased heat, generated as a result of the high compression. First of all high compression pressures cause high explosion pressures and therefore higher temperatures throughout the cycle, which raise the mean temperature of the walls, valves, piston, etc., and these increase the temperature of the next charge resulting in its ignition before the piston reaches top center. With this condition, mean effective pressures are not proportionately as great and the gain in thermal efficiency becomes less.

The increased heat of the exhaust gases also tends to increase the initial compression temperature as the gases left in the clearance space intermingle with those of the incoming charge. In addition, the heat loss to the cylinder walls is greater with higher temperatures which partially offsets the gain due to the higher compression. In other words the inability to control the heat of both the gases and metal parts of the cylinder form a limit to the compression ratio.

The reasons for the increase in efficiency with a high compression ratio are (1) reduced area of wall surface exposed to the combustion, (2) reduced time of explosion, (3) reduced amount of dilution of incoming charge. Opposed to this is the increased heat loss caused by the greater density of the charge and greater temperatures. Obviously the greater the amount of compression the smaller the amount of cylinder wall and head area of cylinder exposed to the explosion. This means that for a given weight of charge the resulting temperature of explosion will be greater as there is less cooling surface to cause heat removal and of course the pressure will be correspondingly greater, and more power obtained from the engine for a given heat supply. It is well known that high compression pressures cause an explosion that is not only more powerful but also more rapid, and since less time is consumed

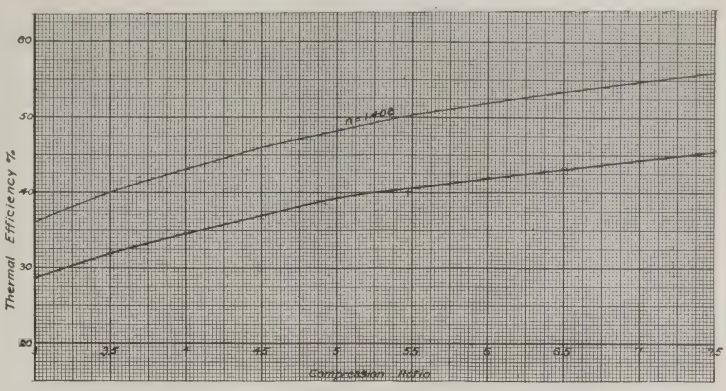


Figure 2.—Curve showing change in efficiency

in the attainment of maximum pressure there is less time in which heat can escape and thus it is more efficiently utilized. In engines with a small clearance space there must of necessity be less burnt gases left in the clearance to intermingle with the fresh charge, detracting from its power and raising its temperature. But as the density of the mixture is increased by compression, the temperature is also increased during this period and a slightly greater loss of heat to the walls results. However, as this increase is only a little over 100°F for an increase in compression ratio of from 4.5 to 6.5 the loss is not great. The overall result is therefore a gain in efficiency.

Next to the compression ratio the most important effect on efficiency is the form of the combustion chamber. Practically no one builds aero engines to day with *L* or *T* heads although there are quite a few modifications of cylinder head shape using overhead valves. Undoubtedly the best form of combustion chamber from the standpoint of high thermal efficiency is that of a sphere as the surface exposed to the explosion is the least possible for a given volume, and the least loss from cooling results. This has been proven by the actual designs over and over again although it is doubtful if the added trouble taken to make the piston head concave has been worth while in added efficiency. So long as the general shape is spherical the increase in volume-surface ratio gained by making it absolutely so must be slight, and as any constructional difficulties present themselves a change would probably not be worth while.

Not only does the form of the combustion chamber affect the efficiency but also the finish of the interior walls. It is well known that a rough or irregular surface radiates or absorbs heat more readily than a smooth one and if the walls of the combustion chamber are highly polished the heat radiated from the charge will not be as readily absorbed by the chamber walls, resulting in higher temperatures with a correspondingly higher thermal efficiency. Thus it is seen that with aero engines it undoubtedly pays to machine the interior of the combustion chamber.

The dimensions of the cylinder as well, have their effect on the fuel economy. As a combustion chamber whose wall area is the minimum possible for the volume it surrounds gives the least heat loss, any change in cylinder dimensions that would tend to decrease the ratio of surface to volume would be productive of good results. Now since the volume of a solid varies as the cube of the linear dimensions and the area as the square, the larger the cylinder diameter the less the percentage heat loss and the more efficient the engine, other things remaining equal. But there is a limit to the gain thus effected, a limit imposed by the quantity of heat that can be taken care of in the cooling of the cylinder in order to keep the operating temperatures so low that the metal does not burn or distort, nor too great suction heating result. With the present rate of heat generation this limit is reached with cylinders 5 to 5½ inches in diameter. This effect of cylinder diameter on efficiency is well substantiated by actual engines the larger of which are, on the average, more efficient.

But when an increase of stroke is considered as well as diameter the problem readily becomes one of a comparison of long vs. short strokes. Here the gain or loss is by no means so clearly defined as there are several compensating factors to be considered.

For two engines having the same piston displacement and the same compression ratio, the one with the longer stroke has the smaller ratio of interior cylinder surface to volume when the piston is at the inner dead center. It may, therefor, be inferred that from this consideration alone the longer stroke engine is more efficient. But on the other hand, the long stroke engine takes a longer time for expansion, provided it is operated at the same piston speed, so that the expanding gases remain longer in contact with the cylinder walls and consequently lose a greater percentage of their heat to these walls. These conflicting tendencies have different values at different engine speeds. At low engine speeds it is probable that in the case of the long stroke engine more is lost during the period of expansion than is gained during the explosion period and hence the short stroke design is the more efficient. But as the engine speed is increased the loss during expansion becomes smaller and the long stroke engine becomes more efficient. In aeroplane engines, however, excessively long strokes are barred by reason of the resulting increase in weight, and hence much gain cannot be expected from this source.

As has been suggested above, speed of revolution has a pronounced effect on economy. A consideration of extremes of operation shows this. If the engine is running *very* slowly, the induced charge will have more time to become warmed to the engine temperature and the weight thus drawn in will be reduced. Also, the time consumed during the explosion will be comparatively large and the heat leakage thereby increased. In addition, the loss during expansion is greater resulting in poor economy and the maximum compression ratio that could be used would be lowered. The higher the speed then, the less chance for heat loss. But there is a limit to this, and while the efficiency improves with speed, as the engine approaches the maximum values the improvement becomes less pronounced and finally falls off as extreme speed is reached. This is to be expected, for at the highest speeds the limiting temperatures have

(*Continued on page* 1170)

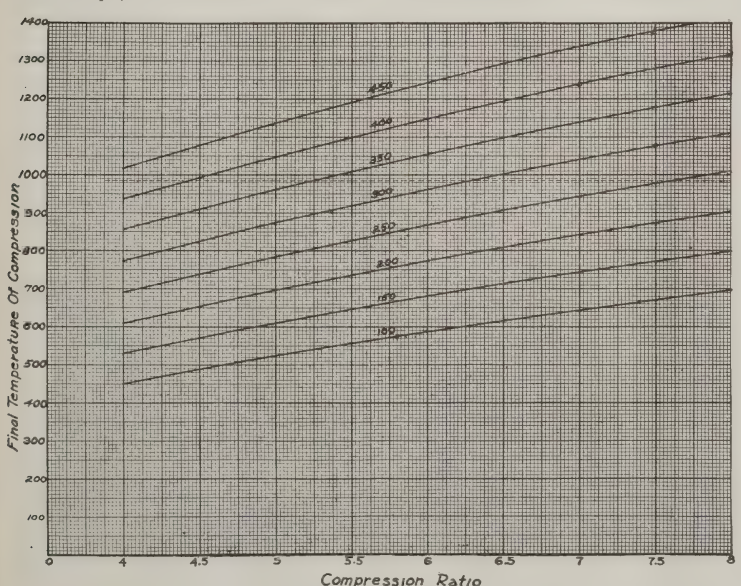


Figure 3.

ADMIRAL MAYO'S AIRSHIP REPORT

A REPORT made by Admiral Henry T. Mayo, U.S.N., to the Secretary of the Navy on the development of the rigid and non-rigid airships and plans for their future development in the British navy was presented to the House of Representatives by Secretary Daniels on February 6 in response to a request from the House Committee on Naval Affairs for information as to why the Navy Department wanted $25,000,000 for aviation purposes. Mr. Daniels explained that "a larger appropriation for lighter-than-air aircraft is requested because in this respect Navy aviation is not as far developed as in the heavier-than-air aircraft."

Admiral Mayo begins his report, which is dated November 3, 1918, with the statement that "the failure of the Zeppelins in the raids over Great Britain and the destruction of several Zeppelins over the North Sea by planes carried on cruisers, and on one occasion by a large American flying boat, has induced the belief in the minds of many officers that the lighter-than-air ship has been definitely displaced by the heavier-than-air machines." He then points out that officers who have had most to do with the lighter-than-air type contend that the types of Zeppelins used in the air raids were unsuitable for the purpose and continues: "The improvement in the lighter-than-air ship design have been such that the latest German rigid airship has a speed of about seventy to eighty miles per hour, a ceiling of 24,000 feet, and a rate of climb superior to any plane. With these characteristics a rigid is comparatively safe against attack from anti-aircraft guns or heavier-than-air machines. Additional safety has been assured to the lighter-than-air ship by the development of a non-inflammable gas (helium) of which the United States possesses almost limitless natural resources."

The airship's chief value in naval warfare, Admiral Mayo states, is in scouting and in keeping large areas of the sea under observation. He considers the rigid type of airship essential to the highest efficiency in the above two classes of utility and states that the latest type of these ships developed by the British (R-38 class) has 2,720,000 cubic feet capacity and an estimated cruising endurance at forty-five miles per hour of 11 hours, thirty-four hours greater than the German L-70 class, which was produced in 1918. Admiral Mayo gives a slight sketch of the progress made in the British navy up to 1915 with the lighter-than-air ships and states that "it appears regular voyages of startling length are planned for these craft." He adds: "In times of war these airships can be concentrated over any area of the seas surrounding English possessions to hamper hostile surface craft and to assist the navy in its operations."

Germany's Airship Program

The report continues: "The results already attained have justified the confidence felt by the German navy in its airships when used in their proper sphere as the eyes of the fleet. Their Zeppelins did much to save the High Seas Fleet at the battle of Jutland, to save their cruiser squadron on the Yarmouth raid, and were instrumental in sinking the Nottingham and Falmouth. Had the position been reversed in the Jutland battle and had the British had rigids to enable them to locate it, they would probably have annihilated the German High Seas Fleet. At the present time Germany possesses apparently fifty efficient rigid airships built since 1915, in addition to a few non-rigids which she uses only for training purposes. The Schutte-Lenz works, which build rigid airships, take about two weeks to build each ship. The maximum output of their factories is one ship every sixteen days. Germany's total output of rigid airships would therefore appear to be thirty rigids a year, or one every twelve days. The latest information shows that Germany has fifty-four housing and constructional sheds, capable of holding seventy-one rigid airships. This surplus of shed accommodation, placed all over the country, enables ships which cannot get to their base after a long cruise to make for vacant berths where the weather conditions are more favorable.

British Rigid Airships

"While no other nation has done as well as the Germans in rigid airships, the British, alive to the need of maintaining sea supremacy, are closely competing. A few days ago they held acceptance trials of a 1,400,000 cubic foot ship (the R-31), which made over fifty-five knots and could lift eighteen tons (or, say, 200 persons). This ship turned in a complete circle of 0.7 mile diameter in three minutes. Another British ship now under way (R-38) will have a displacement of 2,750,000 cubic feet, a speed of about seventy knots, and a range of well over 200 hours, or safely across the Atlantic and return in any weather except the worst storms. The British, who, despite having shot down so many bombing Zeppelins, are keenly aware of their utility, are embarked upon a construction program of sixteen of modern type (besides smaller, now obsolete, types already in commission and used for training); the French, have a similar program, calling for eight; it is understood the Italians are to construct two and our joint Army and Navy rigid airship board has recommended that we begin with four for the Navy.

The development of the non-rigid airship is practically at a standstill, while the development of the rigid type is being pushed by Germany, France and Great Britain. The future of the rigid airship depends upon the ability of its designers to secure for it a superiority, relative to heavier-than-air craft, in radius, ceiling, climbing ability and an approximation to the speed of the fighting planes."

High Thermal Efficiency in Engine Design

(*Continued from page* 1169)

been reached, with tendencies toward preignition and less efficient combustion.

It has been claimed by some that an offset cylinder is productive of higher efficiencies. The reason given is, that as the piston travels more slowly on the induction stroke the amount of charge is greater in density and cooler. But as the engine is certainly warmer than the charge, any additional time would seem to be a detriment to coolness which is essential to maximum weight. Then too, as the piston is supposed to remain longer at the top of the stroke, thus giving more nearly the conditions of constant volume, the pressure is supposed to be greater. But when the actual differences in time and strokes are figured out for the ordinary amounts of offset given it is found that they are so small in magnitude that any pronounced difference in economy is unbelievable, especially as the result of the changes produced are contradictory to each other. But with the proper amount of offset the mechanical efficiency is improved owing to the reduction in piston friction and a slight gain in power output is effected. Now as the thermal efficiency under discussion is based on the brake and not the indicated horsepower, the result of offsetting is a slight improvement in economy.

Probably the most important of the conditions for efficiency is that of the proper quality of the mixture fed to the engine. Everyone knows that excessively rich or lean mixtures can not give the best results, but the exact proportions are more or less in doubt. A mixture that is only slightly rich has often been observed to give maximum power and because of this it has sometimes been thought that the best power for the heat supplied had been obtained. By definition a rich mixture means that there is an excess of fuel to the amount of air and consequently, as there is not enough oxygen to burn all of the gasoline, some passes out unburnt. Of course, no work at all is obtained from this and there is obviously waste.

With a lean mixture, however, there is an excess of air, which means that this extra oxygen and its accompanying inert nitrogen must also be heated up and pass out the exhaust. A lean mixture is slow burning as well, so that the power output is reduced and the efficiency lowered. But in the case of mixtures that are only slightly lean the excess air serves to reduce cylinder temperatures, permiting of a higher compression without self-ignition and lowering the final temperatures of explosion so that the temperature difference between the charge and the wall is lessened and the radiation loss cut down somewhat. Of course the power obtained is not as great, but the percentage of power obtainable from a given amount of fuel is increased. This mixture ratio for optimum efficiency is about 17 to 1, varying with the fuel used and the compression ratio. As might be expected, the mixture for optimum efficiency, in the case of high compression engines, is slightly leaner the higher the compression, as these extremely high temperatures are more favorably affected by the cooling effect of the excess air.

As the most rapid explosion possible is desirable in order to reduce the time for heat to radiate, the location of the spark plug has some bearing on the economy of engine operation. Two sparking points are better than one, as has been proved over and over again, but there is still some controversy over the exact location in the cylinder in which to place them. It would seem natural that to locate them in such a way that the distance from either plug to the most remote part of the mixture was a minimum would result in the quickest explosion, the greatest power and best economy. Tests, however, have failed to show any appreciable difference in engine operation of one method over another and accordingly they have been located wherever is most convenient for the designer. Needless to say, the electrical system must be so timed that the sparks from the two plugs occur simultaneously to obtain any advantage.

The time that the spark occurs in relation to the piston position is another contributing factor to economical operation. To obtain the highest possible pressure from a given charge the inflammation part of ignition should be completed before the piston has moved an appreciable distance out on the down stroke. Furthermore, the charge should not be ignited so soon that inflammation will be completed before the piston has reached the top of the stroke. In other words, the point where this process should be completed is a very definite one, and to alter it the least bit is to reduce the power obtainable. As the engine may revolve at various speeds and as the time occupied by inflammation for ordinary engine conditions is approximately constant, it is seen that ignition must be started at earlier points on the stroke at higher speeds in order to have it end at the proper point. Hence, there is only one point for the spark advance at any one speed, if it is desirable to obtain the best that the engine can do. The great advance necessary at the highest engine speeds forms one of the limits to efficient operation at these speeds and so anything that will reduce the time of inflammation will improve economy.

With an increase in altitude compression pressures fall off and accordingly the engine can stand a greater spark advance at constant engine speed, for, owing to the reduced pressure, the time of the explosion will be less.

Another operating feature affecting economy is the kind of fuel carried. Although high test gasoline is far more expensive, a plane can fly further with a fixed *weight* of this fuel than with the same weight of low Baumé gasoline. While, on the other hand, for a fixed *volume* a longer flight may be made with the low test fuel. And, if prophesies are fulfilled, the new fuel developed during the war has a promise of better economy than any of the gasolines.

Although a high engine speed is desirable from the standpoint of economy, it should be driven at a speed that gives the plane the most mileage for a gallon of fuel, and this is not its maximum speed. In fact, the relations between engine and propeller speed and that of the plane itself must be definitely understood if the pilot is to get the best mileage from his machine.

The proper altitude at which to fly the machine is governed by so many variables that definite laws are hard to formulate. Should the machine encounter at a certain altitude strong steady winds blowing in the desired direction of flight, there is no question but that more miles per gallon could be accomplished with its aid. In general, however, better economies can be made at the lower altitudes, although it has been shown that for the same power developed the economy is the same at a higher altitude but at a higher engine speed. Minimum consumption, however, never attains as low a value at the higher altitude.

Engines using high compression ratios may exhaust as much as 40% of the heat of the fuel, for high speed engines have not the same time to allow the waste heat to get to the cooling water. One of the reasons given above for increased efficiency of high speed was the reduction of the time during explosion and expansion and the consequent reduction of the amount of heat lost to the jackets. But at the same time, all of the heat thus saved is not used in useful work, and hence the higher the speed the greater percentage of the heat passes out the exhaust. The following might be a possible heat balance of a high speed engine: useful work, 30%; exhaust, 40%; lost to water jacket, radiation, etc., 30%.

Now, in some of the latest planes, engines totaling as much as 2,400 B.H.P. have been constructed. This means that fuel having a total heating value equal to 8,000 H.P. is used in developing the useful 2,400 H.P., and that 3,200 H.P. or its equivalent in B.t.u.'s passes out the exhaust. With units as large as this the heat thus wasted is enormous, and it is not inconceivable that some successful device will be perfected that can utilize some of this heat. It may be that only 5% or 10% could be reclaimed, but even then it would amount to 160 or 320 H.P., a quantity that would drive a plane of small capacity. And so with the larger power plants greater economies may be possible.

It is not expected that any or all combinations of the features mentioned will yield the best economy. Each design of engine has, for example, an optimum compression ratio beyond which it would not be of advantage to go to give the best results. And so each part of the design must harmonize with the others; combinations intelligently made and carefully tested, until the best possible or best feasible design is attained.

AEROPLANE AND SEAPLANE ENGINEERING

By Commander H. C. RICHARDSON, U. S. N.

THE problem confronting the Navy was largely determined at the time the United States entered the war by the fact that the operations of the German and Austrian fleets had been reduced principally to minor raids from the fleet bases at Kiel and Pola, and the only real seagoing operations comprising the activity of submarines.

The work of the seaplanes, therefore, was primarily reduced to that of cooperation with the fleet in reducing the submarine menace. This naturally led to the establishment of coastal stations in France, Italy, England, Scotland and Ireland. In these operations it was possible to operate seaplanes from shore bases in practically every case, and the development of work with the fleet became a minor consideration.

Some of the seaplane bases, however, were sufficiently close to enemy territory to be within raiding distance of enemy planes of both land and water types, and it became necessary for the Navy to extend its activities to the use of land planes for the protection of seaplane bases, and naval aviators also participated in big bombing raids on German and Austrian territory.

I refer to these matters in this general way, not to describe these activities, but to show that in naval work both land and water planes were used, and why the Navy problem was in general restricted to operation from shore bases rather than operation from ships. Activities, however, were not confied to shore bases in Europe. Stations were established on the Atlantic coast, principally for the purpose of submarine patrol and for convoy work from the principal ports from which our troops and supplies were sent abroad.

Paper presented at the Annual Meeting of the Society of Automotive Engineers.

Types of Planes Developed

The work of seaplanes abroad was that of submarine patrol and convoy work, and this having been determined on, all efforts were made to obtain the most suitable seaplanes for the service. The principal work was done with two types of seaplanes, namely, the HS-2—the single-motored plane developed from the HS-1—and the H-16, a copy of the English seaplane of the same type developed as a result of Commander Porte's experience with the original America and subsequent types developed therefrom. Finally, the F-5L type was developed from English designs for manufacture in this country by the Naval Aircraft Factory at Philadelphia. The HS-2 and the H-16 have proved well suited to the work required, but the F-5-L did not enter production early enough to get into active service before the armistice was declared.

The Navy did not attempt to develop land plane types, but accepted and used those which had been developed and produced for the Army, adopting for this purpose the English Handley-Page, the Italian Caproni, and the Army DH-4 and DH-9.

In order that pilots should be trained for this service, it was necessary to adopt training planes, and for this purpose the Navy developed and used the Curtiss N-9, the R-6 and the R-9, the Aeromarine and Boeing seaplanes, and the F-boat; and also experimented with a number of miscellaneous types, such as the gnome scouts—both biplane and triplane of Curtiss and Thomas manufacture—and the Gallaudet D-5. The most successful of these training planes was the N-9, particularly after the original float had been modified and later on after the substitution of the Hispano 130-h.p. engine for the OXX 100-h.p. engine. This plane was a biplane tractor with a single center float, having wing tip balancing floats. It was remarkably strong and could perform practically all sorts of maneuvers. Although in training work it was frequently wrecked, there were remarkably few deaths resulting. This I attribute to its moderate speed, remarkable strength of construction, and tractor arrangement, which made it emininetly suited for training purposes.

As soon as it was determined that seaplanes of the flying-boat type were to be used in service it became necessary to provide preliminary training in a type of seaplane which more nearly represented the conditions of operation of the big boats. For this purpose the F-boat originally developed by Curtiss for sporting and for naval use was modified and adapted to instruction purposes.

I shall later on describe and illustrate the principal types referred to.

So far as the aerodynamical and mechanical features of construction are concerned, seaplanes differ very little from aeroplanes, the principal difference being the use of the landing gear suited to operation from the surface of the water instead of from the land. The proportions are, naturally, somewhat different, and the performance is different; primarily, because of the greater inertia due to the greater weight involved in the seaplane construction than is the case in the seaplanes. But bearing



Commander Richardson inspecting the N.C.1

this in mind, the details of construction of seaplanes are substantially the same as those used in aeroplanes.

Factors Affecting Performance

It will now be of interest to consider the principal factors which affect performance, as it is necessary to understand these completely to develop a design which shall perform according to the requirements of the service intended. For the purpose of illustrating the factors involved I have prepared a set of performance curves, which I believe will give a clear insight into this phase of the problem. The complete calculation of the curves shown is given in the Appendix, together with the formulas involved in the computations.

The performance in power flight is determined by the horsepower required and the horsepower available, and, of course, the latter must always exceed the former or power flight is not attainable.

In determining the power required there are two principal factors involved. The first factor is that of the horsepower required to propel the planes with their load in flight. This horsepower I term the plane's E.H.P. To determine it, is is necessary to know the form and disposition of the wing surfaces used, as well as the aerodynamic characteristics of the wing section employed. The lifting power of the wing depends on the area and the square of the speed of advance, and its resistance is also in proportion to the area and the square of the speed of advance, the speed of advance being the speed relative to the air itself and not to the speed over the ground.

The lift of an aeroplane surface and its resistance to advance are determined by the lift and drift factors, which vary with the type of section used and also with the angle of attack at which the surface is presented to the relative stream of air. It has been found by experiment that these factors are influenced by the proportion and arrangement of the surfaces, the best results being attained with what is known as the monoplane surface.

Performance is improved by increasing the dimension of the wings in the lateral sense, over that of the fore-and-aft dimension. The ratio of these two dimensions is called the aspect ratio. As the aspect ratio is increased, it is found that the efficiency is improved indefinitely. But after an aspect ratio of 8 or 10 is attained the improvement in efficiency becomes less and less, and, practically, is not worth going after, because the dimensions become unwieldy and the gain in lifting power and efficiency may be more than wiped out, due to the increased weight and resistance of the structure required in employing same. It is largely on account of this difficulty that the biplane and the triplane have been used where large lifting power is required, even though in the latter cases the efficiency of the surfaces is reduced because of interference of the air flow, which is found to depend upon the gap ratio. By this is meant the ratio of the distance between superposed planes to the chord length, or fore-and-aft dimensions of the wings.

Where the leading edge of the upper plane is forward of the leading edge of the lower plane the efficiency is improved over that where one plane is immediately above the other, and conversely. This arrangement is referred to as stagger and the condition of positive stagger, that is, with the upper wing forward of the lower wing, is generally adopted with the view of improving efficiency. There are limits to its usefulness because of the obliquity of the trussing involved.

Stagger may be adopted for various reasons; such as correcting the balance of an aeroplane in which the actual location of the center of gravity does not conform to that originally contemplated, or, in order to improve the view of the pilot or observer, particularly if the latter is also a gunner.

The efficiency is improved if the upper plane has a greater lateral dimension than the lower plane. This disposition is known as overhang. There are limits to the extent to which this can be employed, on account of the structural difficulties involved.

In the normal type of construction, the front and rear edges of the wings are parallel, although it is found that tapering the wings to a smaller fore-and-aft dimension at the wing tip improves efficiency. This arrangement is not satisfactory from a manufacturing point of view, as it involves different sized ribs at every station in the wings. All the above considerations power—the movement of the center of pressure is such as to cause instability longitudinally. faces. It is found that where wings have a cambered surface—which is usual in aeroplane construction because of the superior lifting have to be taken into account in determining the form and proportion of the wing surfaces.

Another factor is very important, that is the travel of the center of pressure on the wing surfaces. It is found that where wings have a cambered surface—which is usual in aeroplane construction because of the superior lifting power—the movement of the center of pressure is such as to cause instability longitudinally. Various devices have to be employed to overcome this. The most satisfactory and usual method is to employ an auxiliary surface at the tail of the aeroplane called the horizontal stabilizer, and the best conditions for stability are found when this rear surface has a smaller angle of attack than the wing surfaces themselves.

This difference of angle between the wings and the horizontal stabilizer is termed "Longitudinal dihedral." The stiffness or steadiness of an aeroplane in flight depends on the area, proportion, section and angle of the rear surface. Where great stiffness is desired, this rear surface may even assume the proportions of a second set of lifting surfaces which may be of monoplane or biplane arrangement, usually of smaller dimensions than the main planes. Where the rear surfaces are increased to near the proportions of the forward surfaces, the tandem biplane arrangement is approached.

For military purposes and for combating rough air conditions it is found desirable to have initial longitudinal stability, but it is undesirable to have this in a high degree on a military plane in which steadiness may be essential to the proper operation of a gun or a bumb-dropping device. If the rear surface were completely fixed relative to the forward surface it would only be possible to proceed in horizontal flight at one definite speed for the load carried, and ascending or descending could only be accomplished by increasing or decreasing the power, or by decreasing or increasing the load. These methods of control are not sufficiently accurate or active, and it is much more satisfactory to use additional surfaces, known as elevators, appended to the rear margin of the horizontal stabilizer, which by modifying the action of the stabilizer make it possible to proceed in horizontal flight at any speed from the minimum to the maximum flying speed, or to cause the plane to rise or descend. In some aeroplanes, in order to get the maximum of maneuvering ability, the horizontal stabilizer is reduced to a very small area, or, even, in some cases, is completely dispensed with, all being merged into the elevator.

In the original Wright machine lateral balance was maintained by warping the wings, but this method is unfavorable to strength in large structures, and the use of ailerons for this purpose has now become general.

In flight, aeroplanes are not always operated so that the trajectory conforms to the axis of the aeroplane, particularly when turning or when encountering side gusts, etc. As a consequence, unless what is known as the keel surface of the aeroplane is distributed equally above and below the center of gravity, there is a tendency for the aeroplane to roll one way or the other, depending upon the location of the center of gravity relative to the center of lateral pressure. To compensate for this effect, or to provide lateral stiffness under such conditions, it is usual to provide a moderate amount of what is known as lateral dihedral; that is, the wing tips are higher than the center portion of the wings; or else skid fins are placed immediately under or above the upper wings. These in general have the same effect as lateral dihedral. By modifying this arrangement the amount of lateral stability can be controlled to any desired degree. Again for military purposes it is desirable to have initial lateral stability, but not to such a degree as to interfere with controlability of lateral balance.

Directional stability is also affected by the location of the center of side pressure, depending upon its location fore-and-aft of the center of gravity. It is essential for steady flight that the center of lateral pressure at small angles of skew should not pass forward of the center of gravity. To accomplish this it is usually necessary to install a vertical stabilizer at the tail of the aeroplane. It is again desirable to have initial directional stability. And again, in a military plane, it is undesirable to have this to such a degree as to interfere with control of direction. As the aeroplane is symmetrical relative to the vertical fore-and-aft plane, it is unnecessary to provide any equivalent of the dihedral effect, and it is only necessary to append a rudder to the vertical stabilizer in order to control direction. In some planes, where extreme maneuverability is desired, the rudder itself, in its neutral position, performs the functions of a vertical stabilizer as well as that of a rudder, and no vertical fixed surface is used.

Location of Power Plant and Crew

Having given due consideration to the influence of the proportion, arrangement and disposition of the main supporting and control surfaces, it is next necessary to consider the service intended and the location of the power-plant and the crew. The possible arrangements are almost infinite, but in general it is desirable to locate the pilot centrally where he will have a proper view to enable him to handle the aeroplane to the greatest advantage and this is particularly necessary to the combat plane. It is also essential that the gunner shall have as large and unobstructed view as practicable, and that with the gun positions selected he shall be able to cover with his arc of fire as much of the surrounding sphere as is practicable, in order that there shall be no dead spots from which the enemy may approach without his being able to return the fire. This sometimes requires that the pilot himself shall be able to operate guns, firing dead ahead, or that additional gunners shall be placed so that they can cover arcs of fire not possible for the others to cover.

In bombing planes, and in particular in night bombing planes, this requirement is of less importance, and the requirement that the bomb dropper shall have a proper view for the operation of the bomb sights becomes of prime importance.

For aeroplanes designed for long-distance flights or for bombing, it becomes necessary to have great power available and this requirement has led to the adoption of multiple unit powerplants. Two, three, and as many as five powerplants have been successfully used for this purpose. The multiple-engine plane has the advantage that in case of damage to one powerplant it is usually possible to continue flight with the remaining power plants; or, if still too heavily loaded to accomplish this, it is possible to stretch out a glide for a long distance and thereby make it possible to select a more favorable landing place and often to avoid landing in enemy territory.

All these and many other considerations enter into the disposition and arrangement of the powerplant and fuselages, and these arrangements themselves have an influence on the performance of the wing surfaces because of interferences involved.

By winging out the powerplants a more favorable load distribution is imposed on the aeroplane structure and advantage is taken of this feature in designing the wing trussing. The effects of interferences and of the disposition and proportion of the wings or bodies and auxiliary surfaces are so complex that unless data are already available from similar designs, it is very desirable that the resistance and lifting power of the complete design should be determined from wind-tunnel tests of a model carefully constructed to scale in every detail. Such model test is usually deferred until the design has approached some definite form after preliminary estimates have shown that it is capable of approaching the performance desired.

Form and Proportion of Wings

In preliminary estimates the influence of the form and proportion of the wings is carefully estimated, and from these estimates a fairly accurate approximation of the horsepower required for the planes is derived. To arrive at the total horsepower required, it is next necessary to consider the horsepower required to overcome the head resistance. In order to do so, it is necessary to have accurate knowledge of the resistance of all elements of the aeroplane structure exclusive of the wings, which are exposed to the action of the wind in flight.

To reduce the resistance of these elements to a minimum, streamline forms are adopted wherever practicable, and even the truss wiring is made up of streamline form; or, if this is not found practicable these wires are covered with false streamline covers of wood or metal. It is found that the reduction in resistance more than compensates for the additional weight involved in applying these false covers.

The resistance of the fuselages, radiators, engines, tail control surfaces, and elevator rudder and aileron horns and all other elements is computed in detail, and account is also taken of the obliquity of these elements to the flow of the air. Such obliquity is found to exert an important influence on their action. For preliminary estimates, it is customary to determine the resistance of these elements for the position assumed by them at some speed intermediate to the low flying speed and to the high speed attainable with full power, and then to assume that the resistance of these elements is proportional to the square of the speed for speeds above and below and intermediate speeds selected. This is most handily done by assuming that the resistance of these elements is represented by a flat surface exposed normal to the wind, which would have the same resistance as the aggregate of these elements. This supposititious surface is what is referred to when we speak of the "surface of equivalent head resistance." In the example which I have chosen to illustrate, "the equivalent head resistance" is assumed to be 20 sq. ft., and the horsepower required to drive this head resistance through the air is indicated on the curve denoted head resistance horsepower. By compounding the ordinates of this curve with the ordinates of the plane's EHp. curve we derive the total EHp, required curve.

We have next to determine the total brake horsepower available in order to determine the performance of the aeroplane. To determine this curve, we must first know the full-throttle characteristic of the engines to be used. This characteristic is indicated in the example showing the brake horsepower available at different speeds.

The next thing to be determined, and the one having a most important influence on the performance of the aeroplane, is the propeller characteristic. To date the progress in propeller design has been far from satisfactory, and although good results have been obtained, the best results possible have seldom been approached. In the selection of the propeller, one of the first considerations is to determine what feature of performance is most important, for it is necessary to select the proper dimensions with a view to gaining the best results for the service intended. For instance, if high speed is of greatest importance, the propeller to be selected will differ materially from that which would be re-

quired if great climbing power is desired, because the greatest climbing power will be attained at a much lower speed than the maximum speed. Or, it may be a question of selecting a propeller which will give the greatest efficiency at cruising speed, and this propeller will usually differ from that selected for either of the preceding cases. In some cases it may be desirable to select a propeller which will give the best all-around performance rather than for a particular condition.

In seaplane work a problem arises which is not found in the land aeroplanes. This problem is that of obtaining the greatest reserve of power to overcome the resistance of the float system, because it is desirable to have the greatest possible reserve to accelerate rapidly on the water so that the getaway may be made in rough water with the greatest possible rapidity, thereby reducing the punishment which the seaplane suffers under such conditions. For a heavily loaded seaplane this consideration may be of vital importance.

Efficiency of the Propeller

It must be understood that the efficiency of an aeroplane propeller is absolutely dependent upon its speed of advance through the air, as is also the power which the propeller absorbs in flight, the result being that even though the full throttle is used the engine cannot make its full revolutions until a good flying speed is attained, with the consequence that full power of the motor cannot be realized until flying speed is attained.

The efficiency of a propeller is dependent upon a function of the velocity and of the number of revolutions and of the diameter of the propeller represented by the *function* $\frac{V}{ND}$. The efficiency, the torque and the thrust, the horsepower absorbed and the horsepower delivered are functions of this quantity, in which velocity the number of revolutions and the diameter must be expressed in the same units.

The influence of this factor is indicated on the propeller efficiency curve based on the values of the fraction $\frac{V}{ND}$. When this fraction equals 0.2 the efficiency of the propeller indicated in the example is only 37.5 per cent. The maximum efficiency is attained when the value of this fraction is 0.59, the maximum efficiency indicated in this case being 73.2 per cent.

In the example chosen I have used a Durand propeller No. 8, whose characteristics have been determined by wind-tunnel tests, as reported in report No. 14 of the proceedings of the National Advisory Committee for Aeronautics—1914.

To derive the dimensions for this propeller I have assumed that it is desired to attain the best results at 80 miles per hour with a Liberty engine operating at 1600 r.p.m. and developing 380 b.hp., as shown by the motor characteristic. In Professor Durand's report he has adopted Eiffle's logarithmatic chart, and I shall now indicate how the diameter of the propeller is determined.

At a speed of 80 miles per hour on the chart (Plate 1) erect an ordinate equal to 380 hp. taken from the scale on the left side of the chart. From the top of this ordinate next draw on oblique line parallel to the line indicating the speed and draw this line of such a length and in such a direction as to represent 1600 r.p.m. on the scale starting with the origin at 1200 r.p.m. From the extremity of this line next draw a line parallel to the line giving the diameter scale, and taking the distance from this point to its intersection with the propeller characteristic for the propeller No. 8 we find that this line intersects at the point O. Transferring the length of this line to the diameter scale and measuring in the direction in which it is necessary to draw this line to make it intersect with the propeller's caracteristic, we find that the proper diameter to use is 9.4 ft., indicating an efficiency of 69 per cent. By the use of this ingenious chart it is possible to select a proper diameter for a given set of conditions by a simple graphical solution.

The diameter now being determined it is next necessary to determine the performance of the combined engine and propeller, and this is done as follows: On a transparent sheet of paper, or tracing cloth (Plate 2), a base line is drawn and, from any convenient point on this line, another is now drawn parallel to the scale of propeller diameters and a distance is laid off representing the diameter of the propeller on that scale. From the extremity of this line a new line is drawn parallel to the scale of revolutions per minute, and on this line is indicated the revolutions per minute of the powerplant, using the scale of r.p.m. for this purpose. From each point representing the different revolutions vertical ordinates are now drawn, representing, according to the horsepower scale, the brake horsepower developed by the engine at these revolutions, and through the points so determined a motor b.hp. curve is drawn.

Next place this diagram on top of the logarithmatic diagram of the propeller, placing the origin on the base line *A* on the base line of the logarithmatic diagram with the point *A* at the speed at which it is desired to determine the brake horsepower available. The propeller efficiency, and from the latter the E.Hp. available, can now be determined.

This construction is based on the fact that the horsepower absorbed by the propeller and the horsepower delivered by the engine must agree. Thus, for example, placing the point *A* at a speed of 30 miles per hour it is found that the brake horsepower curve of the diagram intersects the propeller characteristic and the engine characteristic at a point *B*, indicating that the engine will make 1500 r.p.m. and develop 355 b.hp. at this speed of advance.

By drawing a vertical line through this point of intersection of the two curves to the dotted characteristic of the same propeller, the E.Hp. developed by the propeller may be determined. This can also be determined by measuring the distance on the vertical line between the full line and dotted line representing the propeller characteristics. By transferring the length of this line to the scale for efficiency, the propeller efficiency can be determined.

In this manner the brake horsepower available and the E.Hp. available have been determined and are shown on curves in the example "*B*." It will be seen that at 30 miles per hour the engine can only turn the propeller at 1500 r.p.m., developing 355 b.hp. Also, that at this speed the efficiency is only 35 per cent and only 124 E.Hp. is available, although the engine is developing 355 b.hp.

Determining Plane Performance

Having now determined the E.Hp. available, we are ready to determine the performance of the aeroplane. It will be noted that the lowest speed indicated in power flight is 58.5 miles per hour.

The climbing power of the aeroplane with full power is determined by taking the difference of E.Hp. required and E.Hp. available at the particular speed at which the aeroplane is flown in the climb. This difference is greatest at the speed of 73 miles per hour. The climb is determined from the reserve E.Hp. available, which in this case is 76. Multiplying this E.Hp. by 33,000 and dividing by the weight of the aeroplane, assumed in the example to be 6500 lb., it is found that the initial climb should be 386 ft. per minute.

Further inspection of the curves shows that the minimum horsepower is required at a speed of 62 miles per hour. It is at this speed that the aeroplanes should be flown to get the greatest endurance. If, however, it is desired to get

(*Continued on page* 1180)



A view of the Naval Aircraft Factory just before the signing of the armistice

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

ABC—Report to Army Balloon School, Arcadia, Cal.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
ARV—Report to Aviation Supply Depot, Richmond, Va.
BFT—Report to Barron Field, Fort Worth, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonia, Texas.
CRI—Report to Chanute Field, Rantoul, Ill.
CWT—Report to Call Field, Wichita Falls, Tex.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EOT—Report to Ellington Field, Olcott, Texas.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GLC—Report to Gerstner Field, Lake Charles, La.
HHM—Report to Hazelhurst Field, Mineola, L. I., N. Y.
KST—Report to Kelly Field, San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses.)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PWM—Report to Payne Field, West Point, Miss.
RSD—Report to Rockwell Field, San Diego, Cal.
RWT—Report to Rich Field, Waco, Tex.
TFT—Report to Taliaferro Field, Fort Worth, Tex. (When specified in the order, the number of the field is given in parentheses.)
TMA—Report to Taylor Field, Montgomery, Ala.
UTA—Report to School of Military Aeronautics, University of Texas, Austin Tex.
WDM—Wire Director of Military Aeronautics upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.

Note 2—Report to Division of Military Aeronautics, Dayton, Ohio.

Note 3—Report to Little Rock, Ark., to Camp Pike.

Note 4—Report to Army General Hospital No. 9, Lakewood, N. J.

Note 5—Report to Chief Statistics Branch, General Staff, Washington, D. C.

Note 6—Report to Judge Advocate General, Washington, D. C.

Note 7—Report to U. S. General Hospital No. 21, Denver, Colo.

Note 8—Report to 25 South Main Street, Dayton, Ohio, to district Manager Aircraft Finance.

Note 9—Report to Aviation General Supply Depot, Houston, Texas.

Note 10—Report to 90 West Street, New York City, to aviation officer.

Note 11—Report to General Central Department, Chicago, Ill.

Note 12—Report to Aviation General Supply Depot, Detroit, Mich.

Note 13—Report to Akron, Ohio, to Commanding Officer Army Balloon and Airship Detachment.

Note 14—Report to Camp Jackson, Columbia, S. C.

Note 15—Report to 515 Little Building, Boylston and Tremont Sts. to district Manager Aircraft Finance,' and wire DAP.

Note 16—Report to 360 Madison Avenue, New York City, to district Manager Aircraft Finance.

Note 17—Report to Kentucky Wesleyan University, Winchester, Ky., as Professor of Military Science and Tactics.

Note 18—Report to the Speedway, Indianapolis, Indiana, to Commanding Officer Aviation Repair Depot.

Note 19—Report to Aviation General Supply Depot, Los Angeles, Cal.

Special Orders Nos. 30 to 36, Inclusive

A

Auten, Harry W.....KST

B

Bauer, John H.....DMA
Borum, Fred S.....LDT
Bedinger, David Wade.....RSD
Blevins, Beeler B.....KST
Buell, Albert A.....AHT
Brannon, Fred R.....EOT
Burnett, Robert L., Jr.....SAG
Boyd, James F.....LDT
Bailey, James E.....LDT
Burnett, Edward Jesse.....RSD
Brown, Ray W.....PMT
Blood, Howard E.....Note 12
Balsley, Horace C.....RSD
Brown, William Glenn.....Note 3
Bridge, Robert B.....PMT
Brewer, Percy O.....KST
Baker, William Dartis.....DMA
Blanchard, Leslie D.....KST
Baez, Raphael, Jr.....KST
Bell, Charles F.....LDT
Berg, George Oscar.....LDT
Bleakley, William H.....BFT
Beaton, Harold W.....LDT
Burton, Louis R.....EOT

C

Corkville, John D.....CAF
Campbell, Douglas.....DMA
Chamberlin, Clarence D.....KST
Coe, Alfred L.....LDT
Cox, Arthur S.....KST
Cutler, Clarence M.....LDT
Crowley, Arthur J.....PMT
Camp, Julian W.....DMA
Conner, Richard M.....MAC
Christmas, John H.....Note 10
Chapman, Amos B.....MAC
Conklin, Claude R.....EOT
Coleman, John M.....CAF

D

Dumas, John H.....DMA
Dichman, Ernest W.....Note 2
Dolan, Charles H., Jr.....FRF
Darrow, Frederick Lynn.....RSD
De Lorraine, Claude H.....DMA
Dahl, George L.....EOT
Dorn, Louis.....DAP
Dean, Charles F.....DAP
Davis, John F.....DAP
Druschel, Henry J. D.....PMT

E

Easter, Philip Ewing.....EOT
Erickson, Harry A.....WFO
Estabrook, George M.....Note 16
Edwards, Idwal H.....LDT
Elston, Welcome B.....Note 2

F

Field, David Edward.....PMT
Foster, Charles M.....DMA
Flee, James A.....WFO
Flanders, George S.....Note 17
Foulk, Albert C.....Note 2

G

Gardner, Harold A.....Note 19
Gassell, Jacob.....DAP
Glose, Charles W.....Note 19
Gray, Will K.....LDT
Gibson, Edmond H.....Note 4
Gormley, Richard R.....KST

H

Hill, Ray C.....DAP
Huggins, Charles H.....CGC
Hall, Melvin A.....DMA
Hartman, Harrison J.....LDT
Herrick, Gerardus Post.....Note 14
Holton, Russell G.....DAP
Harris, Joseph P.....KST
Hewitt, Clarence L., Jr.....KST
Harding, Roland R.....AGC
Hill, Edward H.....KST
Hartman, Harrison J.....SAG
Haskins, George W.....Note 2
Hegenberger, Albert F.....Note 2
Hemmick, Frank Schley.....DAP
Howard, James G. L.....BFT
Hall, Spencer.....MAC

J

Joy, William P.....BFT
Johnson, Bayard.....Note 2

K

Knight, Climpson M.....DMA
Kohfeldt, Fred C.....AHT
Kamm, Philip Schuyler.....LDT
Krick, Frank.....Note 13
Knight, Arthur R.....FRF
Kenyon, William S.....RSD

L

Libbey, Henry A.....Note 15
Landers, Lorenzo S.....Note 15
Landis, Reed G.....Note 11
Levy, Tony W.....LDT
Lawrence, Frederick W.....Note 8
Lawrence, Rutherford.....Note 9

M

Morris, William G.....Note 15
Meissner, James A.....DMA
McGeary, John E.....LDT
McGuire, John.....WFO
Maxwell, William C.....KST
Miller, Marion L.....KST
Martin, William Thompson.....KST
Mercer, Robert A.....KST
Moynihan, Frederick M.....LDT
McMullen, William H.....CAF
Morse, Charles L.....Note 2
Mainwaring, Charles R.....LDT
Myers, Devereaux M.....LDT
Martin, Robert C.....Note 12
Montgomery, Robert H.....PFO
Mooers, Clifford.....Note 6
Marr, Kenneth.....FRF

N

Noland, George R.....LDT
Niblack, Polk H.....KST
Nixon, John F.....Note 19
Newman, Nathaniel.....DMA
Nelson, Arlen C.....AGC
Neighbors, Sidney W.....Note 15

O

Organ, Vernon C.....PMT

P

Peik, Paul G.....WFO
Paris, Samuel H.....AGC
Perry, George Mason.....KST
Page, Henry L.....KST
Peterson, David McK.....FRF
Pendleton, James D.....LDT
Polk, George W.....Note 2
Pyle, Carl W.....Note 2
Pinney, Kyle J.....BFT
Potts, John T.....CAF

R

Rickenbacker, Edward V.....DMA
Rowland, Dudley E.....LDT
Roper, George M.....SAG
Reardan, John D.....DAP
Rochford, James L.....DMA
Reese, Lewis R. P.....EOT
Reynolds, George E.....KST
Rinker, Harry M.....BFT
Rice, George K.....EOT

S

Sloan, James.....BFT
Schumacher, Herman O.....LDT
Sundahl, Albert H.....Note 2
Simpson, Samuel M.....KST
Swan, Reuben C.....WFO
Skagerberg, Rutcher.....Note 2
Spencer, Haven H.....LDT
Schumacher, Herman O.....LDT
Sherman, John H.....Note 5
Satterfield, John M.....DMA
Sands, Richard E.....WFO

Sharp, Maurice A.....LDT
Smart, Ralph G.....KST
Sweeley, Wm. Robert.....KST
Smith, Harry A.....KST
Sloan, John.....DMA
Smith, Joseph P.....FRF
Sleete, Claude W.....KST
Selff, Robert E.....WFO
Spatz, Carl.....RSD
Stevens, Clarence E.....DMA
Studler, Rene R.....BFT

T

Tyrel, Charles P.....Note 7
Taylor, Carroll G.....CAF

V

Van Zandt, John Parker.....MAC
Vogelback, William E.....Note 18
Van Natta, Garnet.....EOT

W

White, Charles D.....KST
Worthington, John A.....WFO
Wiessman, Arnold E.....Note 2
White, William Joseph.....BFT
Weigler, William R.....Note 2
Ward, Thomas F.....LHV
Weissenborn, Stanton M.....KST

Y

Yates, James W., Jr.....WFO
Young, B.....KST

D. M. A. Aeronautical Library

The Aeronautical Information Branch of the Executive Section, Division of Military Aeronautics, has organized and will maintain a Library on aeronautic and related subjects. It is located on 3d Floor, Wing 1, Bldg. D.

This Library now consists of books on aviation, ballooning, engineering, radio, photography, metallurgy, and lubrication, besides dictionaries, handbooks, and general reference books.

About sixty periodicals, English, French and Italian, are regularly received and indexed. An annotated list of the more important articles is stencilled bi-weekly and sent to those interested. As many of the aeronautical magazines are not included in the periodical indexes now published, this service is found to be of value.

It is frequently found necessary, by the various sections of this Department, to compile technical data and to do research work of various kinds. Officers and civilians have spent much time on such work at the Library of Congress, the Smithsonian, and other Libraries. It develops that the same work is being done all the while by this Library. It, therefore, seems advisable to have the Library undertake all such service. Presumably it is more thoroughly and quickly done by those trained in Library work than by those unfamiliar with this profession.

It is planned to have books and periodicals to meet the requirements of all Sections. Requests for special material needed will be given prompt attention.

The Library is for the service of every Section and of each individual in the Air Service of the Army.

Air Service Citations Number Three Hundred Seventy-Four

Three hundred and seventy-four awards and citations have been issued to members of the American Air Service to date.

The Director of Military Aeronautics has just received a second list of Honors and Awards conferred upon American Aero Squadrons and flying officers of the American Expeditionary Forces. This list gives the citations of five squadrons, including the Lafayette, the 17th and 148th, which were with the British; the 90th and the 99th Squadrons. The names of fifty-nine American Flying Officers awarded the Distinguished Service Cross are recorded. Thirteen awards of the Croix de Guerre and three French citations are listed. One award of the British Distinguished Flying Cross is announced. The list of Italian honors conferred shows that thirty-nine American officers won the Croce al Merito di Guerra; six others were mentioned in Italian citations.

Distinguished Service Medals have been awarded to Generals Menoher and Patrick, and Legion of Honor Medals, Commander to Generals Menoher and Mitchell.

The list, together with the first list, which showed the citations of five American Squadrons, the 1st Day Bombardment Group and 129 Air Service Officers, brings the number of Air Service citations up to two hundred and fifty individuals and eleven organizations, not including over one hundred other awards of Distinguished Service Crosses announced by the War Department.

The citation of the Lafayette Squadron, formerly the Lafayette Escadrille, is signed by General Petain and reads as follows:—"Brilliant unit which has shown itself, during the course of operations in Flanders, worthy of its glorious past. In spite of losses which took away a third of its effectives, in a difficult sector, it has assured a perfect security to our Corps Observation airplanes, a complete service of reconnaissance at both high and low altitude, and the destruction, not only near the front lines but deep in the enemy's territory, of a great number of German airplanes and captive balloons."

The 17th and 148 Squadrons which served with the British Royal Air Force were cited in letters by both Generals J. M. Salmond and J. Byng, when they were transferred to the American Army. In citing the 90th Squadron, General Bell, Commanding the 33d Division says in part:—I wish to express to you at this time my appreciation for the valuable and efficient work your Squadron has done while serving with us. You have met all our requests with willing compliance unless prevented unquestionably by the elements. Your greatest cooperation has been in assisting us in locating our lines, which you have done repeatedly with uniform success and accuracy."

Attached to the citation is a list of the pilots of this squadron, as is the case of this citation of the 99th Aero Squadron, by Major General J. E. McMahon, in which he especially mentions pilots and balloonists as follows:

Captain William O. Butler, Germantown, Pa. Lieutenants James A. Healy, Jersey City, N. J.; Thomas J. Abernathy, West Pembroke, Me.; Sidney I. Howell, East Orange, N. J.; Arthur H. Jones, Hayward, Cal.; Lee M. Hurphy, Roxbury, Mass.; Ralph A. O'Neill, Nogales, Ariz.; Charles P. Porter, Beechmont, New Rochelle, N. Y.; Kenneth L. Porter, Dowagiac, Mich.; Joseph C. Raible, Jr., Hannibal, Mo.; Louis C. Simon, Jr., Columbus, Ohio; James E. Wallace, (Exam.ned) Atlanta, Ga.

The Italian Croce al Merito di Guerra was awarded to the following:

Major Florello H. La Guardia, New York City, N. Y., First Lieutenants James L. Bahl, Wooster, Ohio; Raymond P. Baldwin, Brookline, Mass.; Arthur M. Beach, Apalachin, N. Y.; Allen W. Bevin, Princeton, N. J.; Gilbert P. Bogart, 1219 N. State St., Chicago, Ill.; Arthur F. Clement, 606 Whitlock Ave., Crawfordville, Ind.; Wm. G. Cochran, Southold, L. I.; De Witt Coleman, Jr., Tenafly, N. J.; Kenneth G. Collins, Port Jefferson Sta., N. Y.; Alexander M. Craig, 79 Worth St., New York City; Herbert C. Dobbs, Jr., 221 B St., N. E., Washington, D. C.; Edmund A. Donnan, 115 Wade Ave., Washington, Pa.; Norton Downs, Jr., Threee Tuns, Pa.; Arthur D. Farquahr, Sandy Spring, Md.; Harry S. Finkenstaedt, University Club, Detroit, Mich.; Willis Fitch, West Medford, Mass.; Donald G. Frost, Paterson, N. J.; William O. Frost, no address; Gosta N. Johnson, Good Pine, La.; James P. Hanley, Jr., 110 Broadway, Wheeling, W. Va.; Geo. C. Hering, Felton, Del.; Wallace Hoggson, Greenwich, Conn.; LeRoy D. Kiley, 3227 Ellis Ave., Chicago, Ill.; Herman F. Krueger, Niosho Falls, Kan.; Paton MacGilvary, Madison, Wis.; Coble Mitchell, Grinnell, Iowa; William H. Potthoff, Logansport, Ind.; Aubrey G. Russell, no address; Wm. B. Shelton, Ithaca, N. Y.; Norman Sweetser, Philadelphia, Pa.; Emory E. Watchhorn, Los Angeles, Cal.; Frederick K. Weyerhauser, 509 North Yakima Ave., Lacoma, Wash.; Warren Wheeler, no address; Alfred S. R. Wilson, Santa Barbara, Cal.; Warren S. Wilson, 2063 Green St., San Francisco, Cal. Second Lieutenants Spencer L. Hart, Whitakers, N. C.; James Kennedy, Lansdown, Pa.; Norman Terry, Fulton, Ky.

New R. M. A.'s

In accordance with recommendations of the Training Section, the following-named officers are rated as Reserve Military Aviators, from the date set after their respective names: 1st Lieut. William Green, 1st Lieut. Aaron E. Jones, 2nd Lieut. Thomas J. Farrell, 2nd Lieut. Thomas C. Fitzhugh, 1st Lieut. James J. Donahue, 2nd Lieut. Jules D. Biscayart.

Air Units to Return

The following organizations have been assigned to early convoy: 16th Aero Squadron, 20th Aero Squadron, 227 Aero Squadron, 266th Aero Squadron, 353d Aero Squadron, 42nd Balloon Company 43d Balloon Company; 69th Balloon Company, 840th Aero Squadron, 488 Aero Squadron.

Recent Naval Orders

Lieutenant Louis C. Higgins, to duty as engineer officer, naval air station, Pensacola, Fla.

Lieutenant Rodman J. Miller, to Pensacola, report to commandant U. S. naval air station for dirigible instructions.

Captain D. C. Hanrahan. Northern bombing group, to post officer Danzig.

Lieutenant (junior grade) Le Roy C. Flino ordered to duty at office of Naval Operations Aviation, Washington, D. C.

Lieutenant Commander Charles P. Mason, ordered to command flight of two F-5 boats to Pensacola, Fla., is revoked.

Commander John B. Earle, report to commandant, Naval Training Station, San Francisco, for duty.

Navy Takes Over Cape May Property

Three hundred and forty-nine acres of Cape May property which are now occupied by the Naval Air Station, the submarine base and barracks, have been taken over by the Navy Department.

Commander J. B. Patton, in charge of the Fourth Naval District, has notified property owners to remove all individual property from the tract.

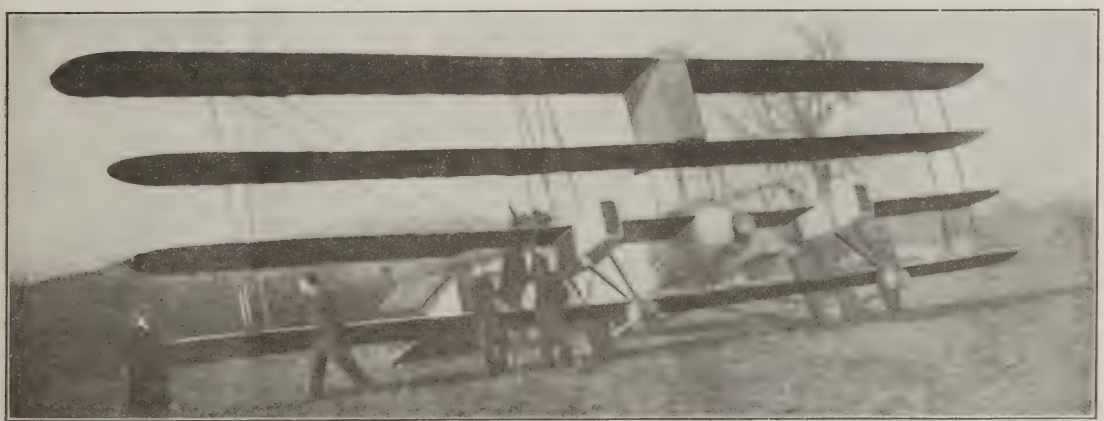
The owners are asking a sum aggregating $4,000,000 for the land and if no agreement is reached with the Navy Department, a board of appraisers will determine the price to be paid.

Colonel Claggett Made Aerial Supervisor of Northwest Texas District

Colonel Henry B. Claggett has been appointed Aerial Supervisor of the Northwest Texas District. This district embraces the flying fields at Fort Worth, Dallas, Loanoke, and the balloon school at Omaha.

Prior to assignment to this duty Colonel Claggett was commanding officer of the Flying Department at Kelly Field. He is a West Point graduate.

Colonel Bruce B. Buttler will take Colonel Claggett's place as director of the Flying Department at Kelly Field.



The Pemberton-Billing quadrupleplane. Designed by the English aeronautic enthusiast

FOREIGN NEWS

Colonel Leclerc Outlines French Aeronautic Plans

Paris.—*L'Excelsior* publishes an interview with Colonel Leclerc, who has been appointed to put into operation a scheme of aeronautic communication.

The type of aeroplane to be used for such service is under consideration, Colonel Leclerc's preference being centered on a four-motored biplane equipped with 800 horsepower motors, giving a speed of 800 horsepower and a carrying capacity of 1,800 pounds.

The planes will carry passengers, mails and commercial goods. The cost, Colonel Leclerc is convinced, of aerial journeys will soon be so reduced as to be no more than present railway fares.

German Politicians Receive Daily News By Aeroplane

Berlin.—The *Zeitung Am Mittag* is the first newspaper to employ aircraft for distribution. Its issues are being carried to Leipsig and Weimer, arriving far in advance of other Berlin newspapers.

Herr Ullstein, of the National Assembly, has arranged for regular newspaper delivery to the delegates at Weimer, having chartered several aeroplanes for the purpose.

Allied Aerial Superiority Annoys Bolsheviki

Archangel.—British and Russian aeroplanes flying low over the frozen timberland lying between the Vaga River and the Vologda Railway are seriously harassing the Bolshevik forces. In such operations, Allied superiority has proven a serious handicap to the enemy.

On February 9 Allied planes bombed the towns of Taresova and Shagovari.

French Firm Sues On Wright Patents

Paris, February 1.—The General Company for Aerial Navigation, which owns the Wright aeroplane patents in France, has resumed legal action against infringers of the patents with a view to having a claim to royalty on machines built on the principle of patents recognized.

It is understood that the company claims a royalty of 1,000 francs on every machine made since the beginning of the war. Its claims aggregate 30,000,000 francs ($6,000,000).

Fonck Made Captain

Paris—René Fonck was notified at a luncheon given in his honor by the Foreign Service Committee of the Aero Club of America that he had been promoted to the rank of Captain in the French Air Service.

Ambassador Sharp, who presided, stated he would not be surprised if Captain Fonck, after receiving a great welcome in the United States, would return to France by aeroplane.

Air Raid In Portugal

Lisbon—Two seaplanes of the Portuguese Republican Forces dropped proclamations on Oporto, the Monarchist stronghold and returned safely to their base, at Aveiro. En route, they bombarded and damaged the railway from Espinbo to Granjas.



Capt. Andrew Lang, R.A.F. and Lieut. Blowes taken after making a 30,500 foot altitude record

Market for Aeroplanes in Chili

According to official information transmitted to the British Board of Trade Journal by the British Consul at Valparaiso, there is a possibility that aeroplanes will be used to transport officials from the nitrate mines to the ports of export. At present a number of days are required to accomplish the journey, which an aeroplane can cover in a few hours.

It is stated that a local firm has already made application for representing as agents a well-known British aircraft firm.

Congressmen Make Cross-Channel Flight

Paris.—Representatives Patrick D. Norton of North Dakota and George White of Ohio returned from London to Paris by aeroplanes. They made the trip in two hours and twenty-five minutes.

American Representatives to Air Conference

Paris.—The International Aviation Conference, which is to be held in Paris in the near future, will have as representatives from the United States Brigadier-General Mason Patrick, Dr. F. W. Durand, of the National Advisory Committee on Aeronautics, and a naval officer. It is reported that Rear-Admiral H. S. Knapp will be the naval representative.

Zeppelins for Passenger Service

Berlin, February 13.—Several Zeppelins of a light type will be constructed for passenger traffic between Berlin and Switzerland, it was recently announced. It is planned to establish an aerial transportation line with them next summer.

Four Hours for London-Paris-London Trip

Paul D. Cravath, who was advisory counsel to the American Mission to the International Council on War Finance, made a record flight in a machine of the British Air Service Passenger Ferry. Leaving Hendon, a suburb of London, at 11 o'clock in the morning in a DeHaviland IV, equipped with a Rolls Royce engine, he was flown straight to Paris, arriving at 1:20 o'clock The return trip was completed in one hour and fifty minutes, making the over-all time four hours and ten minutes. Mr. Cravath did not go back to Paris on this trip. He was most enthusiastic as to the possibilities of rapid passenger transport by aircraft when interviewed by the press.

Air Invasions Dreaded

Paris, February 15.—In an interview with Professor Ferdinand Larnaude, Dean of the Paris Law Faculty and one of the French delegates on the League of Nations Committee, the fear of German treachery, particularly as to the possibility of a sudden aerial invasion of France, was given as the reason for France's insistence on a League of Nations which is potently armed. The Professor stated that it seemed quite within range of possibility for Germany to secretly prepare an aerial fleet which in one day could inflict terrific damage on the city of Paris.

Fireproof Petrol Tank Developed

London, Feb. 13.—A new petrol tank, which will neither leak nor catch fire when perforated by incendiary bullets, the *Daily Mail* says, has been added to the list of wonderful war inventions.

These tanks were being built and fitted in British aeroplanes as fast as possible when the armistice was signed. Had the fighting continued, British pilots would have been immune from one of the greatest causes of casualties.

This invention is to be applied to commercial aeroplanes.

England to India Flight Completed

London.—The Air Ministry announced that on January 16 the Handley Page machine, which started from England on December 13, arrived safely at its destination in India.

British Remove Flax Control

London.—The Flax Control Board announces the rescindment of the Flax Yarns Order, 1918, and the Flax Yarns Amendment Order, 1918, by which the Board's permission was required for the shipment of flax line or tow yarns both to and from Ireland.

British Air Ministry Well Represented at Peace Conference

London.—According to a semi-official announcement the Air Ministry is represented at the Peace Conference by thirteen delegates.

Record Paris-London Flight

London, Feb. 13.—The British Air Ministry announces that a British service machine made a record flight between Paris and London, covering the distance in one hour and fifty minutes.

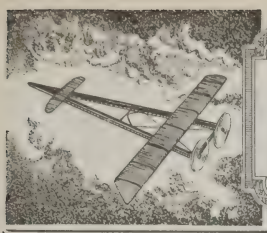
Make Good Time in London-Edinburgh Flight

At 3 a.m. on January 17, a Bristol fighter biplane, with Rolls-Royce engine, piloted by Major C. L. Payne, M.C., with Major C. Coe as observer, landed at Edinburgh, having flown up from London. Their actual flying time for the 400 miles was 3 hours 40 minutes, but a forced descent on the way, due to petrol trouble, increased the gross time to just over five hours. Considerable wind was met on the journey, and for most of the way the bright moonlight proved helpful. At the chief aerodromes on the route flares were lighted, and as the machine passed each station signal lights were fired from the machine.

14 Men Drink Wine, Play Cards, On Joy-Flight

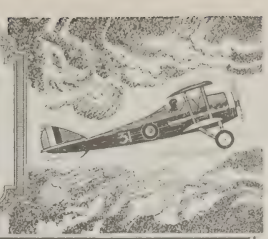
London, February 11.—After flying from Paris to Croydon, an aeroplane with fourteen French officers aboard made the return journey, reaching Paris safely, says a copyright dispatch to the New York *Times*. The machine covered the non-stop journey of 200 miles from Paris to Croydon in 155 minutes.

The officers, despite the cold weather, wore their ordinary uniform without being protected by flying "warm." When the channel was reached a champagne luncheon was served aboard, and the officers smoked, played cards and altogether had an enjoyable journey.



ELEMENTARY AERONAUTICS
and
MODEL NOTES

By John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

"Modern Aeroplane Building as a Step to Aeronautical Engineering"

IN conclusion to the series of articles titled "Model Aeroplane Building as a Step to Aeronautical Engineering" the writer feels that although a reader who has followed the articles from the beginning will not be an engineer in the strict sense of the word, he will have passed the rough stages of aeronautics and he will be in line for the more difficult studies to follow.

The author did not propose to develop a school-boy or an older beginner into an experienced designer of aircraft when he began these articles. He endeavored to merely give them a better and broader knowledge of aeronautics and to take a few technical formulas used for determining the performance of a machine and to transpose it into "easily understood by the average person" formula.

That these articles have done all that I expected has been proven to my satisfaction by the great number of letters and inquiries received daily pertaining to the calculations of aeroplane performance. In later articles I intended to go deeper into "Aeronautical Engineering" and show how to figure strains and stresses, strength of materials, sizes and dimensions of different parts to stand certain strains, in fact everything pertaining to Aerodynamics that I have not included in these articles.

Any student of Aeronautics who has followed this series from the very beginning and has constructed the models, gliders, and lastly the Ford motored Aeroplane is an aeronautical engineer and is entitled to call himself an engineer. Of course you know that to be known as "Engineer" it is necessary to win a "Degree" at some university and for that reason you cannot sign the big "A.E." after your name.

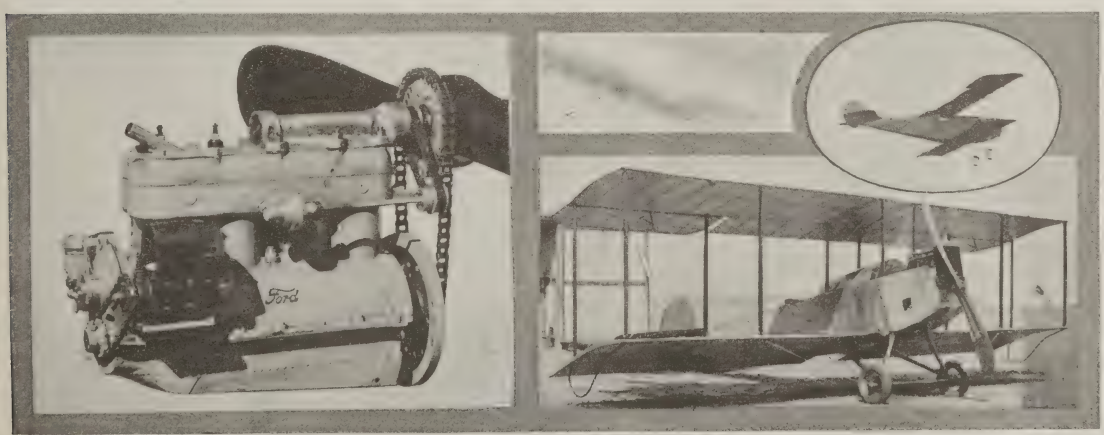
It is well to glance back a few years to the days before the aeroplane was a success and we see that old and young men alike were flying model aeroplanes driven by rubber bands, steel springs, compressed air, steam and gasolene motors, just as the model flyers of today are doing. The difference between those bygone days and model flyers of today is that they were working without any guide or figures and the flights of the models were for distances of about 50 feet while the aeromodelists of today have records and data to guide them, and the flights of some are upward of a mile.

Many of the old model flyers are today the best Aeronautical Engineers in the world, and have done wonders in the development of aircraft up to the present time.

So the model flyers of today can develop into the best "Engineers" of ten years from now and the field is large and profitable. You model flyers of today will see large aeroplanes capable of carrying tons of useful loads and many passengers arriving like the big steamships and the fast trains between our large cities. Even now aeroplane builders are in a neck and neck race to see who will be the first to cross the Atlantic Ocean and this I believe will be done by the first good aeroplane that attemps it, which will be as soon as the good weather arrives.

Not alone will there be these large machines but small fast pleasure and commercial planes as well and I might say here that there is plenty of room for improvement as the 100 per cent. efficient aeroplane is not in sight as yet and you, the young engineers of today, have a wonderful opportunity of developing something new and startling.

The accompanying illustrations of the re-designed Ford motor which shows how cleverly and compact a Ford motor can be made to give great power. This motor is the work of Mr. P. P. Bent, Fredonia, Kansas, and he has used it for four years in a Curtiss Pusher Type Machine. This motor has given a thrust of 340 lbs. actual test, with a seven-foot diameter, 5½-foot pitch propeller. The engine turning up 2,400 R.P.M. and the propeller running at 1,300 R.P.M. Mr. Bent is a garage man and has done considerable work and made many changes with the Ford Motor and he is now contemplating the building of the Ford motored aeroplane which was described on this page. In the aeroplane to the right of the engine the reader can clearly see the old style Ford radiator and just above it the aeroplane in flight. Mr. Bent flew all last season with this machine, being in the air close on to 800 hours.



Photographs of re-designed Ford motor and a one-seater aeroplane built by Mr. P. P. Bent, Fredonia, Kansas



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Nomenclature

(Unofficial)

Aerodynamics: At the bottom of the whole business.
Air Pocket: Look into any of our heads.
Angle of Attack: The difference between the way it ought to be done and the way we are doing it.
Angle, Gliding: Demotion.
Avion: Some of these days—MAYBE.
Drag: There ain't any such animal in the army.
Drift Indicator: Daily kuizzes.
Gap: Daily, or rather nightly, from 10 p. m. to 5:45 a. m.
Head Resistance: Self-evident.
Instability: Just before the academic board meets.
Lift: Money from home.
Lift-Drift Ratio: The difference between the coin we spend and the coin we earn!
Non-Skids: Hints from the bunch just ahead of us.
Nose Dive: To bust.
Pitch, To: To take a quiz without preparation.
Side Slipping: Women.
Stabilizer: They won't serve it to men in uniform.
Stalling: Doing it without an introduction.
Streamline Shapes: Queens.
Stringers: Most of the women we know.
Trailing Edge: About half of us.
Yaw: To yaw is to swing off the course. Week-ends.
Strain: Evidenced in our case by loss of weight.
Ultimate Strength: Graduation.
Work: Work is the overcoming of a resistance through a distance. Wings against heavy odds.—*Ohio State Pilot.*

ITS AN ILL WIND THAT BLOWS NOBODY GOOD



Someone's Little Mary visits Taliaferro Field
From *The Taliaferro Target*

In the Henhouse Sector

When Daniel Kramer's little black and white dog attacked a skunk in the chicken house at 5:30 A. M. on Friday, the canine was badly gassed, but he would not give up the fight until he had gotten his Hun.—Brighton News.

Not Anticipation

Some try breaking landing gears,
Others try the wheels;
But the biggest chance we seem to take
Is trying to eat our meals.

Looking Ahead

The year 1930. "All the air pilots put their machines in the hangars and refused to go on duty. Large numbers of City people were held up by the strike and had to make the journey to town by the electric trains. The strikers held a mass meeting in the Square, which was addressed by Mr. Dan Flyett, the President of the Union, who said that if the men's terms were not granted they would fly in a body to Washington."

Little Bo-Peep
Left one of her sheep,
To graze on the aerodrome;
An airman descending,
Caught Bo-Peep's sheep bending,
And that's why it didn't come home.

An Insinuation

"Well, Jones, do you like the Air Service, eh? Fine branch of the army, what?"
"Yes, sir! Fine life, sir."
"Ah, fine life! What were you in civil life?"
"In civil life—I was a soldier, sir."

Styles Change

Blue used to be "her color"
It suited cheek and brow,
But she makes up her complexion
So that khaki suits it now.

Technical Points

1. Never put more than 18 pints in the sump, or machine will wobble.
2. Try putting the prop on wrong way round. You will find it very easy to do stunts that way.
3. Always ascertain the amount of petrol in the tank by the aid of a match.
4. If the engine loses "revs" drop another penny in the slot, quick.
5. If an air leak occurs, fetch a plumber.
6. If misfiring occurs, fill magneto with shellac—this will make the spark stick.
7. If the engine is a "dud," fit a Ford.
8. If the engine drops out while flying don't get the "wind up." A J.N.4 can fly on its reputation.
9. If the engine is running rough, squirt carborundum paste into the cylinders. This will smooth things.

A Suggestion

Cadet.—"No, we must be firm, and stick to our determination not to open an 'Answers to correspondents' column. We will oblige you for once, however. When you join the mess, the best way to make yourself popular is to ingratiate yourself with your brother officers. You might even bring a little present for each; homeruns for the Wing Commander would do, and say Mr. Wells' latest novel, for the subs."



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(*Continued from page* 1173)

the greatest range, the most favorable speed will be indicated by drawing a tangent from the origin to the E.Hp. required curve, as at this point the most favorable ratio is attained between velocity and horsepower required.

In the example this speed is found to be higher than the speed for minimum power and is about 73 miles per hour. It will be noted that the tangent to the curve substantially conforms to the curve over the range of speed from 70 to 76 miles per hour. If the endeavor is being made to cover the greatest possible distance, it would be desirable to select the higher of these two speeds, for the reason that at the higher speed the controls would be more effective; the flight would be steadier; and also the flight would be accomplished in a shorter time.

As the aeroplane proceeds its weight will be reduced because of the consumption of fuel, and with a plane of heavy carrying capacity this reduction of fuel at the end of a long flight will appreciably reduce the load and thereby appreciably reduce the horsepower required for flight.

In the example chosen, I have indicated the horsepower required when all the fuel is used up, assuming a weight at this time of 4500 lb. In this condition the most efficient speed will again be indicated by a tangent to the origin, and in the example this speed is appreciably lower than that indicated for the full load condition, being anywhere from 55 to 60 miles per hour. At intermediate stages intermediate speeds will be found the best for the greatest range. This, therefore, indicates that in planning a long-distance flight due account should be given to this effect, as the radius of flight will be appreciably increased if proper account is taken of the influence of change of weight. To be exact, the tangent should not be drawn to the E.Hp. required curve, but to a set of curves which can be derived from these curves indicating the fuel consumption at different speeds and at different loads. The determination of the fuel consumption curves is a simple matter, but it would take more time and space than I consider it desirable to give in this paper. I can state, however, that the favorable speeds for long-distance cruising are not appreciably affected by using these fuel consumption curves in preference to the E.Hp. required curves.

The computations made in deriving the curves shown have been based on the Liberty engine, using straight drive. If it were possible to have available the same power with the geared-down propeller, it would be possible to greatly improve the propeller efficiency and thereby to improve the performance of the aeroplane indicated in the example. It is unfortunate that the geared-down engine is not available for general use, as the performance of practically every plane I know of using this engine in this country would be materially improved by its use. An inspection of the $\frac{V}{ND}$ efficiency plot will make this obvious. I also consider it unfortunate that in the development of the geared-down Liberty engines which have been produced, advantage has not been taken of the possibility of locating the propeller more centrally in relation to the engine group, because of the advantages which would be gained in streamlining. This engine is extremely awkward to streamline in its present form.

Design of Seaplane Floats

I will now proceed to the consideration of some of the elements of design of seaplane floats. The requirements of seaplane floats, because of the nature of their use, are necessarily conflicting, and the best that can be done is to make a compromise, bearing in mind these requirements.

The first requirement of a float is that it shall be seaworthy. This requires that the form shall be properly proportioned to provide good initial stability and a reserve of buoyancy. This is necessary to obtain a reserve of stability, as the seaplane must float without capsizing in a seaway and in strong winds. This requirement in itself conflicts with airworthiness and lightness and with the adoption of the best streamline form, which otherwise would be, in general, a form similar to a dirigible. It must be strong, but this naturally conflicts with being light. It must also have good planing qualities, and this requirement conflicts with streamline form. Airworthiness requires that it should have the minimum resistance and interfere in the least possible degree with the other characteristics of the seaplane.

In order to develop the best form of hull, the Navy Department began experiments at the Washington model basin late in 1911. These experiments were initiated by Capt. W. I. Chambers, U. S. N., with a view to the use of hydroplane blades, such as had been used by Forlanini, and to improving the planing qualities of the then existing types of floats. At that time the most successful float was that constructed by Glenn H. Curtiss, having a simple box section and a sled form profile. At the same time Burgess had developed twin floats having a single step, which had also proved successful.

One of the earliest experiments at the model basin was an attempt to reduce the wetted surface to a minimum by the use of a semi-circular section in the form of a half-cylinder whose ends were pointed like a projectile to reduce the air resistance and the water resistance. It was fortunate that this model was tried among the first, for its trials at once showed up a factor which later was discovered to be of the greatest importance, this factor being suction, due to downward curved surfaces when exposed to the contact of water at high speeds. It was at once realized that in the test of the floats due allowance should be made to represent the change in load carried by the float as the speed of the seaplane increased and the lift of the wings became an important factor, and all runs at the model basin had been made taking account of this and determining for each particular speed the "corresponding displacement" of the float. This was originally done by counterweighting the float so that the weight resting on the water represented that which would be the case taking into account the auxiliary lifting power of the wings. In the latest form of apparatus for testing at the basin this compensation is automatically made by the use of an inclined vane submerged in the model basin, which, by means of a system of pulleys, exerts a lifting power which is proportional to the lifting power of the wings at the speed at which the test is run.

In the tests with the semi-cylindrical model above referred to, it was found, as anticipated, that the resistance at low and moderate speeds was less than that experienced with other models, but as one-half of the speed for the getaway was approached, and therefore the float carried only three-quarters of the original load, it was found that the resistance of this model, instead of decreasing, increased; and that the model, instead of planing, as was expected, settled into the water and, finally, at the getaway speed, with no weight being carried by the float, but the float just in contact with the water, the influence of suction was so great that this model, instead of skimming the surface, proceeded to envelope itself in water and was drawn down so sharply by suction that its deck was flush with the surface of the water in the tank and great sheets of spray were lifted clear of the surface of the model basin.

As the work progressed the models of every known successful type of float were tried in the model basin, and data were collected as to the performance of these models. At the same time many experimental models were tried, and when these showed improvement over existing types, full-sized floats were constructed and tried out in actual flight. From these trials it was found that the conditions indicated in the model basin were duplicated in practice with full size, and it was seen that the model basin tests formed a means of predicting the performance of full-sized floats.

The steps of the Burgess floats were ventilated, and an investigation of this feature showed the value of ventilation for the step-type floats then in use.

All sorts of bow forms were tried and were shown to have very little influence on performance. The use of one, two, three and four steps was tried, and the indications were that there was little, if any, advantage to be gained by the use of more than two steps.

The introduction of the V-bottom showed promise of improvement, but it was early found that a V-bottom at the bow was invariably associated with large quantities of spray which would flow over the planes, and also, in a cross-wind would make the navigation of the seaplanes very uncomfortable. It was found by making the lines hollow at the bow that this spray could be held down close to the water, and in some later designs this hollowness was also introduced at the step apparently with beneficial results. After much experimenting it finally became apparent that the best form of hull was that embodying the single ventilated step, in which the after bottom rose at an angle of approximately 8 degrees to the bottom just forward of the step. The reasons for this are about as follows: With this type of float sufficient buoyancy can be provided abaft the step to eliminate the necessity of tail floats for stability. It was also found that by ventilating the step the water flowing under the forward bottom flowed over the step in the form of an inverted waterfall and that the contact of this inverted stream moved further aft as the speed increased and generally passed clear of the tail of the float just before planing was attained. At this point maximum resistance was encountered. After this point is passed the float proceeds to plane on the forward step, and because of the raised position of the tail of the float, it is then possible to vary the trim of the plane and change the angle of attack without again bringing the tail of the float into the water. Then progressively as the speed increases to flying speed the planing power of the portion forward of the step increases rapidly and the amount of wetted surface exposed to the action of the water is rapidly reduced, and the resistance of the float decreases, until finally at the getaway the water resistance of the float is eliminated.

The best results are obtained where the bottom of the float just forward of the step is substantially parallel to the axis of the seaplane. This portion of the bottom should have no curvature for a distance of several feet forward of the step.

Attempts were made to curve up the portion abaft the step with a view to producing a better streamline form for the hull, but this curvature was invariably found to produce suction, retard planing, and in many cases to augment the resistance of the float to such a degree as to require an excessive reserve of horsepower in order to get away. There was one case where a flying boat was built with very moderate curvature abaft the step, but on account of this curvature in the tail was unable to leave the water with a single passenger. Even though it could get up to a speed where the step itself was clear of the water, the tail would still drag and could not be drawn out of the water. By slightly modifying the tail of the float so that the lines abaft the step were straight, this same flying boat with the same powerplant was able to get off the water with a pilot and passenger.

One of the earliest floats tried at the model basin and built in full size was a twin float having a sharp V-bottom. The lines of this float conformed to the lines of a successful gunboat, and it was very pretty and clean in its action, but due to the influence of the curvature of the buttock lines at the stern, suction was present in this model and an aeroplane fitted with these floats, although able to get away with a pilot, was unable to get away with a pilot and passenger, there being insufficient reserve power to get over the hump.

Until very recently it was considered that so many inches of beam were required for every 100 pounds of weight carried by the float in order to attain planing, and this criterion has led to the adoption of the great beam found in the F-5 and H-16 and HS-2 models. But experiments with floats suited to carry 1,000 pounds each indicated that this model was remarkably satisfactory. The attempt was therefore made to enlarge this model in geometrical proportion to a 2,000-pound float, and the model basin results indicated this could be satisfactorily done. Another model was made of a 2,000-pound float and behaved satisfactorily. This same model was expanded to a 6,000-pound float, which behaved even more satisfactorily than the original. The lines of the N-9 float, which has proved successful in our training program, were developed from the original 1,000-pound float, although this float had less beam than the original full-size float which was unsuccessful. As a result of these trials, I now consider it to be conclusively established that once a satisfactory float is developed for carrying a definite load under given conditions, the same design can be used for larger loads by merely expanding the original lines in the ratio of the cube root of the displacement ratios.

In the design of the float for the NC-1 this principle was used and the model tested in the model basin, although only one-twelfth full size, gave data which indicated satisfactory performance. These data have been closely verified by the actual performance of the NC-1, though many designers were skeptical that this float could handle its load on so narrow a beam. This is no greater than that used in the F-5; the F-5 carries a load of only 13,000 as against over 22,000 pounds carried by the NC-1.

Attention is now invited to a series of curves showing the results of model basin tests on a number of different models.

Results of Model Basin Tests Compared

The dimensions of the floats and the seaplanes they represented were so different that to get a comparison it has been necessary to plot these results on non-dimensional scales. It will therefore be noted that the displacement of the hull is plotted as a per cent of the total displacement based on a per cent of the getaway speed. The resistance of these floats is indicated by a plot of the ratio of the displacement to the resistance; also based on the per cent of the getaway speed.

Based on the plot of model No. 2022, which is that of a successful H-12 boat, I have plotted the resistance and the horsepower required to overcome this resistance for the sample seaplane, the horsepower curves of which I have already explained, and I shall return to those plots in a few minutes. Before doing so, however, I wish to invite your attention to the plots of model Nos. 2081-A, 2081-B and 2081-C. You will note that the resistance of No. 2081-A was nearly one-quarter of the displacement at 40 per cent of the getaway speed; that the resistance of No. 2081-B was reduced to nearly one-fifth of the displacement at about 47 per cent of the getaway speed, and the resistance of No. 2081-C was between one-fifth and one-sixth of the displacement at about 52 per cent of the getaway speed. Also, the displacement in the latter case is less than in the preceding cases.

This change was brought about as follows: The original form of float had two steps, with curvature in the middle step and a rank upcurvature in the rear step. No. 2081-B represents this model with the rear step straightened, and No. 2081-C represents this float with straight lines for the bottom abaft the first step. It will readily be seen that the first modification was an improvement over the original, and the second modification was a still greater improve-

(*Continued on page* 1182)



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(*Continued on page* 1180)

ment. These models represent the model of the NC-1, and there is no doubt in my mind that if the original model had been used this seaplane could not have gotten off the water. Further, the influence of the curved portion at the tail of the float would have been so great as to cause the machine to squat so badly that the tail surfaces would have been caught in the stream of water rising from the tail of the float.

Let us now return to the horsepower curves. It will be noted that the resistance of this seaplane float reaches a maximum at a speed of 20 miles per hour, which speed corresponds to the point at which planing begins and, that there is a secondary hump at a speed of 40 miles per hour. The getaway speed is assumed as 62 miles per hour. The horsepower curve has been directly derived from the resistance of the float, and this horsepower must be compounded with that of the aeroplane progressing through the air. The horsepower required for this purpose is determined by taking the horsepower of the aeroplane at 62 miles per hour, which in this case is 150 E.Hp., and noting that the horsepower for the wings and head resistance is proportional to the cube of the speed. We thus derive the curve of the total air E.Hp. required for the seaplane, which must be compounded with the horsepower required for the float, thus giving us a total horsepower curve for the seaplane for speeds below the getaway speed; that is, while still in the water.

From an inspection of the horsepower curves it will be seen that the maximum horsepower for the float is required at a speed of about 23 miles per hour, and that this, compounded with the horsepower due to air resistance, requires 88 h.p. at this speed.

The horsepower for planing is very little exceeded by the horsepower available, so that it would take a relatively long time to pass through the planing condition; but, after this point is passed, the seaplane should accelerate rapidly because the reserve of horsepower available rapidly increases up to the getaway speed.

There is a secondary hump in the horsepower curve at 60 miles per hour just before the getaway is attained, but this secondary hump is of little importance, as there is an ample reserve of horsepower at this point.

As a matter of interest, I have investigated the improvement in performance which could be expected if a geared-down engine were used, assuming a ratio of 0.6; that is, the propeller turning at 0.6 of the revolutions of the engine. With this gear ratio a propeller 13 feet in diameter is indicated. Such a propeller at a speed of 80 miles per hour would show an efficiency of 73 per cent as against 69 per cent for the 9-foot diameter propeller. This gain of 4 per cent at 80 miles per hour would increase the climb by more than 11 per cent. It would have little effect on the speed, as the horsepower curve is very steep in this region. The improvement in efficiency at 20 miles per hour, although only 6 per cent, would mean an increase of 200 per cent in the reserve of horsepower to get over the hump in the horsepower curve at that speed. You will therefore see why in naval work the use of the geared-down propeller offers considerable advantage. The substitution of the geared-down Liberty for the straight-drive Liberty engines in the F-5 changes the top speed of this seaplane from 90 to 100 miles per hour and makes the getaway of this seaplane certain and rapid under all conditions, whereas the straight-drive propellers were only able to get this boat away in a calm with great difficulty.

The V Versus the Flat Bottom

Experiments have recently been made at the model basin on a series of models having different angles of V-bottom from the flat bottom up to a 20-degree V, and it is found that from a resistance point of view there is very little difference in the performance of the four models tried. So far as any advantage is shown, the deep-angle V has slightly the best of the argument. From a service point of view the deep V-bottom has many advantages; among them its remarkable shock-absorbing properties in taking care of bad landings, or in getting away and landing on a rough sea. The V-bottom also permits landing across the wind without serious retardation and without danger of capsizing sideways. This type of hull appears to absorb the shock by penetration and reduces the loads imposed on the bottom planking and on the framing supporting same. Due to this feature there is no need of carrying shock absorbers between the floats and the rest of the plane structure, and the lightest possible construction can be adopted.

The first hulls built in this country had an elaborate framework of ribs and longitudinals supporting the bottom planking, which afford a regular network having hundreds of intersections requiring fastening, and the fastenings themselves weakened the frames and the longitudinals at the point at which the frames carried concentrated loads on small areas of side grain. This type of construction was unnecessarily heavy and costly and was early abandoned in the construction of pontoons of navy design in favor of the longitudinal system of support.

In the longitudinal system of support the inner ply of planking is run athwartship and thereby constitutes a continuous system of ribs. This system is further reinforced by the outer planking run 45 degrees to the keel, which also acts as a continuous system of ribs, and these two systems transmit the water pressure as a distributed loading to the longitudinal members, which do not have their strength robbed by a series of notches. The longitudinals are arranged so that they collect the distributed load and concentrate it at points of support in athwartship bulkheads and these bulkheads in turn distribute the load to the keel, to the chine stringers, and to the deck planking. The keel itself is usually associated with a center longitudinal truss. Through these members the load is finally distributed to struts or directly to the wing structure.

On a large scale this system is adopted in the construction of the hull of the NC-1, which, although it embodies other features than those necessary to support the bottom planking, weighs only 2,600 pounds, while it carries a load of 22,000 pounds. This hull has demonstrated ample strength in landing on and getting off an 8-foot cross sea in practically dead air, where the landing and getaway were both made under the hardest conditions.

A controversy has existed for years as to the merits of the single float as compared with the twin float, but, based on the experience of our Navy with examples of both types, I believe that the central float with wing tip balancing floats is decidedly the best arrangement. In the central float system the loads can be concentrated on the point of support, whereas in the twin-float system the loads are usually concentrated in the center of the span and the wing structure has to be utilized to gain the necessary stiffness and necessarily has to be made heavier. In the center-float type, if a single propeller is used, it is located above the float and protected from the water, whereas in the twin-float type such propeller necessarily swings over the gap between the floats, which subjects it to punishment by spray and broken water. In landing a twin-float seaplane, unless both floats are landed at the same time, the second float invariably lands harder than the first, being slammed down on the water. Due to the greater lateral stiffness of the twin-float system, when getting off rough water the seaplane is forced to conform in its attitude to the form of the surface and wracks and lurches violently sideways unless going directly across the crest of the sea. In maneuvering in the air, also, the separation of the twin floats adds considerably to the inertia about the longitudinal axis and makes the action of the ailerons less effective. With twin floats, when taxi-ing across a strong side wind, the lee float must have at least 100 per cent reserve buoyancy, and this leads to greater weight than is necessary with the single center-float providing the same stability.

Types of Navy Planes

As above referred to, the principal types of service planes used by the Navy were the HS-2, H-16 and F-5. Your attention is invited to the illustrations of same.

The HS-2 was developed from an original twin-motored seaplane designed for the Army, which, however, did not prove successful. It was originally intended to be used with two 100-hp. engines. Later, when the Navy took hold of it, the Curtiss VX3, a 200-hp. engine, was used, and this seaplane gave a fairly satisfactory performance with this powerplant. At about the same time the Liberty engine became available, and as soon as it was installed it was found that this performance was very much improved and this seaplane was capable of flying at a total weight of about 5,900 pounds. On this basis it was then attempted to convert it into a military machine by providing the necessary guns, bombs and other equipment. After everything had been added, it was found impracticable to carry the military load desired on a limit of 5,900 pounds total weight. The expedient was therefore adopted of adding wing surface, and the original HS-1 thus became the HS-2, capable of carrying a load of 6,500 pounds, with practically no reduction in full speed and with considerable increase in climbing power. Many forced landings have been made at sea; some due to powerplant difficulties, such as stoppage of fuel supply, or failure of the engine or propeller, and sometimes due to head winds forcing a landing on a return trip on account of exhaustion of fuel. Although many of these landings were made under bad weather conditions and in rough seas, in nearly every case landings were accomplished without serious damage to the hull.

The general arrangement of this seaplane is indicated in the illustration. The pilot and assistant pilot are seated in a cockpit just forward of the wings, from which point they have a good view for the operating of the seaplane. A radio outfit is provided just forward of the pilot. A gunner's cockpit is fitted in the bow, and this cockpit is provided with a gun ring and Lewis gun. This gunner has a very good range of fire, particularly ahead and down and on either beam; also upward and to the rear above the planes. But there is no means of firing abaft the beam, and this boat is unprotected against attack from the rear. In the gunner's cockpit are also fitted the bomb pulls and the sight for dropping the bombs, which are located under the wings just clear of the hull. On account of its undefended condition against attack from the rear, this seaplane was not used in sectors where it would be exposed to attacks by enemy aircraft, but there were many places abroad—and, of course, in this country—where no such attack was probable and where this seaplane proved particularly useful in submarine patrol and convoy work. This seaplane is also used for instruction purposes as an advance step toward handling the regular twin-motored seaplanes. The HS-2 was provided with a single Liberty engine and a pusher propeller, and has very satisfactory air maneuvering qualities.

The H-16, as you will see, was a twin-engined seaplane with a flying-boat hull, using tractor propellers. The pilot and observer are seated in a cockpit about half-way between the bow and the wings, where they have an excellent view. The H-16 was also fitted with a gunner's cockpit the same as the HS-2. In addition, a wireless operator was carried inside the hull just forward of the wings and back of the pilots. Abaft the wings an additional gun ring was fitted covering the arc of fire above and between the wings and the tail controls and to take care of the region to the rear and below the tail controls; gun mounts were also fitted, swinging on brackets through side doors in the hull. The bomb gear was operated from the forward gunner's cockpit and four bombs were carried, two under either wing. This type of boat proved very serviceable, and was a substantial copy of the same type of boat built in this country for England, differing only in minor details from those supplied to England. This boat was really a successor to the H-12, which was very similar, except that the hull of the H-12 was more like that of the HS-2 both in construction and in the form of the planing fins.

As you will note, the F-5 is very similar to the H-16, being approximately 10 per cent larger than the H-16. In addition to this increase in dimensions, which was made to afford a greater military load, it will be noted that this seaplane had balanced wing tip ailerons and also a balanced rudder. The hull form is practically identical with that of the H-16. The principal data of all three of these boats will be found in the appendix of this paper.

A little over a year ago the Navy Department decided to build a large seaplane equipped with three Liberty engines and, after consultation, a contract was entered into with the Curtiss Aeroplane & Motor Corporation and a design was developed, under the supervision of representatives of the Navy Department, first at the Austin Street plant of the Curtiss Corporation in Buffalo and later at the Garden City plant of that company. As a result, the NC-1 was developed and built and has recently undergone trials at Rockaway Beach.

It will be noted from the illustration that this seaplane is neither a hydroplane nor a flying boat. It may be considered a compromise between these two types. The three engines are arranged as tractors in separate nacelles placed between the wings, and the pilot and assistant pilot are located in a cockpit just abaft the center motor. A gunner's cockpit is located on top of the center plane, another gunner's covkpit is located in the bow. The tail is of the biplane type and supported by hollow spars in an inverted pyramidal form of structure resting on the stern post of the hull. The pilot and observer have an entirely satisfactory view for general maneuvering and for landing and getaway. It was contemplated that additional gunners would be placed in the after portion of the hull with guns mounted on brackets so that they could cover the arc of fire from the beam to the stern and downward; also that this seaplane would carry a number of bombs, together with a non-recoil gun of large calibre at the bow. Three more of this type are under construction, and advantage is being taken of the opportunity to make a number of changes which it is believed will improve performance over that of the original.

Future Developments

I have been asked to incorporate in this paper some remarks on the future developments for the Navy, but as these more properly come under the subject of operations of the Navy, on which subject we are to hear from Commander Towers, I shall limit my comments to the statement that the Navy Department fully appreciates the desirability of experimenting with a view to improving existing types and the development of new types of seaplanes and aeroplanes, directed to the solution of those problems which have arisen in the war and, more particularly, to the development of seaplanes or aeroplanes for operation with the fleet. This development, as I pointed out at the beginning



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Contractors to the United States Government

of this paper, was naturally set aside because at the time of the entry of the United States into the war the lines on which development was most badly needed were already pretty definitely determined and there was almost no need of aeroplanes for operation with the fleet. I believe that much larger seaplanes are possible and will probably be found useful for naval work, and development on these lines may reasonably be expected.

This paper has already reached too great a length for me to enter into the subject of structural design, which is a very broad subject in itself. It is a matter of interest to know that so far as this branch of aeronautic engineering is concerned, very satisfactory progress has been and is being made, and along these lines some of the greatest improvements in the near future may be expected. So far as aerodynamic engineering is concerned, wind-tunnel experiments and full-sized experiments have now brought this branch to a very satisfactory state, so that the performance of a new design can be very definitely determined, even before construction is begun. So far as the engineering features of float design are concerned, I believe important progress has been made through the demonstration that model basin data can be accurately applied to full-sized design.

Book Reviews

The Skyrider: Compiled by B. M. Bower. This up-to-date narrative of ranch life will thrill and amuse every lover of western stories. The humor that characterized the "Flying U" stories is again to be found in "The Skyrider." Its refreshing variation—the introduction of the aeroplane—should make this rank high in popularity among the B. M. Bower books.

Johny Jewel, of Rollong R. ranch in Arizona, is so obsessed with the idea of flying that, to the amusement of the other ranchmen and to Mary V., the winsome daughter of ranch-owner Selmer, he expresses his ambition in poetry. To assist him in his duty at Sinkhole Camp of preventing outlaws from rushing Rolling R. horses over the border into Mexico, Johnny purchased a damaged aeroplane from a "greaser," who promptly proceeds to steal some of the choicest of the Selmer stock. So absorbed was Johnny in his task of repairing the damaged plane, for which purpose he had enlisted the assistance of a stranded aviator of dubious character, that the "greaser" was able to escape unchallenged. Confronted with the loss by the owner and chagrined by his negligence, Johnny in his aeroplane seeks out the missing horses. There are tense moments of excitement and danger, involving encounters with outlaws, and Johnny escapes with his life.

This book can be purchased at The Aeronautic Library, Inc., 299 Madison Ave., N. Y. C. Price, $1.55 postpaid.

"The Aeroplane": compiled by A. Fage. On account of the rapid advancement in aeronautics, the author has been forced to bring out a revised edition,—the fifth edition—of this publication. In this volume there is explained comprehensively the following: air resistance, wind velocity, distribution of pressure around cylinder and streamline bodies, struts, design and construction of wings, front or main spars, aeroplane fabrics, construction of various types of aeroplanes, namely Bristol 80 H.P. Tractor Biplane, Sopwith Bat-Boat, Sopwith 100 H.P. Hydroaeroplane, Avro Biplane, Blériot Monoplane, Nieuport Monoplane, Wright Hydroaeroplane, etc.,—the equilibrium and stability of an aeroplane, the design, construction, aerodynamic theory, performance and stresses of the two-bladed and four-bladed airscrews, and several modern aeronautical motors, such as: 120 H.P. Argyll, 120 H.P. Beardmore Austro-Daimler, 200 H.P. Salmson, 100 H.P. Grome, Monosonpape types, 100 H.P. Green, 300 H.P. Green, 135 H.P. Sunbeam.

In addition to above mentioned data, there is other miscellaneous material, which will prove of much value to the technical man interested in aeronautics.

This book can be purchased at The Aeronautic Library, Inc., 299 Madison Avenue, New York City. Price, $3.25 postpaid.

The Flying Fighter: Compiled by *Flight*. No branch of Uncle Sam's service is so alluring as aviation. And what greater hero can there be than the birdman who hunts the Hun through the clouds and risks his life in all manners of thrilling and dangerous maneuvers? This is a story of a skilled American air-fighter, who has the most exciting adventures dropping bombs on Ostend, chasing German raiders over London, spotting submarines and battling with the enemy 18,000 feet in the air. It gives a vivid picture of life on the western front as thousands of our boys have seen it.

Following is a list of the contents I Off for Canada; II Young Airmen; III Learning to Fly; IV Aerial Gunnery; V Final Training; VI My First Reconnaissance; VII An Air Raid on Belgium; VIII Contact Patrol; IX Artillery Observation; X Aerial Photography; XI Coast Defence Work; XII Repelling Zeppelin Raids; XIII Night Flying; XIV My Last Air Battle; XV Back to New York.

This book can be purchased at The Aeronautic Library, Inc., 299 Madison Avenue, New York City. Price $1.50 postpaid.

Sunstedt-Hannevig Seaplane

(*Continued from page* 1162)

run out with a small piece of spruce between, serving as a very flexible trailing edge, greatly increasing the stability and gliding efficiency of the machine.

The lower plane is entirely constructed of solid ribs, with a chord of 8'-0". The wing ribs are cut out of a special three-ply veneer, with lipped ends, fitting closely into the boxes of the I-beams, and fastened in place by means of two cap strips, glued, nailed and screwed to the webs and wing spars.

At the points of fastening the interplane struts to the main spars of the wings, there is an internal steel compression tube, reinforced at the ends, bolted in place, and sockets fastened directly to the main spars, interbraced diagonally with solid steel wires fitted with turnbuckles for adjustment and locked, taking up all of the drift and other strains on the wings, and subjecting the wing ribs to the one purpose of lift only.

The ailerons are of strong construction, located at the wing ends, and hinged to the upper rear beam by means of eye-bolt hinges.

The wing section used in the U. S. A. No. 5, which is especially designed for high speed and great lift, serving as a medium between a scout and an extra heavy lifting wing, and, as well, has high structural safety factors.

The interplane struts are all made of seamless steel round tubing, streamlined with Balsa wood encased in linen, and the struts with reinforced ends are fitted into sockets which are bolted to the main spars of the wings by four nickle steel bolts straddling the wing spar to tie plates on the opposite side of the spar.

All brace wires in the wing cellule are Roebling stranded steel cable, doubled where necessary, and attached in the most approved method to shackles and turnbuckles. Control cables are of flexible cable, and all internal wing drift wires and fuselage wires are of solid steel.

Tail Assembly

All of the tail surfaces are built up of steel tubing and wood spars, with laminated ribs and spruce cap strips. They are all covered with linen and treated with dope and then painted, as are also the wings.

The control is by standard methods of arms and cables, and the bracing of the tail is such as to make a very rigid construction. The horizontal stabilizer is adjustable to correct for uneven loadings when necessary.

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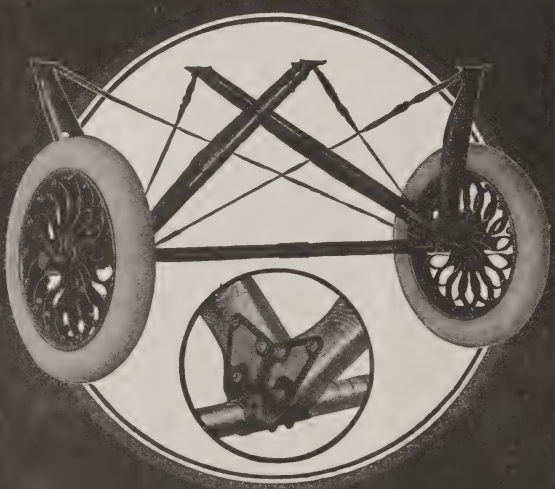


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AERIAL AGE WEEKLY

Vol. 8, No. 25 MARCH 3, 1919 25 CENTS A COPY



The Future of the Aeronautic Industry

BLISHED WEEKLY BY THE AERIAL AGE COMPANY, INC., FOSTER BUILDING, MADISON AVENUE AND FORTIETH STREET, NEW YORK CITY
scription: Domestic, $4. Foreign, $6. Entered as second-class matter March 25, 1915, at the Post Office at New York, under the act of March 3rd, 1879



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AERIAL AGE WEEKLY

VOL. VIII MARCH 3, 1919 No. 25

TABLE OF CONTENTS

	PAGE
American Aeronautics' Great Future	1217
Liquidating 24,000 Contracts	1218
The News of the Week	1219
The Aircraft Trade Review	1222
A New Principle in Carburetion	1223
American Aeroplanes and Seaplanes, 1918-1919	1224
The Manufacture of Veneer and Plywood	1240
American Aero Engines:	
The Liberty Twelve	1242
The King-Bugatti	1243
The Curtiss K-6 and K-12	1244
The Hispano-Suiza	1245
The Duesenberg Model H	1246
The Lawrance 60 H.P. Engine	1247
The Union 6-Cylinder Aeromotor	1248
The Knox Twelve	1249
The Hall-Scott A-8	1250
The 80 H.P. LeRhone	1251
Characteristics of Leading Aero Engines	1252
Honor Roll of the Air Service	1255
The Aeronautical Radiator	1257
Napier "Lion" Aero Engine	1262
U. S. Aerial Mail	1265
Naval and Military Aeronautics	1266
Foreign News	1268
Elementary Aeronautics and Model Notes	1269
Aeronitis	1270

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Air Service Demobilization

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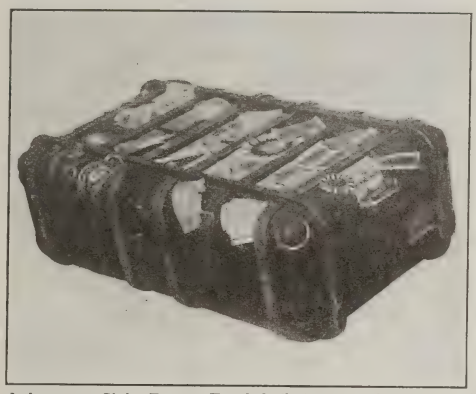
If **YOU** hold any of the above qualifications, but have not yet registered, you are invited to communicate with the Editor (Air Service Demobilization Department) AT ONCE.

280 MADISON AVE., NEW YORK

Pioneer History of Water-Proof Ply-Woods

Its development in America by the Dodge Manufacturing Company, as applied to

INDESTRUCTO Products



Indestructo Globe Trotter Trunk built in 1904 of water-proof ply-wood

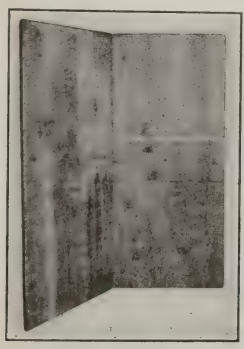


Indestructo bottler's case patented in 1904—built of water-proof ply-wood

THE process of wood lamination or wood veneering dates back to the time of Pliny in the days of the Roman Empire, at which time it was quite generally used on fine furniture.

While the present process is a common one to wood workers, the scope of the practice was until 1904 limited, on account of the failure of known glues and cementing processes to hold under all conditions of atmosphere and contact with moisture.

In 1904, coincident with the growing necessity for the conservation of timber, came the discovery of the Indestructo ply-wood process, and its introduction to the American markets by the Dodge Manufacturing Company, as the first water-proof ply-wood that had been offered for commercial use in this country.



Large water-proof seven ply panels built for table tops in 1908

No branch of forest utilization, with the possible exception of pulp wood has shown such rapid development in the last ten years as the veneer industry as a whole.

In 1905, 132,800,000 feet of logs were used by veneer makers, but as the amount of timber cut from the log averages about 20% greater than the logs measure, it is safe to say that the timber used for veneer stock would have made more than 166,000,000 feet of ordinary lumber.

Until the discovery of the Indestructo process, only a few of the hard woods were available for use in laminated woods.

By the Indestructo process all woods except those containing resinous sap can be utilized in the manufacture of water-proof, weather-proof multi-ply construction.

In 1904 the first commercial product manufactured of water-proof ply-wood was placed on the market; this was the famous Indestructo trunk made by the Dodge Manufacturing Company of Mishawaka, Indiana, and of which there have been 275,000 sold in the last fourteen years.

Heretofore the "Veneering process" had been largely applied to fine furniture, pianos, interior finishing, etc. Quite naturally the Dodge Manufacturing Company, after its acquisition of the veneer process, searched the available commercial fields for the exploitation of ply-wood as a substitute for solid woods for utility purposes.

The Indestructo bottler's case was developed in 1907, and sold by the hundred thousands to brewers all over America.

This was one of the most difficult and exacting usages to which ply-wood had ever been subjected.

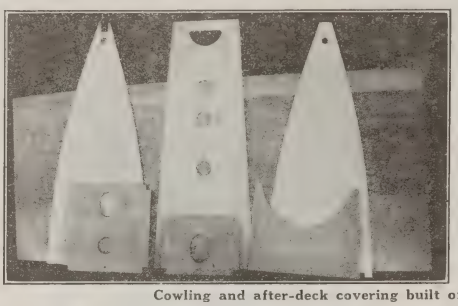
Contact with moisture, steam and spirits in bottling houses constituted a test that proved beyond a shadow of a doubt the adaptability of Indestructo ply-wood for such purposes.

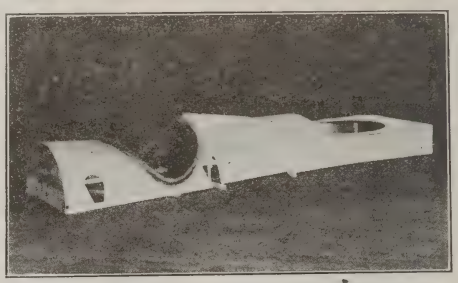
During that time the ply-wood manufactured by the Dodge Manufacturing Company had been made and sold on water-proof guarantee since 1904.

It had been subjected to the most unusual tests, of which the most notable perhaps was the construction in 1916 of a large sign board, 30 feet long by 12 feet high, erected near the plant for advertising purposes.

The face of this board consisted entirely of three-ply veneer, protected only by paint against the elements.

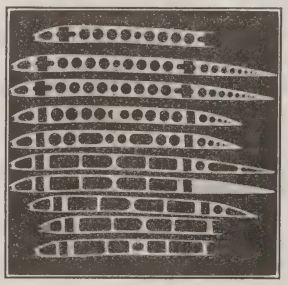
That the board is standing today in its original condition is sufficient evidence in itself of the durability of the product made by the Dodge organization.





Cowling and after-deck covering built of Indestructo ply-wood for DeHaviland Fours

In 1908 the Dodge Manufacturing Company installed in the new mill of Hecker-Jones-Jewell Milling Company of New York, 20 flour receiving bins, 50 ft. high and 4 ft. in diameter, and holding a slipping load of 30,000 pounds of flour each. These receptacles superceded the use of the old style stave and steel equipment, because of their freedom from sweating and caking of flour on the inside surface and as a protection against vermin.



Ply-wood wing members for De-Havilands

These bins are in operation today, and are in as good order as when they were put in eleven years ago. This same installation included the housing equipment for 112 roller mills.

In 1906 the first ply-wood barrel was constructed.

A striking feature of its pioneer construction was its lightness and the elimination of leakage, as well as the unit head.

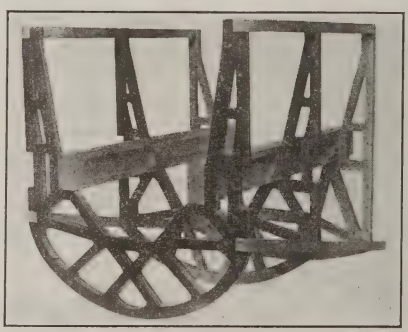
Safety covering for factory machinery, all types of trunks, laundry hampers, meat carriers, delivery boxes, heat deflectors and wall covering followed the process of engineering development up until 1916 when the attention of the Government was first directed to the necessity for water-proof ply-wood to be used in airplane and dirigible construction.

There is no doubt in the minds of the commercial world as to whether or not the Dodge Manufacturing Company made the first use of water-proof ply-wood in America.

There is no doubt in the minds of the users of Indestructo trunks and other products since 1904, that the material used in the construction of these products was actually of the water resisting type, and embodied maximum strength with minimum weight.

In 1917 the United States Government first experimented with ply-wood for use in aeroplane construction.

The Dodge Manufacturing Company taking the initiative, immediately placed its entire organiza-



Engine bearers for Liberty motored DeHaviland Fours

tion of engineers and practical mechanics at the disposal of the Government in working out a suitable basis upon which ply-wood could be produced in great quantity for such uses.

land 4's, working in conjunction with the Dayton-Wright Aeroplane Company of Dayton.

Press capacity was immediately increased to meet the demands of the Government, and thou-

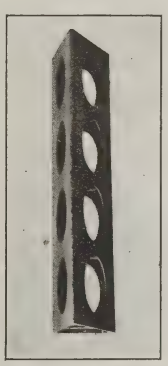




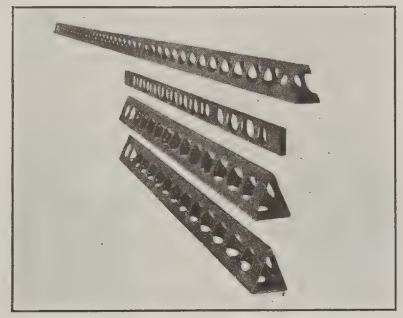
Interiors of airplane construction rooms in Dodge Mfg. Co. Plant No. 2

Co-operating with the various national testing, experimental and research laboratories, the Dodge organization placed at their disposal the vast amount of data and practices collected in the course of 14 years' experience with water-proof ply-wood, thus enabling a rapid and thorough

sands of feet of water-proof ply-wood was furnished to the Naval Aircraft Factory at Philadelphia, to the L-W-F Engineering Company, and its sub-contractors for use on sea-planes; to the Thomas Morse Aircraft Company of Ithaca, N. Y., and to other of the leading builders and sub-con-



Transverse girder, 3 ft. long weighing 12 oz. that broke at 22,600 pounds pressure



Transverse girder sections built for Bureau of Naval Construction and Repair



Testing Press in Dodge Laboratory

adaptation of tests and standards by which the facilities of wood workers in other lines might be adapted to the intensive production that was required.

During the period of the war the Dodge Manufacturing Company constructed cowling, afterdeck covers, wing beams, ribs and engine bearers, for the De Havi-

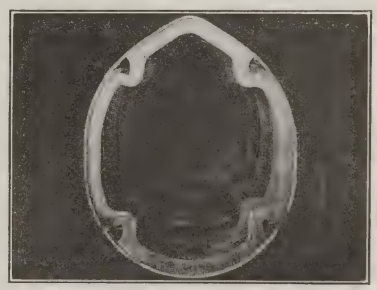
tractors of aircraft, working on Government contracts.

In the Fall of 1917, the Bureau of Naval Construction and Repair of Washington submitted drawings from which samples were to be built and tested, covering transverse girders and other frame members for dirigibles.

After considerable



Monocoque fuselage built without cross wires or interior bracing

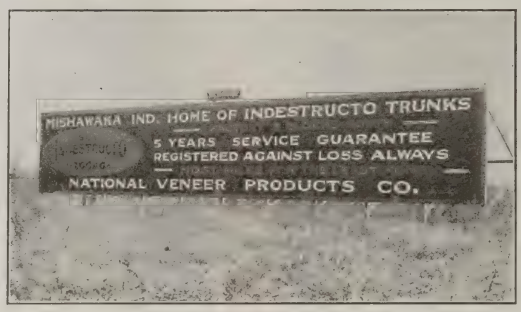


End view of Monocoque fuselage

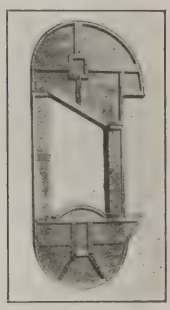
study and experiment at the Dodge plant, a triangular girder was built, a three-foot section of which, weighing 12 ounces per foot, finally broke under a total pressure of 22,600 pounds, or 6,027 pounds per pound of weight.



Flour mill boot made of ply-wood with butt joints affording smooth interior surface



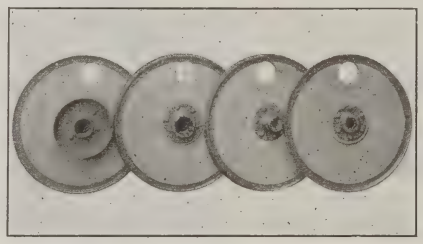
Ply-wood sign board exposed to weather protected only by paint



Ply-wood safety covering for Band Saw

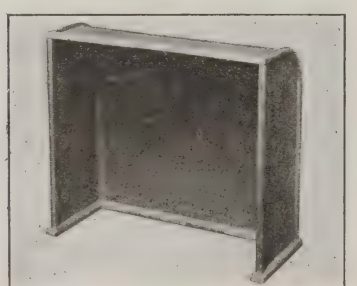
Photographs accompanying this article on the opposite page, show the girder and the hydraulic press used in testing.

The first Monocoque fuselage built in this country was submitted to the Government early in 1917. This fuselage was built without cross wires or bulk heads, the strength of the whole structure being carried by the skin and laminated longerons, as illustrated on the opposite page.



Motor car wheels built of heavy ply-wood

In addition to the manufacture of aeroplane parts, the Dodge Manufacturing Company designed and constructed field container and shipping cases for the Lewis machine gun and balloon trunks of considerable size for the Goodyear Tire & Rubber Company.

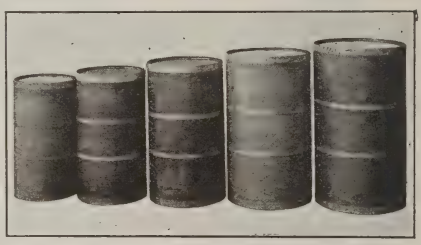


Heat deflectors for hot air registers

The files of the Dodge organization are filled with hundreds of testimonials from users of Indestructo products that prove conclusively the general satisfaction that has been experienced in the last fourteen years from the use of Indestructo ply-wood.

Considerable literature has been issued from time to time by the Dodge organization and is available to those requesting it.

The war is over, and while the demand for aeroplane parts constructed of ply-wood is in suspension pending the rearrangement of the industry to meet the peace-time program, the wheels of the Dodge plant are turning just as busily in the production of their regular ply-wood products as they were before the interruption caused by the war.



Ply-wood barrels of progressive sizes for nesting during return shipment

The demand for Indestructo trunks, hampers and other products is greater today than it has ever been, and one need only step into the highest-class trunk-selling store in any city to learn once and for all how highly Indestructo-made goods are regarded by dealers and users throughout America.

From the position of pioneer to that of leadership, covering a period of fifteen years, each filled with study, experiment, failure and ultimate success, the Dodge Manufacturing Company have found a satisfaction in the development of Indestructo ply-wood products that fully measures up to the accomplishments of Dodge products in other lines.

Dodge equipment for the mechanical transmission of power is known the world over for its quality, standardization and reliability for the service intended.

And we point with pride to our final record of achievement in the ply-wood industry as being the highest recommendation of the Dodge reputation as engineers.

DODGE MANUFACTURING COMPANY

Ply-Woods Products Division

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright THE AERIAL AGE CO., March 3, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, MARCH 3, 1919 NO. 25

AMERICAN AERONAUTICS' GREAT FUTURE

AMERICAN aeronautics has a great future. It only requires the proper impetus to start the different aeronautic activities.

This impetus is to come through the combined results of the Aeronautical Exposition being held at Madison Square Garden and the 69th Regiment Armory and the Aeronautic Convention and aerial contests to be held under the auspices of the Aero Club of America, the Aerial League of America and the Pan-American Aeronautic Federation in May.

Substantial results are assured from these successive events. The present exposition will show the aircraft produced in the United States during the past year. The aerial contests to be held in May will show in operation the aircraft which are ready for sport, aerial transport of mail, express and passengers, exploration, aerial forest patrol, meteorologic research, and other utilitarian purposes, as well as the military and naval aircraft.

The Aeronautic Convention is to bring up for consideration every important phase of aeronautics and is to be attended by hundreds of authorities from all over the world and, it is expected, by thousands of people. The plans for both the contests and the convention, which are to be announced in a few days, are most extensive and promise to answer the questions which thousands of people have been asking during the past three months regarding the future of American aeronautics.

Whenever we have stated that American aeronautics has a great future and that the "peace" aeronautic movement would soon be established on a substantial basis, scores of people have asked:

"When and how will these aeronautic activities start? Will these activities start on time this year to partly fill the gap in the aeronautic industry caused by the cancellation of war orders?"

The extensive use of aircraft for sport, pleasure, aerial mail carrying and aerial transportation of express and passengers are some of the most substantial developments to be expected in the United States this year.

Latin-American Missions coming to Air Contests and Aeronautic Convention.

Lack of time in which to get here prevented the Latin-American missions from coming to the United States for the present exposition. But they will be here for the Contests and Aeronautic Convention to be held in May. The twenty Latin-American republics need aircraft for their military and naval schools as well as for aerial transport of mail, passengers, express and products. There the aircraft promise to solve difficult problems of transportation. These problems are also to be discussed at the convention in May, and the Latin-American commisisons will be given the opportunity to see in flight the aircraft which are to solve the problems under discussion.

Remarkable Opportunities

"Permit me to urge that you bring to the attention of the country the fact that today aeronautics offers even greater possibilities than the railroad field did to the Vanderbilts, Harriman, Hill, and other great railroad builders. The world is ready for aerial transportation and the men whose foresight leads them to put their efforts in establishing air lines will find aeronautics to offer greater possibilities than were offered by any other line of human endeavors."

Thus Rear Admiral Peary, one of the energetic and progressive leaders of the aeronautic movement, summarized the splendid prospects for the employment of aircraft for transportation and other utilitarian purposes in his message to the Aero Club of America last week.

Like Mr. Alan R. Hawley, the progressive president of the Aero Club of America, and Mr. Henry A. Wise Wood and Admiral Fiske, Admiral Peary is in a position to know the exact status of American aeronautics. To these men, who have so ably led the American aeronautic movement in the past eight years, the country turns for advice and leadership. We know that the daily time of these able leaders is occupied by the hundreds of people who are becoming interested in the aeronautic movement from different standpoints and who go to these leaders for advice and guidance.

Their expressions of opinion are based on knowledge of public interest in aeronautics as well as on years of experience and sound judgment.

Their leadership and foresight was proven wise and sound in the past years and their efforts in training hundreds of aviators at private expense in 1915, 1916, 1917 gave the United States Army and Navy 300 aviators who were the first to be sent overseas, where they gave a good account of themselves.

These leaders have been the people who have maintained an optimistic attitude regarding the immediate future of American aeronautics during the past few months, and have prevented the spread of pessimism which was rampant for a time.

172 Orders for Aeroplanes Secured by an Aerial Age Advertiser

We see a great many evidences of public interest in aeronautics. One of the most forceful evidences was the experience of a manufacturer, an AERIAL AGE advertiser, who received 172 "line" inquiries from prospective buyers of aeroplanes in response to his advertisements in AERIAL AGE and *Flying*.

Some of these inquiries are from aviators who have left the service; some are from people who would like to use the planes for pleasure and transport in the United States; some are from South and Central America and Canada. A score are from substantial business concerns who desire to secure the agency for this type of aeroplane.

This is only one of scores of similar indications of the fact that public interest exists and we only need proper impetus to start American aeronautics on a substantial basis.

LIQUIDATING 24,000 CONTRACTS

MAJOR GENERAL CHARLES T. MENOHER, Director of the Air Service, in his message to the Aero Club of America said, in part:

"On assuming charge of the Air Service I find the following conditions existing: Due to the signing of the armistice and to the orders to demobilize as rapidly as possible, the Bureau of Aircraft Production is engaged in the cancellation and settlement of some 24,000 contracts, agreements, and so forth, of all kinds, and the disposal of a large amount of surplus material on hand—in fact, in a general liquidation of its business. The policy being pursued in this matter is to settle these contracts as rapidly and as liberally and equitably as is possible, consistent with the interests of the Government; and to dispose of surplus property and material at as a good a price as possible, but gradually, so as to disturb the market in any commodity that is offered for sale as little as possible. Although the best talent in the Bureau is now engaged on this work, it all takes much time."

A report from Washington states that aircraft contracts aggregating $468,847,993 have been cancelled by the War Department. The cancellations were distributed as follows:

Engines and spare parts	$250,107,551
Planes and spare parts	163,231,790
Chemicals	13,181,285
Balloons and balloon supplies	9,877,356
Instruments and accessories	9,864,238
Fabrics, lumber and metals	5,954,726
Miscellaneous	16,631,047
Total	$468,847,993

Altogether 20,147 Liberty motors have been produced, and 331 are still on order. When the armistice was signed there were 30,526 on order, and since that time contracts for 23,622 of these have been cancelled. From November 11th to February 7th deliveries totalled 6,573, distributed as follows: Nordyke & Marmon Co., 548; Ford Motor Company, 897; General Motors Corporation, 927; Packard Motor Car Company, 1,473, and Lincoln Motor Corporation, which was built with Government money specifically for the production of Liberties, 2,728.

Exclusive of 204 shipped without motors, the United States had produced 4,600 Haviland 4s. There are still 42 on order. Deliveries between November 11th and February 7th were 61 from the Standard Aircraft Corporation, 631 from the Fisher Body Corporation and 681 from the Dayton-Wright Aircraft Company.

May Sell Surplus Property in Adjustment of Contracts for War Supplies Without Reference to Sales Director

The War Department publishes the following supply circular issued by the Director of Purchase, Storage and Traffic:

"The bureaus of the War Department are hereby authorized to sell without further reference to the Director of Sales, any surplus property covered by the act of July 9, 1918, and War Department Bulletin No. 1, 1919, provided:

"(a) That the sale or agreement to sell is made as an incident to the contract for war supplies or the settlement of such a contract which has been suspended or reduced, and has the approval of such contracting officer, board, or higher authority, as may be required to approve such contracts or settlements, and

"(b) That the proper sales officer or board of the bureau shall be consulted as to the terms, conditions, and advisability of the sale or agreement to sell.

Full Report Required

"A full report shall be rendered to the Director of Sales, office of the Director of Purchase, Storage and Traffic, immediately upon the completion of each such sale, showing the character of the property sold, to whom sold, the price received therefor and the purpose for which sold.

"It is believed to be of advantage to the Government in the settlement of any contract to have the contractor retain as much as possible of the property involved, provided he will take it at a fair price. Any property that can not be disposed of in this way becomes surplus and should be turned over to the Director of Sales for disposal. The Director of Sales is at all times ready to take over and dispose of such property if the contractor will not pay a fair price for it, and it is not the policy of the department to sell property to contractors who are known to intend to market it, or contractors who take it for speculative purposes and not for their own use."

Regulation in Bulletin No. 1

The regulation in War Department Bulletin No. 1, 1919, mentioned in the foregoing, is as follows:

II. Sale of surplus property acquired since April 6, 1917.—Section V, Bulletin No. 50, War Department, 1918, is rescinded and the following substituted therefor:

The following extracts from an act of Congress and the regulations for carrying the same into effect are published to the Army for the information and guidance of all concerned:

1. An act making appropriations for the support of the Army for the fiscal year ending June 30, 1919 (approved July 9, 1918):

* * * * * * *

SALE OF WAR SUPPLIES.—That the President be, and he hereby is, authorized, through the head of any executive department, to sell, upon such terms as the head of such department shall deem expedient, to any person, partnership, association, corporation or any other department of the Government, or to any foreign State or Government, engaged in war against any Government with which the United States is at war, any war supplies, material, and equipment, and any by-products thereof, and any building, plant, or factory acquired since April 6, 1917, including the lands upon which the plant or factory may be situated, for the production of such war supplies, materials, and equipment which, during the present emergency, may have or may hereafter be purchased, acquired, or manufactured by the United States: *Provided further,* That sales of guns and ammunition made under the authority contained in this or any other act shall be limited to sales to other departments of the Government and to foreign States or Governments engaged in war against any Government with which the United States is at war, and to members of the National Rifle Association and of other recognized associations organized in the United States for the encouragement of small-arm target practice: *Provided further,* That a detailed report shall be made to Congress on the first day of each regular session of the sales of any war supplies, material, lands, factories, or buildings, and equipment made under the authority contained in this or any other act, except sales made to any foreign State or Government engaged in war against any Government with which the United States is at war, showing the character of the articles sold, to whom sold, the price received therefor, and the purpose for which sold: *Provided,* That any moneys received by the United States as the proceeds of any such sale shall be deposited to the credit of that appropriation out of which was paid the cost to the Government of the property thus sold, and the same shall immediately become available for the purposes named in the original appropriation.

* * * * * * *

2. *a.* Bureaus of the War Department desiring to sell any war supplies, material, or equipment, or by-product thereof, or any building, plant, or factory, including land upon which such plant or factory may be situated, embraced within the provisions of the act of July 9, 1918, shall secure the approval of the Director of Sales, office of the Director of Purchase, Storage and Traffic, Purchase, Storage, and Traffic Division, General Staff, except in the Philippine and Hawaiian Departments, where the authority of the department commanders is sufficient. The foregoing does not apply to property under the jurisdiction of the American Expeditionary Forces.

b. Upon receipt of such approval from the Director of Sales, office of the Director of Purchase, Storage, and Traffic, given either specifically or by general authorization, such supplies, material, equipment, by-products, buildings, plants, or factories, including land on which plants or factories may be situated, will then be disposed of, unless otherwise authorized or directed by the Director of Sales, office of the Director of Purchase, Storage, and Traffic, for cash at auction, or to the highest bidder on sealed proposals, on due public notice, and in such market as the public interests require.

c. The proceeds of sales shall be deposited to the credit of that appropriation out of which was paid the cost to the Government of the property thus sold, and the same shall immediately become available for the purposes named in the original appropriation.

3. These regulations supersede all previous regulations, authorizations, or instructions, either special or general, heretofore issued on this subject.

4. Authorizations of sales in conformity herewith heretofore made by the Director of Purchase, Storage, and Traffic are ratified and confirmed.

[400.32, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

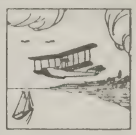
PEYTON C. MARCH,
General, Chief of Staff.

OFFICIAL:

P. C. HARRIS,
The Adjutant General.



THE NEWS OF THE WEEK



Flies from N. Y. to Washington in 85 Minutes

Lieut. Frank H. Harmon, pilot, of Bolling Field, Anacostia, established the record flight from New York to Washington by aeroplane.

He lowered all previous records by more than 30 minutes in landing at Bolling Field 85 minutes after his "take-off" at Hazelhurst, N. Y. The machine used was a La Pere fighter.

New Record Flight from Washington

Captain Roy N. Francis made a record-breaking air voyage, carrying four passengers, from Washington to New York, February 18, in 2 hours and 15 minutes, which, for the 240 miles, made the speed nearly 107 miles an hour.

Better time has been made between the capital and New York by single-passenger or two-passenger ships, but this flight was the swiftest ever made by a group as large as five. Col. E. R. Hertz, commanding officer at Bolling Field, Washington, was one of the passengers and got his first view of New York from the sky.

The ship was a twin Liberty Glenn-Martin bomber, and Capt. Francis flew it to New York to the Aeronautical Show.

Kenly Commands Airmen

The War Department authorizes publication of the following General Order issued by Major General W. L. Kenly, Director of Military Aeronautics to the Officers and Enlisted Men of the Air Service:

"It seems fitting at this time to express my appreciation of the splendid work performed for the past year or more of war activities by the officers and enlisted men of the Division of Military Aeronautics. Many of you are now returning to civil pursuits with the regret that you were not among the more fortunate ones who experienced actual service overseas. To you who have labored night and day, undertaking hazardous duties in all weather, that the training of our fighting air men might continue without interruption, I express my sincere thanks for your steadfast devotion to a duty which so suddenly became apparent would involve little hope of commensurate reward. The interminable grind of performing the same hazardous duties over and over again in order that others less experienced might be fitted for the work in hand, and then to have your former students sent to the front while you 'carry on,' requires a quality of pluck and steadfast determination which the fortunate few who have never experienced such heart-rending disappointment can never understand.

"To those who serve overseas and return to this country with the satisfactory feeling of difficult duty well done, I offer my sincere congratulations for your worthy accomplishments.

"For those who met an untimely end in our service I am sure we all hope that they may receive the reward they so justly merit for the extreme sacrifice."

Navy Asks for Seaplane Bids

Washington, D. C.—The Bureau of Steam Engineering of the Navy Department has invited bids from various aircraft manufacturers for the construction of four experimental twin-motored seaplanes and the preparation of blue prints and compilation of performance data. It is anticipated that the newly designed flying boat will show considerably improved performance over the present model of large flying boat. The motive power is to consist of two 400 H.P. motors. Controls are to be provided in both cockpits of the nacelle so that the two pilots may relieve each other. Armor will protect the pilot from fire from all directions, including from astern. The total weight of the complete machine will be between 8,000 and 9,000 pounds, including about 3,000 pounds of useful load.

Toronto-Hamilton Air Line to Be Opened Soon

A passenger, freight and mail service by aeroplane is to be put into operation soon between Toronto and Hamilton, Canada, it was announced in New York by one of the syndicate who recently bought from the British Government aeroplane equipment which remained in the Dominion after the war.

This air route is to be the first of many being planned for the near future. It is a test service, in order that the operating cost of regular air lines and their general feasibility may be determined.

Army Aviator Makes Record Flight in Delivering Glenn Martin's Plane for Aero Show

New York, N. Y.—Captain Roy N. Francis, who is in charge of the Army's plans for the trans-Atlantic flight, carried four passengers in two hours and fifteen minutes, which is an average of nearly 107 miles an hour. This is the fastest time made in a plane carrying five persons for this trip.



Marjorie Stinson, sister of Katherine Stinson, is an expert pilot, and has served Uncle Sam in one of the drafting departments of the Navy Department

The ship used was a Glenn-Martin Bomber and was the first part of the thirty-odd planes to arrive for exhibition at the Aero Show.

Captain Martin has had more hours of flying than any other aviator in Government service. After directing the setting up of the plane at Madison Square Garden, Captain Francis will return to Washington in connection with his duties in arranging for the trans-Atlantic flight.

Flying Cadets Entitled to $100 Per Month to June 30

A recent decision of the Comptroller of the Treasury is to the effect that cadets who were in training for commissions in the Air Service from April 1 to June 30, 1918, should have been paid at the rate of $100 per month under the Appropriation Act of June 15, 1917.

The Director of Finance has authorized, under arrangements with the Auditor for the War Department, to settle these unpaid accounts of cadets on supplemental final statements. This holds in the case of all cadets who have been subsequently discharged or commissioned, or both. Settlement will be made in this manner not only for the difference in pay before July 1, 1918, but also for the 50 per cent. increase of pay for flying duty subsequent to that date.

The necessary forms to be filled out in getting settlement for these unpaid accounts will be furnished on application to the Director of Finance, 3202 Munitions Building, Washington, D. C.

Communications on this subject should not be addressed to the Director of Military Aeronautics, but to the above address.

Aeroplane Brake Project

An invention which the firm claim will revolutionize the aircraft industry has been patented by the Navarro Aviation Co., Ltd., of Burton-on-Trent. It is a rudder air-brake which Mr. Navarro states can be used in flight as well as on landing to slow a machine down and thus prevent accidents.

Old Manuscripts On Aeronautics On Auction

An important and probably unique collection of very early books on aeronautics, collected in England and now to be dispersed by sale at auction on the afternoons of March 10th and 11th, is on display at the Anderson Galleries, Fifty-ninth Street and Park Avenue, New York.

Though the literature of true aerostation can hardly be said to antedate Montgolfier's first successful experiment, the ancients were continually grasping after some solution of the problem, and as early as the age of Plato, Archytas of Tarentum, we are told by Aulus Gellius, the Latin historian, is said to have devised a flying dove.

The work of earliest date in this collection is therefore a copy of Aulus Gellius. Francis Bacon speculated on the subject in his Silva Sylvarum and Roger Bacon describes methods by which the object may be attained in some of his astrological books. The above and other works of a like character are included in the collection.

With the problem solved successfully in 1783-84, the true literature of flying may be said to take its inception. The present collection contains no less than fifteen works dated 1784, and as many more dated prior to 1790. One of the most interesting and important items is a large scrap book containing rare and early prints, drawings, broadsides, posters, newspapers, etc., dating from 1783, and covering a period of nearly one hundred years, some of the later items dealing with the balloon service of the French during the siege of Paris, 1870-71.



Judge K. M. Landis, his son, Capt. Reed Landis, and Mrs. Landis. Captain Landis has just returned from France, where he downed 12 Germans

Sergt. Connelly Returns an Ace

Philadelphia, Pa.—The Guaranty Trust Company announces that Sergeant James A. Connelly, of the Philadelphia office of that company, has returned after nineteen months with the French aviation corps. He is credited with having brought down fourteen Hun planes, and having taken part in sixty-five air battles. He downed seven German planes by official count and seven are reported unofficially. Connelly received the Croix de Guerre with seven palms and a gold star, and the Medaille Militaire. Sergeant Connelly was also cited in official despatches from the front in Italy as a pilot of unusual adroitness.

Control of Craft by Radio Proved

Washington.—Army and navy experts have reported favorably on the device of John Hays Hammond, Jr., for radio control of surface craft to be sent laden with explosives against enemy ships. They predict similar results with submerged craft showing above water only wireless attennæ.

Results of tests were made public in connection with the new fortifications appropriation bill, which carries $417,000 for construction of an experimental submerged boat.

Secretary Baker wrote to the House Appropriation Committee, which is considering the bill, that the joint Army and Navy Board was "convinced of the practicability of the control" of the surface craft, and added that there had also been demonstrations of the possibility of the control to a craft, completely submerged, except for an air intake pipe.

Before finally deciding on the purchase of the patents for $750,000, the board desires further experiment with the submerged craft and a change in law for the experiments is necessary to permit building so as to make success certain before purchase.

Construction of the submerged craft, which will be about 80 feet long, by 7 feet in diameter, will take two years, according to Mr. Hammond, who told the committee he has spent ten years and $400,000 on his invention.

"There is no question whatever as to the ability to control with great accuracy the torpedo or carrier, whatever kind it is," said a letter to Major-Gen. F. W. Coe, a member of the board, "so long as it is a surface vessel or has any antennae above the water, by direct radio waves, either from shore or from aeroplane.

"The board had before it also, and considered, the ability of the enemy to interfere with the control of the vessel by radio energy. Mr. Hammond's claims are that no interference can be had with the craft outside a radius of 100 to 250 yards from the source of the energy; that is, from the radio plant of a battleship, for example.

"Within such a radius a certain interference from a powerful wireless station is possible, but that interference with the apparatus only operates to keep the torpedo on a fixed course on which it may be running."

With a shore station having a height of eighty feet above sea level radio control of the craft has been demonstrated to the board up to a distance of about seven miles. But Gen. Coe said that if controlled from an aeroplane there was no limit as to distance except the propelling power of the torpedo or the boat that carried it or the aeroplane.

"A surface launch with the apparatus on it," said Gen. Coe, relating demonstrations before the board, "was controlled from both the shore and from an aeroplane, the means of control in each case being the same. The board also witnessed the dropping of depth charges from the stern of the boat while it was proceeding on any desired course."

Gen. Coe said he had run the craft "all around vessels coming into the harbor at will," and at close ranges there would be no difficulty in ramming a vessel from shore.

Mr. Hammond said an aviator after four hours training on control was able from a height of 9,000 feet and a distance of six or seven miles to exercise absolute control over the high speed boat.

"World's Greatest Flying Circus" at Rockwell Field to be an Annual Event

Rockwell Field, in its "World's Greatest Flying Circus," held at the field on North Island in San Diego Bay on February 2, instituted what promises to be an annual ocurrence that will supplant in popular favor the time-honored saw-dust ring, annual football games, Mardigras, and every other fete that makes its yearly round.

By permission of Lieut. Col. Harvey Burwell, Commanding Officer, the entire field and its equipment were turned over to the use of the circus. As the Rockwell Field *Weekly Flight* puts it: "Hundreds of intrepid aviators, in the roles of circus men, risked their lives in the performance of the most spectacular feats known to the flying game; the 'big top' was limited only to the cloud-flecked sky; huge battle planes were the horses ridden; and the god of chance was the ringmaster. A capable director he proved, too, for not an accident happened to mar the entire flying program." There were sham battles and all the strategic moves of aerial warfare, both in single encounter, pursuit and formation. Parachutes were dropped from aeroplanes, and a captive observation balloon, brought from the Arcadia Balloon School, demonstrated parachute drops from the basket of its big "cigar."

The concessions or side-shows of the circus were novel and aeronautical. A shooting gallery had small aeroplanes for targets and a sign read, "Get five planes and become an ace." Near by was a tent where one could get "flying instructions" for a quarter of a dollar. Over at another booth a sign read, "Are you physically fit to fly 30,000 feet in the air, with both feet on the ground? Come in and try." In another booth many talked over the new wireless telephone. These are but samples of the many. Old-fashioned Southern barbecued meats, cooked over wood coals, were served in some of the booths, and in others fake cabaret stars danced and sang.

The crowd came by train and by motor, and, despite threatening weather, was one of the largest San Diego has seen. For most, it was their first close-up view of Rockwell Field. All were amazed at the extent of the improvements, at the buildings, the paved streets, the splendid flying field, the equipment, and the ability and discipline of the men. It was the first time in more than twenty months that the general public had been permitted to make an inspection of the aeronautical shops. Each department of the flying school gave, as part of the day's entertainment, lectures on its own work. Experts explained the various types of motors, guns and planes; and every piece of machinery was, besides, well placarded to show its particular use.

The climax of the day, however, was not in the circus itself. It was instead a replica of what has taken place many times on the battle front in France, with full military ceremony. This was the presentation of the Distinguished Service Cross to Major Carl Spatz and of the Croix de Guerre to Major Kenneth Marr. The presentation was made by Colonel H. H. Arnold, District Supervisor of the Western District of the D. M. A. The Quartermaster General had been directed to have the cross for Major Spatz sent to the Commanding Officer of the field, and the Secretary of War had directed that upon its receipt it be presented with appropriate ceremonies. The citation of Major Spatz for extraordinary heroism during the St. Mihiel offensive, September 26, 1918, has already been published. This was read at the presentation, as was also an order from the headquarters of the French armies of the east citing Major Kenneth Marr for the Croix de Guerre and describing him as an "excellent squadron commander of a legendary bravery, who has been a beautiful example for his entire unit."

A subsequent feature of the program was a presentation of medals to the Boy Scouts of Coronado.

Rockwell Field lays not a little of the credit for the success of the day to the work of the nine bands that played continuously. These bands were from the Balboa Park Naval Training Station, Camp Kearny (three bands), Rockwell Field, Naval Air Station, Fort Rosecrans, and the Section Naval Base.

Among the distinguished visitors at the circus as guests of Lieut. Col. Burwell were Major Gen. Guy Carleton, commanding Camp Kearny; Rear Admiral William Fullam, commander of the reserve force, Pacific fleet; Glenn Martin, vice-president of the Wright-Martin Aircraft Corporation; Col. Henry H. Arnold; Lieut. Commander E. W. Spencer, commander of the naval air school, North Island; Brig. General W. C. Short; Colonel Guy Rowe; Colonel J. R. Pourie, commander of the seacoast defenses of San Diego; Captain Arthur McArthur, commander of the naval training camp, Balboa Park. Most of these officers were accompanied by their wives; and Mrs. Newton Baker, wife of the Secretary of War, and Mrs. William Kenly, wife of the Director of Military Aeronautics, were also guests of the commander.

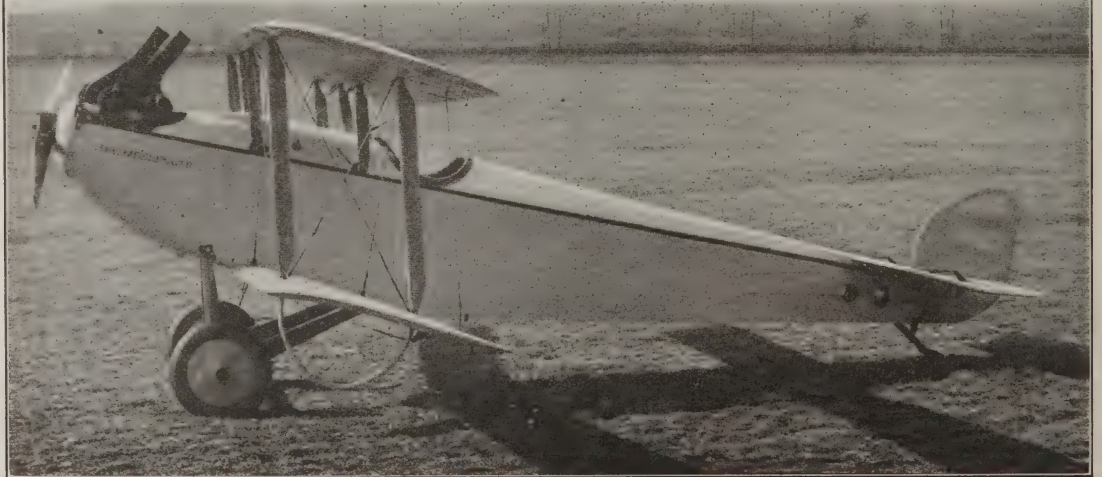
The net profit of the circus was set down as $4,742. This is to be devoted to the Rockwell Field Athletic Fund and to the expenses of the great international exhibition, which it is planned to give at North Island, November 11, 1919, the date set for the annual event.

De Palma Breaks Records With Aero Engine Packard Car

On the beach at Daytona, Florida, Ralph De Palma, driving a Packard special aviation twin six, of 905 cubic inches piston displacement, has strengthened his position as the "Ace" of automobile speed demons.

Under the official auspices of the Automobile Association of America, De Palma thundered off the speediest twenty miles that have ever been covered in an automobile, and brought back the world's speed honors to an American car, whereas most of the former records up to twenty miles had been held by cars of German make.

The new speed marks set up by De Palma are as follows: One mile, 24.02 seconds; two miles, 49.54 seconds; three miles, 1 minute 15.04 seconds; four miles, 1 minute 39.77 seconds; five miles, 2 minutes 4.58 seconds; ten miles, 4 minutes 9.3 seconds; fifteen miles, 6 minutes 48.75 seconds; twenty miles, 8 minutes 54.2 seconds.



The Dayton-Wright "Messenger" Biplane. It has a wing spread of 18 feet 5 inches, weighs 476 pounds net, 636 gross, has a maximum speed of 78 miles per hour, minimum 40 miles, and is equipped with a 37 horsepower motor

Want Roosevelt Cemetery in France

To acquire Belleau Wood from France by purchase or otherwise and convert it into an American national cemetery in memory of Theodore Roosevelt is a proposal that has been laid before the Roosevelt Permanent Memorial National Committee, according to an announcement made by the committee on February 23.

The proposal, first made three days after Col. Roosevelt's death by Miss Agnes Shufeldt, of Johnson City, N. Y., has the idorsement of many of the friends of the late President, including Lawrence F. Abbott, Richard Washburn Child, Arthur F. Cosby, Col. John C. Greenway, John Mitchell, Samuel Parsons, W. F. Purdy and Cushing Stetson.

The suggestion which comes to the committee is that the Belleau Wood, already called by the French "the Wood of the Marines," be made the final resting place of the bodies of the American dead whose families prefer to leave them upon French soil. The grave of Quentin Roosevelt is close to the Belleau Wood, and it is thought that it would be included in the proposed cemetery.

Italy Honors 2 U. S. Airmen

New York, N. Y.—The memory of two brave American aviators who met death in aerial combat on the Italian front was honored February 23 in the City Hall when their fathers received medals awarded by Italy. The father of Lieut. Coleman De Witt Tenafly received a gold medal, awarded by the King, and the father of Lieut. James Bahl received a silver medal, awarded by General Diaz, the Italian Military Chief. Major-General Guglielmotti, Military Attache of the Italian Embassy, represented the donors. Major F. H. La Guardia and many other aviators attended the ceremony.

Lieuts. Tenafly and Bahl were killed October 27 last when their Caproni plane was attacked by five enemy machines. They put up a desperate resistance and brought down two of the German machines before their own machine was shot down.

First Aviation Attache

Great Britain has taken a new departure in the composition of her diplomatic group in Washington, being the first nation to appoint an Aviation Attache. The first man to act in that capacity will be Brigadier General Lionel E. O. Charlton, now on the way to his post with Earl Reading, who is returning from London.

Military aviation thus takes its place as a separate and distinct service and shares the importance hitherto accorded only to the army and the navy. The appointment of such a functionary for service in Washington is a recognition of the eminent place which the United States occupies in the development of the aeroplane and is evidence of the expectation of further and important advances.

General Charlton, the first man chosen for the post, is a distinguished soldier as well as an authority on aviation, he having been decorated by his own government and also by that of France. In the war he was a squadron commander in the Royal Flying Corps.

Aeroplane to Make 300 Miles an Hour

Paris, Feb. 23.—An aeroplane with a speed of from 200 to 300 miles an hour, which will bring America within a short day's journey of Europe, is the prospect held out by the invention of a French engineer, Auguste Rateau, acording to the *Matin*. The invention of M. Rateau was one of the surprises in store for the Germans which were about to be revealed when fighting ceased.

At the present time without the invention the higher an aeroplane mounts the less power does its engine develop on account of the rarefying of the air. The loss at 15,000 feet, for instance, is 50 per cent.

M. Rateau's device, the paper says, is very simple. It consists of an arrangement by which the exhaust from the engine works a small turbine which compresses the air drawn into the engine to normal pressure so that the engine develops full power no matter what the altitude. As the resistance of an aeroplane decreases enormously at high altitudes, the *Matin* adds, it follows that the higher a machine fitted with the new device mounts the greater will be its speed. This fact, it is declared, was demonstrated by the famous German long-range gun.

It has been found that a heavy day bombing machine whose speed at 15,000 feet ordinarily did not exceed 80 miles an hour made 140 miles an hour when fitted with M. Rateau's invention.

Aeroplanes Used in France for Milk Distribution

Communication from France on February 21 to Mrs. Warren McConihe, president of the New York Committee of Free Milk for France, stated that the crippled condition of the French railroads had made it necessary to distribute the milk throughout Northern France by aeroplane. It is the first time that aircraft have been used in the extension of relief in France, although similar methods were resorted to many months ago in Italy.

Aeroplane in Agriculture

In connection with scouting and other survey work in Texas the United States Department of Agriculture is putting the aeroplane to its first practical application in agriculture. A try-out of this method of survey was made last year along the Trinity River and resulted in the discovery of several outlaw cotton fields in heavy timber, which had previously escaped detection. This year the aeroplane is to be used more extensively. It has been found a valuable aid in pink bollworm work, as it makes possible the easy mapping, by means of photographs, of the quarantined territory, and facilitates the inspection work in forested areas, especially in such long stretches of country as the valley of the Rio Grande and its tributaries.

Admiral Sims Expects Trans-Atlantic Flight Next Summer

Washington, D. C.—Rigid airships in the future will comprise a specific element of the fleet of every first-class naval power, Vice-Admiral Sims said in a wireless message made public February 23 by the Navy Department. The admiral said that observance of the naval lessons of the war had thoroughly convinced him of the importance of these machines and he recommended that the United States lose no time in developing them.

Secretary Daniels included the message in a letter sent to Senator Swanson, chairman of the Senate Naval Committee, expressing the thanks of the department for the favorable report of its recommendation that $36,000,000 be appropriated for the development and construction of rigid airships.

England is making rapid strides in the new line of military aeronautics, Admiral Sims said, having already built airshps 695 feet long, with a displacement of 2,700,000 cubic feet, a maximum speed of 59 knots and cruising period of more than 200 hours.

"Following the signing of the armistice," the admiral added, "this programme was so modified as to provide that new construction and development work be pushed even more actively than during the war."

Admiral Sims confirmed printed reports that the British Admiralty the coming summer intends a flight to the United States and return with one of these new ships and declared that the chances are better than fair that it will be successful.

"Without hesitation," Admiral Sims said, "I can recommend on strong military grounds that two more airships of the latest type be started in the United States and that these be followed by at least two more of an improved type for helium gas. This should involve an adequate building and repair base and an operating base to be located later."

Flyers Reach Mobile Enroute to Houston

Mobile, Ala.—The Handley Page aeroplane which is making its first trip from Elizabeth, N. J., to Ellington Field, Houston, Texas, carrying eleven passengers, arrived in Mobile at 12.30 P.M., Sunday, February 23.

The aeroplane left Americus, Ga., Sunday morning at 9 o'clock and made the trip of 252 miles in 3½ hours.

The machine is operated by Lieut. George M. Palmer as pilot, assisted by George L. Bradford. The officers expect to complete the trip by Wednesday. They will leave here at 9 o'clock Monday morning for New Orleans.

Aviators' Clubhouse National Memorial

A club house that is to be a memorial to the American aviators who lost their lives in the great war is to be erected in Washington by the National Aeronautic Committee, No. 289 Madison Avenue, New York, of which Mrs. Charles A. Van Rensselaer is president. The club house will be the home of the Army and Navy Air Service Association, until a few days ago the Air Service Clubs Association.

Mrs. Van Rensselaer made her offer at the meeting at which the association changed its name and admitted many fliers to membership. The association was an army project, having grown out of a plan evolved by Major Maxwell Kirby, who was commandant of Gerstner Field, Lake Charles, La., when Major John Purroy Mitchel lost his life. Now the navy is represented on its Board of Control by Commander John H. Towers, U. S. N., a pioneer airman.

The committee of which Mrs. Van Rensselaer is the head has been active in behalf of the comfort of aviators since the United States entered the war. The first work to which it devoted its energies was the establishment of a balloon training school at Stapleton, S. I. Then it took up the supplying of athletic sports equipment, and by the time the armistice was signed had outfitted 207 overseas squadrons and had sent complete supplies to 22 training fields in this country at costs ranging from $500 to $2,000.

This recognition of the need of athletic sports for men in so hazardous an arm of the service as aviation won the committee the cordial indorsement of officials, among the most approving being Major General W. L. Kenly, Director of Military Aeronautics.

Last fall the committee gave at Belmont Park an Aviation Carnival which was the most spectacular thing of the sort ever seen in the East. In the announcement of the project made by the association it is said:

"One of the principal functions of the association is to bring air service officers closer together for the good of the air service and aeronautics in general. The club house will be for officers of the air service of both the army and navy, either active or discharged, when the best things they have learned in the service of their country can be encouraged and perpetuated."

Board to Review Flying Rewards

Major Gen. W. L. Kenly, Director of Military Aeronautics, has appointed a board of officers to pass upon the qualifications and merits of flying officers who have distinguished themselves in action. The board will review all the records with a view to awarding flying officers such ratings as their achievements warrant. These ratings will carry an increase in flying pay. This action is in recognition of the fact that the list of pilots credited with destroying five or more aeroplanes is incomplete and that officers on details of ten, requiring a greater amount of skill in fighting, deserve recognition in the way of higher rating and appropriate rewards.



A line-up of German aeroplanes turned over to the French under the terms of the armistice

The AIRCRAFT TRADE REVIEW

A. E. J.

Wright-Martin Turns Out Combination Liberty-Hispano-Suiza

New Brunswick, Feb. 10.—About 2,000 workmen are still employed by the Wright-Martin Aircraft Corporation on a Government aeroplane engine contract, which will be completed in about a month. It has developed, according to *Automotive Industries*, an aeroplane motor combination of Liberty-Hispano-Suiza, and has a four- and six-cylinder engine completed.

Frank Mossberg Joins Rice Leaders

Attleboro, Mass., Feb. 10.—The Frank Mossberg Co. has become a member of the Rice Leaders of the World Association.

Aeroplane Show for Chicago

Chicago, Feb. 11.—Chicago will hold its first aeroplane show at the Coliseum, March 29 to April 5. Louis Disbrow is the promoter. He and George W. Browne, Wisconsin distributer for Willys-Overland and distributer in Wisconsin and Illinois for Curtiss, have formed the International Airplane Exposition Co., and may put on similar shows elsewhere. Four Curtiss planes are promised for exhibition. Bart J. Ruddle of Milwaukee will manage the show.

Johns-Manville Co. Give 20% Bonus to Employees

In appreciation of the good work of its employees during the strenuous war period, the H. W. Johns-Manville Co. has decided to distribute among all employees who have been in their employ for the full year of 1918, excepting officers of the company, an extra compensation of 20 per cent. on the salaries paid them during the year. This compensation will entail an expenditure of more than $1,000,000.

Motor-Driven Valve Grinder On Market

A new tool, an electric motor driven valve grinder with an oscillating spindle and designed to supplant the laborious hand grinding, has been put on the market. The device is controlled by a trigger similar to the trigger of a revolver. The spindle oscillates with a long, steady sweep similar to the movement obtained in grinding by hand, but many times more rapidly. A 1/6 H.P. motor is used, which is air cooled. It operates on standard power circuits either alternating current with range 25 to 60 cycles or direct current, being made for circuits of 110 volts, 220 volts, and 32 volts.

The motor and gearing with reciprocating mechanism are completely enclosed in an aluminum housing, the gearing and oscillating movement being separated from the motor compartment and packed in grease. The grinding spindle runs in a ball thrust bearing. Armature shaft runs on Norma ball bearings, and gears are mounted on shafts ground to size supported at both ends in long phosphor bronze bushings. Bits are provided to make the tool adaptable to various types of valves.

Personal Pars

R. G. Ames has joined the Black & Decker organization as branch manager of the Chicago office.

Mr. Carroll M. Aument, formerly one of the engineers of the Wright-Martin Aircraft Corporation, has resigned his position and opened a consulting, designing and sales engineering office under the name of Aument & Gillespie, at 87 Nassau Street, New York City.

Lieutenant-Colonel Grayson M. P. Murphy, senior vice-president of the Guaranty Trust Company, who was in charge of the American Aviation Forces in London, has returned to the United States and is back at his desk.

J. J. Tobias is in charge of the new Detroit branch of the Moto Meter Co., Inc., 2019 Dime Bank Building.

C. L. Diers, formerly in charge of the Indianapolis branch of the Goodrich Tire & Rubber Co., Akron, is now in charge of the European division, covering Europe, Asiatic Russia and the northern coast of Africa.

F. H. McFarlin has joined the sales department of the Erie Specialty Co., Erie.

Junior Plattsburg to Have Aviation Ground School

A department of aeronautics has been added to the curriculum of the next Junior Plattsburg, according to an announcement made by E. C. O'Brien, managing director. The course will be similar to that offered at government ground schools, including instruction in the theory of flying, elementary aerodynamics, motor mechanics and structural design. To this will be added military aeronautics, including aerial reconnaissance, aerial photography, map-making, elementary aerial navigation, aerial communication and the theory of aerial gunnery. The courses will be given by experienced aviators and the equipment will consist of 5 JN-4D Curtiss planes, in which the majority of American aviators were trained, and one MF flying boat. A Curtiss OXX motor will be used for laboratory work. Upon completion of the course each cadet, upon authorization by his parents, will be given a practice flight.

Johns-Manville Employees Receive Extra Compensation

Many progressive business organizations have adopted one or another form of profit-sharing plan for employees. Few, however, have shown so great liberality in this respect as the H. W. Johns-Manville Company, miners and manufacturers of asbestos, and allied products, who will distribute to all salaried employees—men and women—from heads of branches and departments to office boys, who have been in continuous service for the full calendar year nineteen eighteen, an extra compensation of 20 per cent on the salaries paid them during 1918.

It has been the custom of the H. W. Johns-Manville Company for some years past to recognize the faithful service of their big business family in this substantial way.

During the past two years especially, the members of this organization, in common with many others, have been working under an exceptional strain, owing to the depletion of their ranks through enlistment and the high pressure of war production.

In appreciation of this fact, the H. W. Johns-Manville Company has at the end of each war-year, 1917 and 1918, set the mark even higher than before—a full 20 per cent of the year's salary.

This extra compensation for 1918 will cost the company approximately $1,000,000.

Represents American Accessory Manufacturers in England

Mr. H. K. Lakin, of the firm of Stanley J. Watson, of London, England, agents for the Eisemann Magneto Co., the Federal Bearings Co., and others, is visiting the United States, and will be located in Room 714, 220 Broadway. He is negotiating with various firms who have been seeking live representation in England for the British agency for American products, and is desirous of extending his connection with the American industry by adding more accessory manufacturers to his clientele.

Honorably Discharged

America's leading "Ace," Captain Edward V. Rickenbacker, A. S. A., who reported at the O. D. M. A., February 10, 1919, was honorably discharged February 13.

The following officers of the Air Service were discharged on the dates noted:

February 10, 1919: Captains William N. Neidig, Clarence G. Spencer, Laurence E. Rubel, Samuel P. Burnam, Daniel C. McCoy, Robert R. McMath, First Lieuts. George H. Pfau, Robert J. Love.

February 13, 1919: Lieut. Col. John A. Drexel, First Lieut. Thomas F. Ward, Second Lieut. Aaron Prussian.

February 14, 1919: Captains David R. Wheeler, Maury Hill; Second Lieuts. Harold Palmer, Edwin S. Ladley, Wallace J. Frost.

February 15, 1919: Lieut. Col. Thomas G. Gallagher, Major Walter G. Rogers, Captains Michael J. Phillips, John McQuerney, Otis S. Van De Mark, Charles M. Neubauer; First Lieuts. William G. Garrett, Edward F. Dean; Second Lieuts. Harry A. Van Horn, John M. Saunders; First Lieut. Lawrence W. Kinnear.

February 17, 1919: Major Charles S. Jackson, Second Lieuts. Thomas H. Owen, William T. Ashby.

February 18, 1919: Captains Leonard C. Hammond, Claude O. Van Valer, Second Lieut. Robert G. Elbert.

New R. M. A.'s

The following officers have been rated Reserve Military Aviators: Second Lieuts. James B. D. Palmer, A. S. A., and Harvey Ashfield, A. S. A., to date from January 30, 1919; and Second Lieut. Walter William Roop, A. S. A., to date from January 18, 1919.

Soon to Return

The following organizations have been assigned to early convoy:

Eighth Aero Squadron.

Photographic Section, Air Service, No. 17.

Photographic Section, Air Service, No. 23.

Lieut. Col. Jacob E. Fickel, J. M. A., A. S. A., Captain George Washington Price, A. S. A., and Captain Louis Montford, A. S. A., have been appointed members of the Board of Contract Review of the Division of Military Aeronautics, created September 23, 1918, vice Lieut. Col. Harold Benington, A. S. A., Captain Otis S. Van De Mark, A. S. A., and Captain Lewis B. Ticknor, A. S. A., relieved.

Lieut. Col. Herbert A. Dargue, M. A., A. S. A., was recently ordered to proceed from Washington, D. C., to Post Field, Fort Sill, Oklahoma; thence to Air Service School for Radio Operators, Penn Field, Austin, Texas; thence to School of Military Aeronautics, University of Texas, Austin, Texas, in connection with an investigation of the facilities existing at Penn Field, for the establishment of a permanent radio school.

A Board of Officers consisting of the following personnel, Col. William N. Hensley, Jr., J. M. A., A. S. A.; Col. James Prentice, J. M. Aer., A. S. A.; Maj. Frank M. Kennedy, J. M. Aer., A. S. A., Commanding Officer, Langley Field, Captain John McInerney, A. S. A., met at Langley Field, Hampton, Virginia, for the purpose of reporting upon the location of a dirigible hangar and making recommendations as to what lighter-than-air activities may be advantageously carried on at that place together with construction required therefor. Col. Arthur L. Fuller, in charge of Lighter-than-Air Training, and Acting Chief of the Training Section, met with the Board at Langley Field.

Captain Roy N. Francis, A. S. A., who was ordered to proceed by aeroplane from Washington, D. C., to Hazelhurst Field, Mineola, Long Island, New York, piloting a Martin bombing machine, made the trip successfully on February in 2 hours and 30 minutes.

Aviators Cited for Promotion

The following twenty American flying officers distinguished themselves overseas and have been recommended for advanced flying ratings, carrying extra pay:

Lieut. Col. William Thaw, Pittsburgh; Major David McK. Peterson, Honesdale, Pa.; Capt. Ed. V. Rickenbacker, Columbus, Ohio; Capt. Reed G. Landis, Chicago; Capt. Douglas Campbell, Mount Hamilton, Cal.; Capt. Edgar G. Tobin, San Antonio, Tex.; Lieut. Louis G. Bernheimer, New York; Lieut. William P. Erwin, Chicago; Lieut. Robert F. Raymond, Newton Center, Mass.; Lieut. Donald B. Warner, Swanstoc, Mass.; Lieut. James A. Keating, Chicago; Lieut. Paul W. Drew, Philadelphia; Second Lieut. Earl W. Porter, Chicago; and the following deceased officers: Lieut. Fred Norton, Columbus, Ohio; Lieut. Edward Orr, Chicago; Lieut. Merton Campbell, Wakeman, Ohio; Lieut. Lloyd A. Hamilton, Burlington, Vt.; Lieut. John O. Donaldson, Washington, D. C.; Second Lieut. Frank B. Bellows, Williamette, Ill., and Second Lieut. Roger Hitchcock, Mount Carmel, Ill.

A NEW PRINCIPLE IN CARBURETION

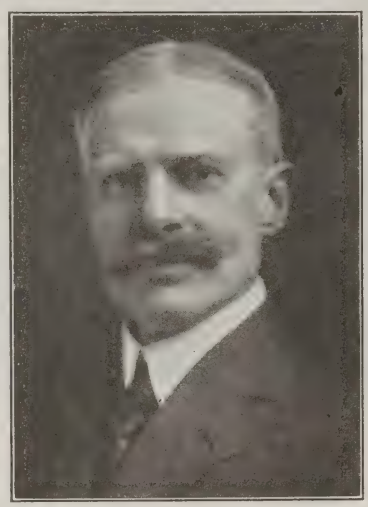
CONSIDERABLE interest has been shown in the novel design of the Brown Carburetor, which has embodied therein a new principle in carburetors. This device is the invention of one of the older automobile engineers, George M. Brown, of New York.

The absence of all cams, springs, dashpots, and the moving parts is noteworthy, also the tendency to get away from the venturi tube idea, the compactness and neatness of design attracts the eye of the engineer desiring to clean up his power plant.

The correct ratio of air and fuel is maintained at all speeds without the use of adjustments of either fuel or air, this is accomplished automatically for either warm or cold weather operation.

Figure 1 shows a sectional view of the top opening type. "A" represents the only air intake (there being no auxiliary air intakes) ;"B" is an air baffle plate which has openings in the sides with an area equal to the area of the air intake. The lowest end of this plate is curved in toward the wall of the mixing chamber "C," and has a narrow opening at its lower end. The mixing chamber "C" is spherical in shape and has a fuel nozzle "D" at its lowest point. The height of this fuel nozzle is set at the factory. "E" is the outlet baffle plate which also has openings of a predetermined shape and size at either side; "F" is the throttle valve, and "G" is a choke valve. The gasoline bowl "H" is directly under the mixing chamber "C". "I" is a metal float which controls the depth of the fuel in the bowl and is connected to a shut-off valve "J" through the ferculum arm "K". The shut-off valve "J" is threaded at its middle portion and the fuel can be adjusted by means of the nut "L". "M" is the fuel duct and the fuel enters same from the bowl through the opening "N".

In operation, air is admitted through the air intake and passes through the side openings of the baffle plate into the mixing chamber and coming in contact with the curved walls of the mixing chamber is caused to travel in a circular direction. The speed of this air is, of course, controlled by the throttle opening and the motor suction at low speed. The action of the air in entering the mixing chamber is such as to draw the proper amount of fuel through the fuel nozzle. This fuel is immediately atomized by the revolving air, the tendency of the incoming air being to create as low suction at the lowest speeds over the fuel nozzle owing to the fact that the greatest air momentum is at these speeds toward the outside walls of the mixing chamber. As the motor speed increases by opening the throttle, the increased volume of air passing through the mixing chamber causes more suction over the fuel nozzle as the increasing volume of air tends to spread out in its path toward the centre of the mixing chamber.



George M. Brown, Inventor of the Brown Carburetor

The outlet baffle openings, also, tend to control the air in mixing chamber by the removal of the gas mixture much the same way that the air is controlled by the intake baffle plate. The reason for this is to balance the direction of the air in the mixing chamber. There is a set idling jet for motor idling; this being a nozzle with fixed opening.

Laboratory and road tests have covered all conditions of motor operation, and the automatic action is uniform under all conditions.

Lack of space prevents the publishing at this time performance curves, but we present a memo from a few tests.

A car equipped with a six-cylinder motor 3⅜ bore and 4½ stroke, weighing 3,475 pounds with driver and observer over a fifty mile course, temperature 34° F. made an average speed of 25 miles per hour, consumed gasoline (63 test) at the rate of .233 pounds of fuel per mile, or 22.3 miles per gallon.

Block test with same motor consumed .512 pounds fuel per brake horse-power per hour at 78% full load.

Tests made for fuel leakage to oil reservoir showed that in 78 hours test on road, there was no perceptible change in the oil except that which would occur through the re-use of the oil.

Carbon residue was almost totally absent; especially was this true on top of pistons and heads.

The carburetors are now being manufactured in ¾, 1, 1¼, 1½ and 2 inch sizes by the Brown Carburetor Corporation, with Engineering Offices at 1790 Broadway, New York City.

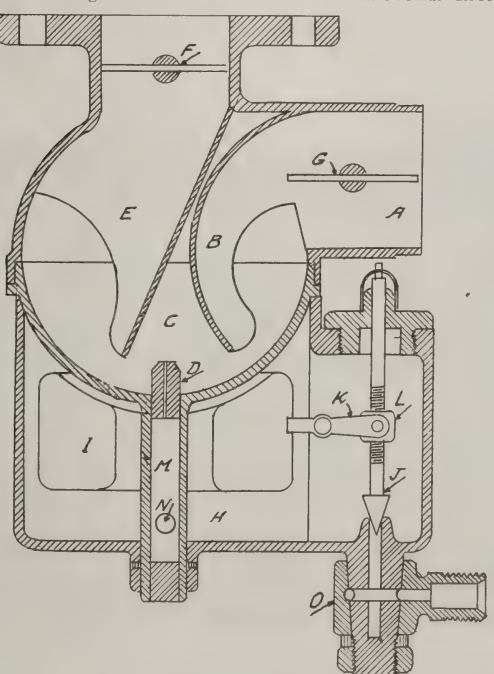
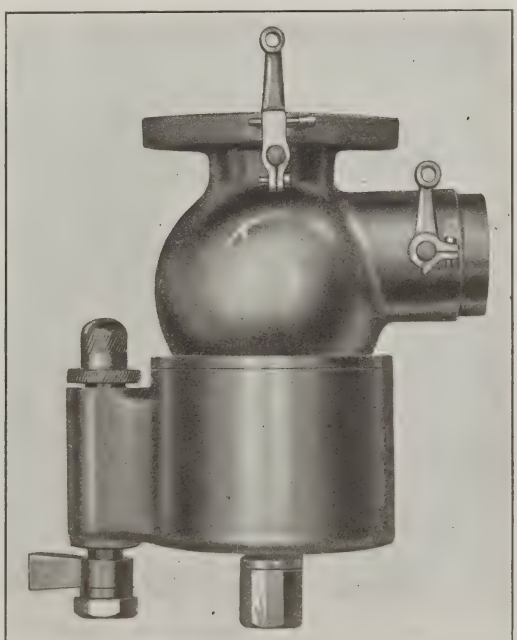
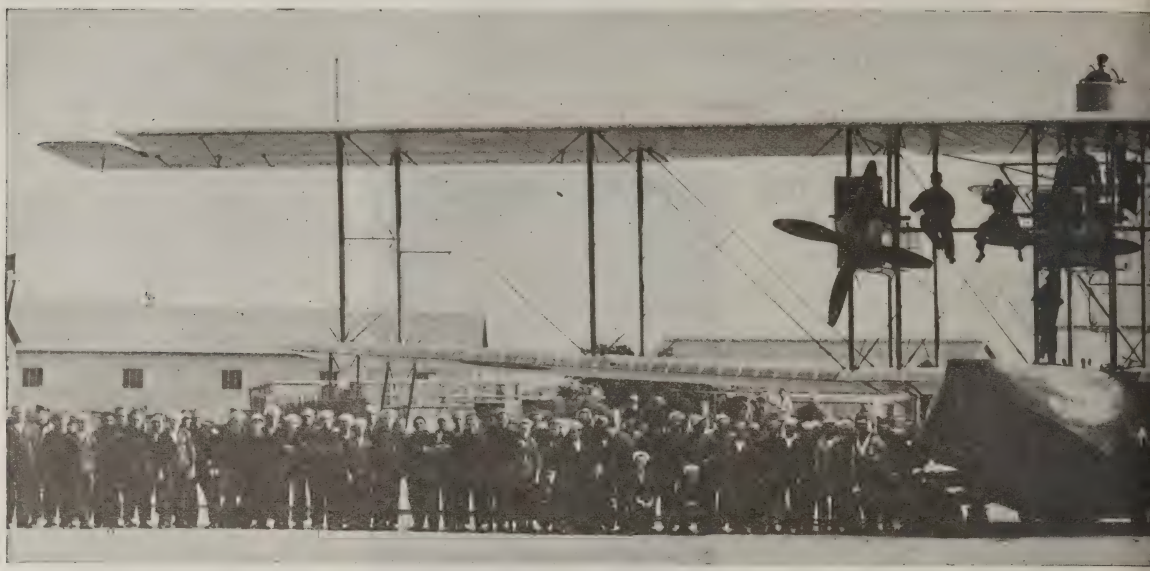


Fig. 1



The Brown Carburetor

AMERICAN AEROPLANES

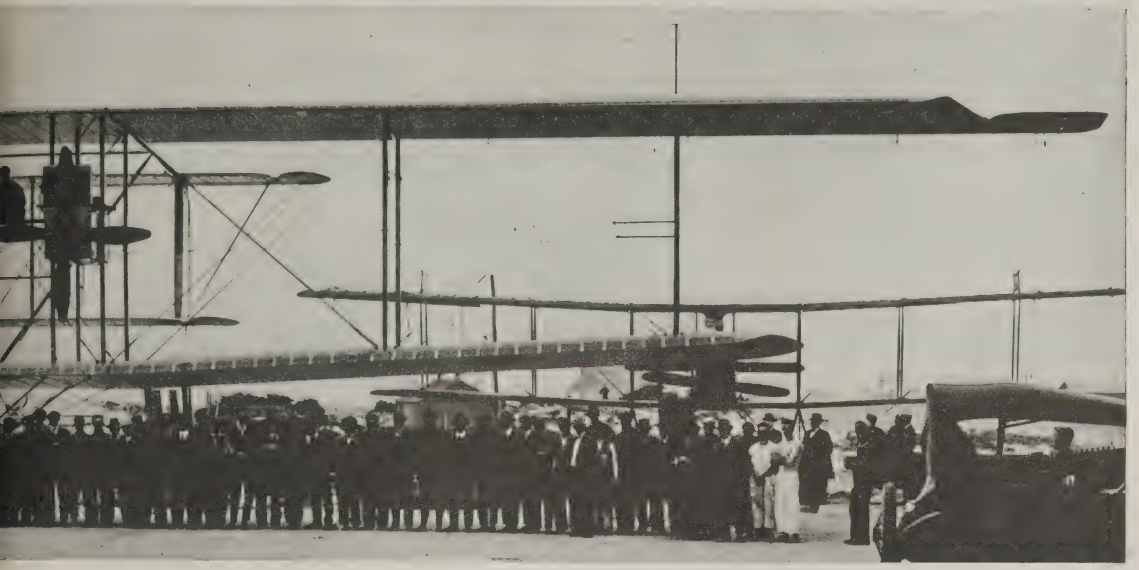


The Curtiss N. C.-1, 3-motored flying boat, which
New York. The Navy Department plans to use this
shortly to cross



Some of the American De Havilland Planes Equipped with Liberty Motors

AND SEAPLANES 1918-1919



carried 50 passengers on a test flight at Rockaway, type of boat in the attempt which will be made the Atlantic



which were active over the German lines when the armistice was signed



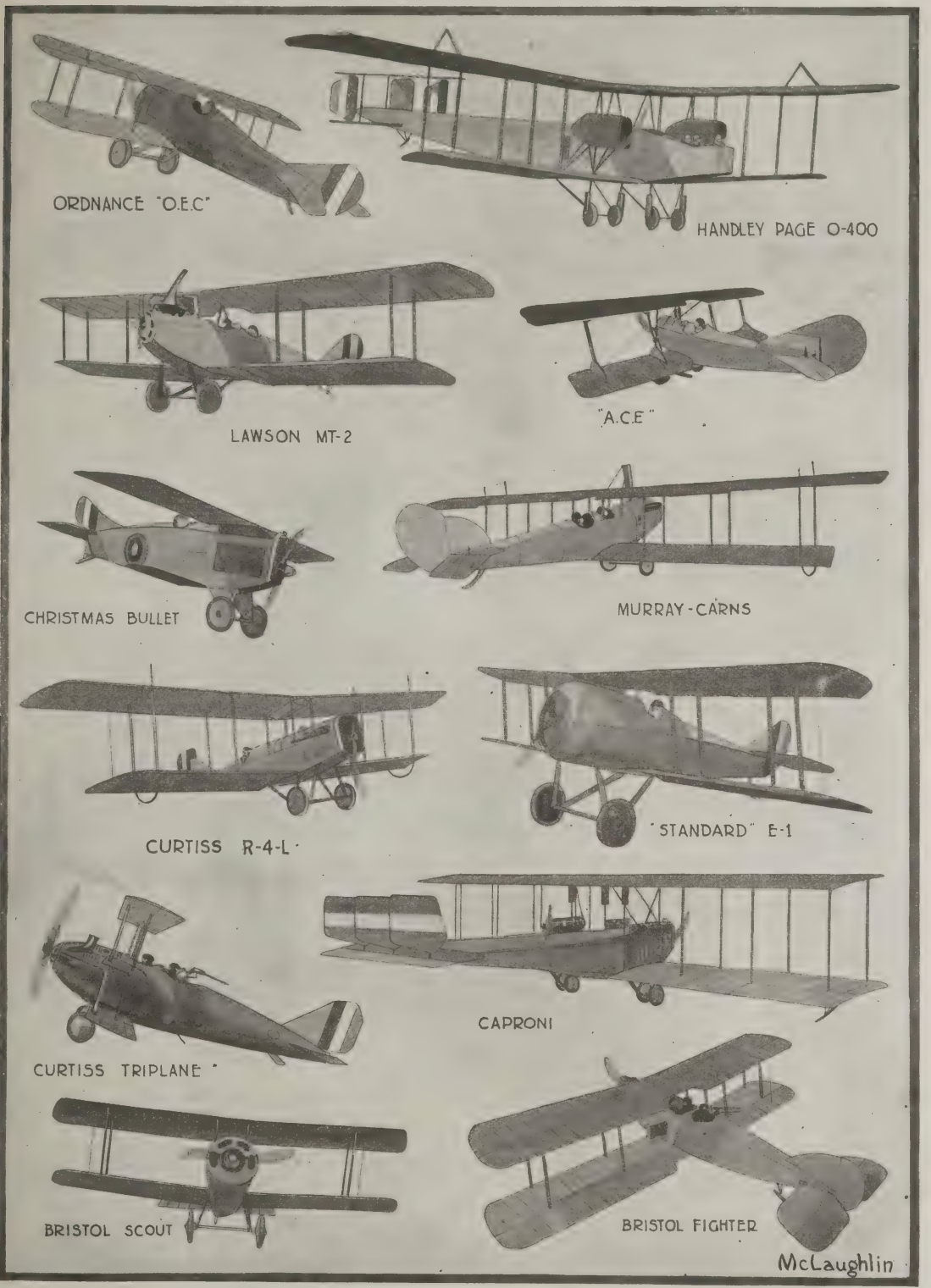
The Thomas-Morse Type S 4-E has a wing spread of 22 feet. It weighs 1,150 pounds and is powered with an 80 horse-power Le Rhone. It has a speed range of 55 to 105 miles per hour and climbs 7,000 feet in 10 minutes, and was designed to furnish the War Department with an advanced training machine

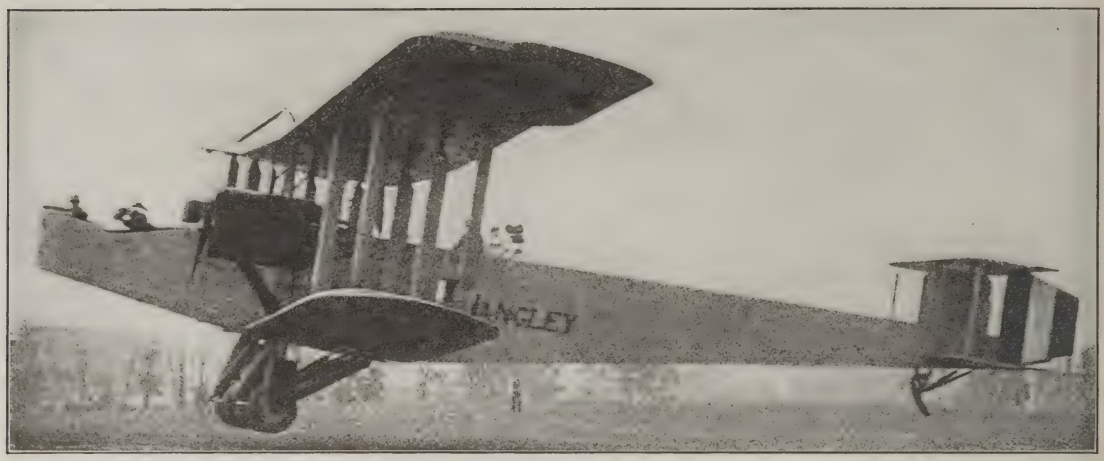


The O. E. C. 80 horse-power Le Rhone training scout, designed and built by the Ordnance Engineering Corporation



The Martin K-III Scout, designed by Captain James V. Martin, powered with an A. B. C. engine, with retractable chassis and wing end ailerons

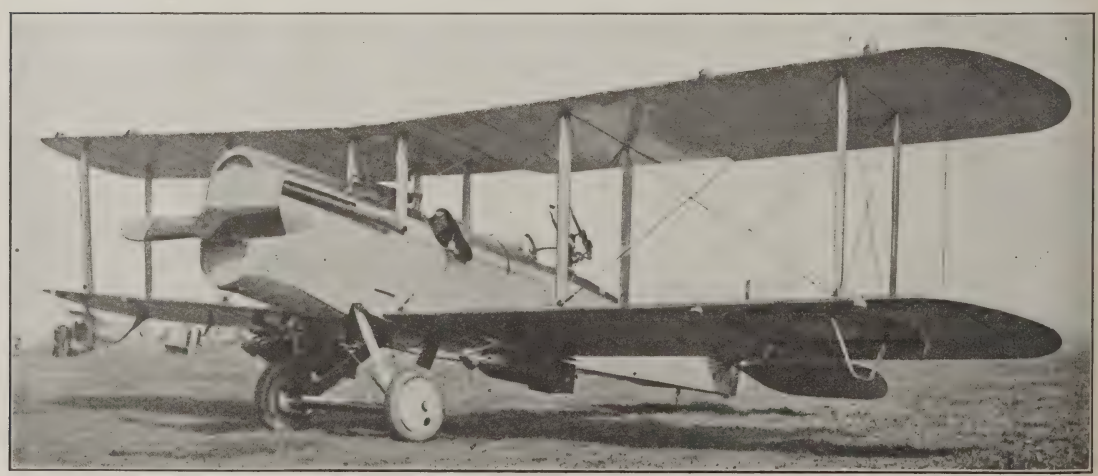

ORDNANCE "O.E.C"
HANDLEY PAGE O-400
LAWSON MT-2
"A.C.E"
CHRISTMAS BULLET
MURRAY-CARNS
CURTISS R-4-L
"STANDARD" E-1
CAPRONI
CURTISS TRIPLANE
BRISTOL SCOUT
BRISTOL FIGHTER
McLaughlin



The Handley-Page Bomber, with two Liberty Motors, built by the Standard Aircraft Corporation at Elizabeth

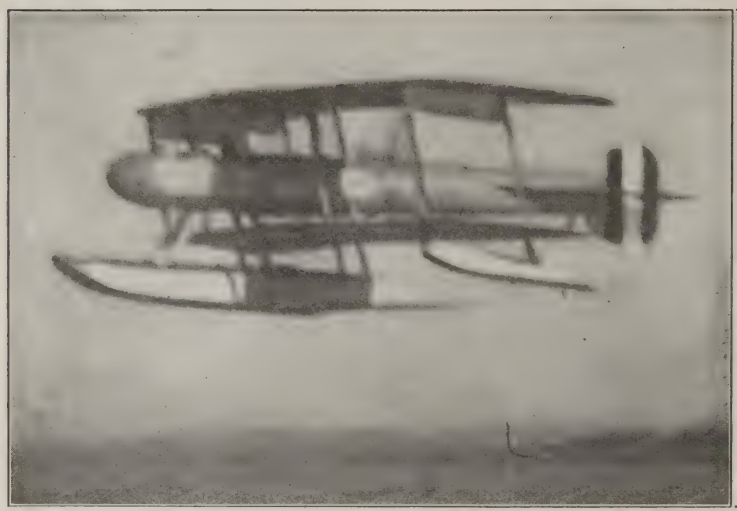


The Glenn L. Martin twin-liberty motored bomber that has established several cross country records



The Liberty-motored De Havilland four, with bomb racks filled for bombing demonstration


BELLANCA
MARTIN BOMBER
CURTISS JN-4H
LE PERE C-11
J.V. MARTIN
"L.W.F." G-2
J.V. MARTIN K III
DE HAVILAND 4
"STANDARD" E-4
THOMAS-MORSE S4-E
VOUGHT V.E.7
SE V
McLaughlin

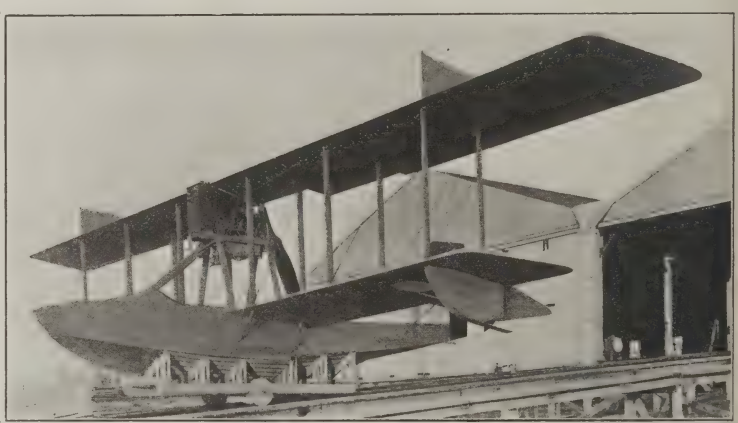


GALLAUDET D-4 BOMBER

The Gallaudet Bomber has a Liberty Engine of 400 H.P. driving a four-bladed pusher propeller. The machine is a two-seater with pilot and observer placed well forward. Fuselage finely streamlined and the placing of the lower wings below the fuselage brings the center of thrust in a very desirable location. A maximum speed of 126 M.P.H. and a climb of 2,100 feet in 2 minutes was recorded in an official test flight

CURTISS MODEL M. F. FLYING BOAT

The Navy Department has employed a great number of the M. F. Boats for coastal training work. Machine is well suited for marine sportsmen for it is comparatively small and is easily handled. The boat is provided with either a Curtiss OX 5 100 H.P. engine or the new Kirkham K-6 150 H.P. six-cylinder vertical engine. The M. F. Boat is an improvement in design over the Curtiss F Boat which found so much favor before the war stopped civilian flying



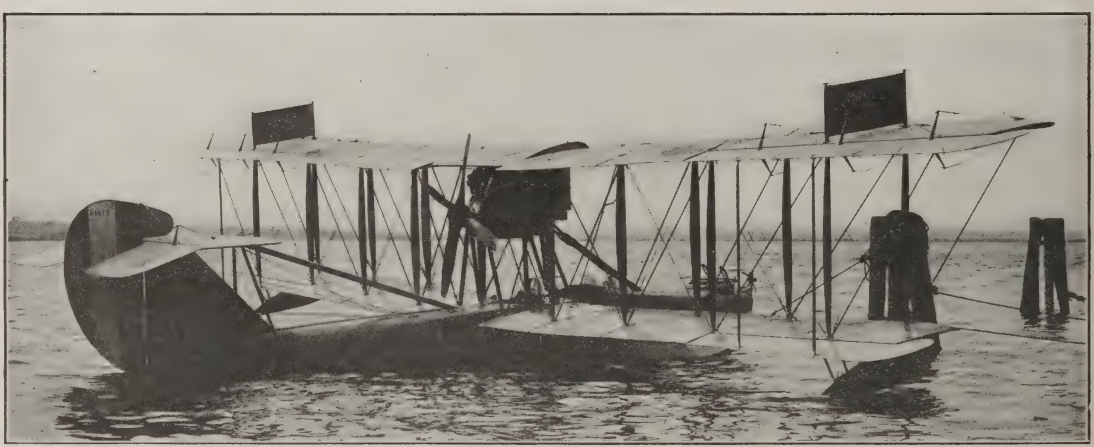


The Curtiss H-16 Flying Boat. The H-16 has two 400 H.P. Liberty Engines. Two guns and a gunner are carried at the bow, and behind them, in an inclosed cabin are the two pilots. In the after part of the boat, two guns are arranged to be fired through windows in either side of the hull. Such machines as these were used in large numbers for submarine spotting and long range coast patrol work

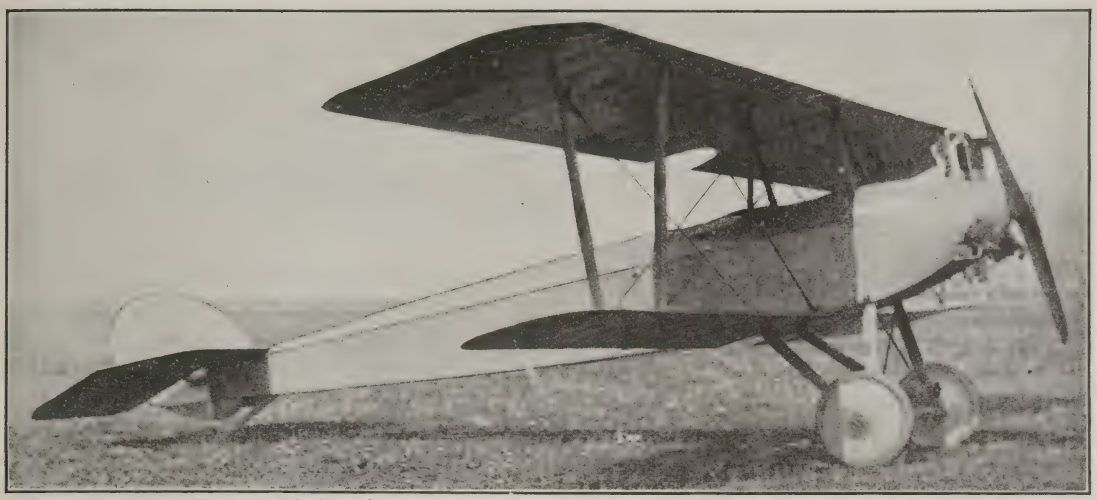

N-C-1 FLYING BOAT
CURTISS M-F
H-16 PUSHER
F-5-L FLYING BOAT
GALLAUDET D-4
STANDARD J-H
BOEING
LOUGHEAD F-1
AEROMARINE 40
AEROMARINE 39
H-S 2-L FLYING BOAT
SUNDSTEDT-HANNEVIG
McLaughlin



The Glenn L. Martin biplane, equipped with two Liberty motors, which has made a number of extraordinary records in the past three months



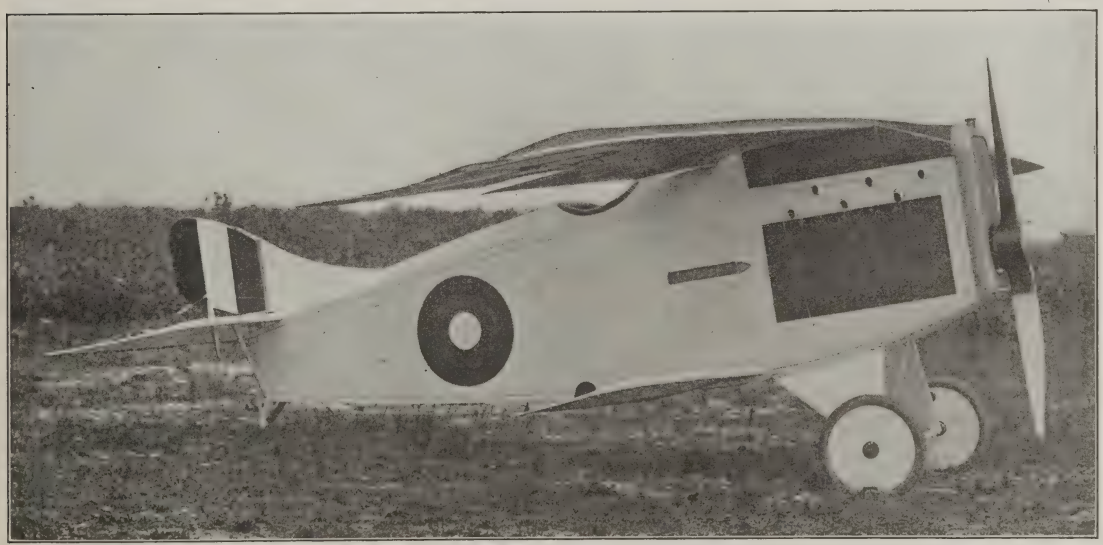
The Model H. S. 2 L. Flying Boat, constructed by the Standard Aircraft Corporation



The Bellanca Biplane, showing the neat appearance of the warping wings and streamline body



The Glenn L. Martin twin Liberty engined bomber that flew from Pittsburgh to Washington, a distance of 175 miles in one hour and fifteen minutes



Christmas "Bullet" strutless and wireless biplane which makes a speed of 170 miles an hour with a 6 cylinder Liberty Motor





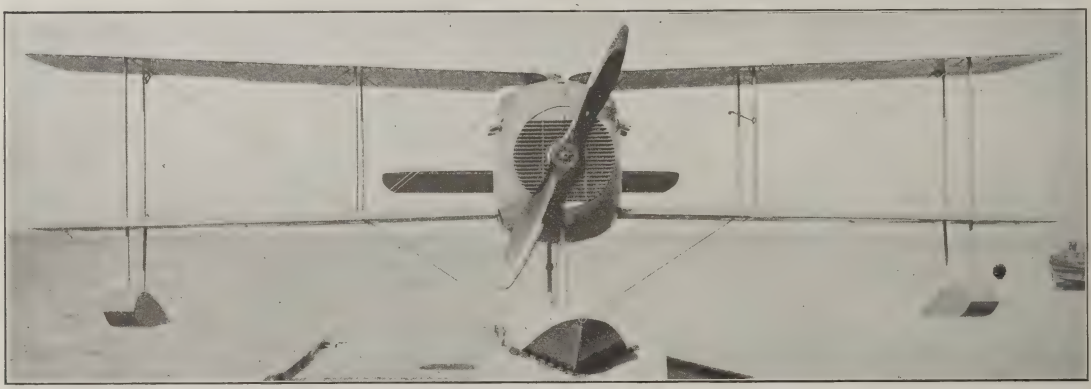
The Dayton-Wright "Sedan" carries two passengers and a pilot. It is completely enclosed and has a body with four windows on either side, has electric ceiling lights, upholstered swivel chairs, a card or dining table and rugs on the floor. It was designed under the direction of President Harold Talbott of tne Dayton-Wright Company



The Dayton-Wright "Honeymoon Express." It has two upholstered sea built-in mahogany vanity and lunch boxes, and bevel plate mirrors. It holds two passengers and pilot. It is painted in cream and black and is equipped with a Liberty Twelve. The machine has a maximum speed of 115 miles per hour and minimum of 53



Curtiss Model H-A Mail Machine. Streamline has been carried out to a very effective degree on the Curtiss Model H-A Mail Machine. The fuselage is exceptionally deep, wings being attached directly to the fuselage and a single pair of struts used at either side. A Kirkham model K-12 engine is used, connected to a four bladed propeller with high pitch. The photograph shows the neat way in which exterior control wires have been eliminated



The Curtiss Model H-A Hydro. An unusual feature in this machine is the single pair of struts from the pontoon to the fuselage, the deep body and the elimination of struts between the wings and body. The upper plane has the customary positive dihedral but the lower planes slope downward in a negative or reversed dihedral. The Hydro resembles in many respects the H-A Land Machine but two sets of struts are used on the Hydro because of the greater span



Sundstedt-Hannevig Seaplane. This seaplane was designed for the Trans-Atlantic flight. It is provided with two Hall-Scott engines with propellers in pusher position. The cabin, accommodating four persons, contains the appointments usually found in a limousine, including cushioned seats, electric ceiling light, glass windows, and wind shield. The instrument dashboard contains a map case which conveniently holds the charts which will be used in attempting the trans-Atlantic flight.



The Curtiss Model K triplane equipped with the Curtiss K-12 engine



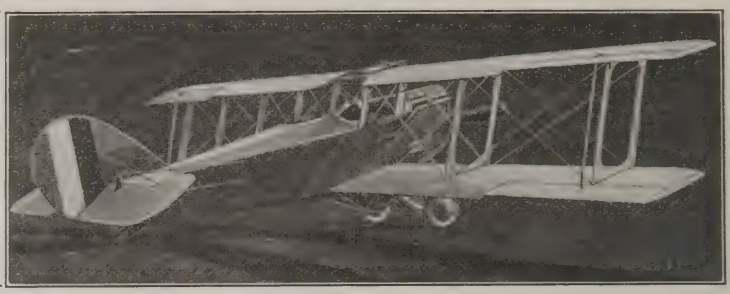
Three-quarter aero of the Curtiss Model K triplane

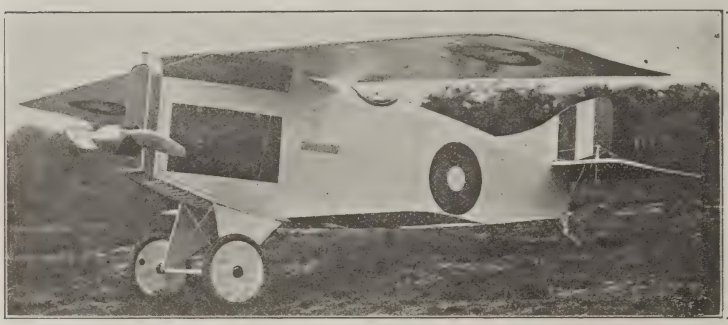


The Standard ME-1 defense Scout, equipped with 80 H.P. Le Rhone engine

LE PERE FIGHTER

The Le Pere has a span of 39 feet, and overall length of 25 feet and a height of 10 feet. Ground speed 136 M.P.H. A "Liberty 12" 400 H.P. engine is used. The fuselage is built up of Veneer





CHRISTMAS "BULLET"

With a Liberty "6"—185 H.P. engine, the "Bullet" has attained a speed of 175 M.P.H. The upper plane has a span of 20 ft. and no bracing is used to keep them rigged. Minimum speed 50 to 60 M.P.H. Cruising radius 550 miles



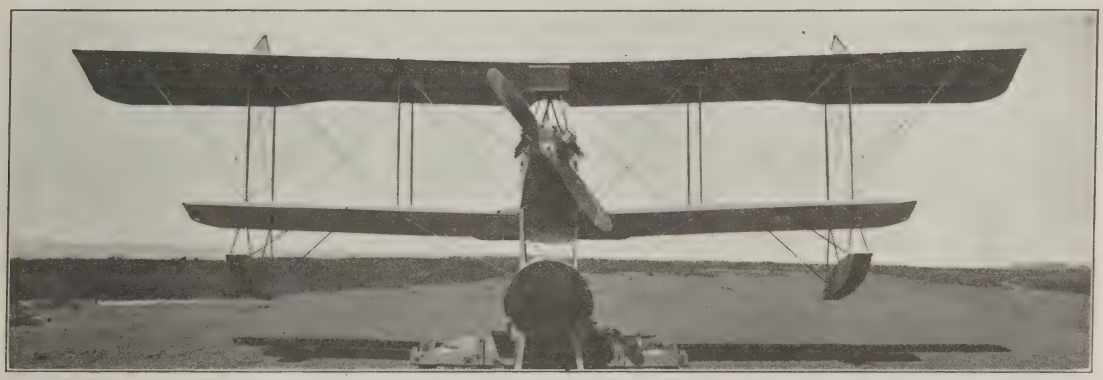
The "Standard" Type E4 Mail Plane, which has a capacity for carrying 180 pounds of mail. With an Hispano-Suiza 150 H.P. engine the machine makes a speed of 100 M.P.H.



The Curtiss NC-1 returning from a trip



The J. V. Martin Tractor. One of the very original machines developed in this country by Captain James V. Martin for the Signal Corps. A single Liberty "12" engine drives two four-bladed tractor screws by means of bevel gears. This machine has the Martin automatic wing-end ailerons, K-bar interplane struts and other unusual mechanical constructional features



FRONT VIEW OF THE 100 H.P. AEROMARINE NAVY TRAINING SEAPLANE

The Aeromarine Navy Training Seaplane. It is equipped with a Curtiss OX 100 horse-power engine or the new Aeromarine 130 horse-power engine. This seaplane is of the single float type, a development of the Aeromarine twin float Seaplane which has been used extensively by the Navy Department. With the single float the machine is easy to manoeuver on the water



The Aeromarine Model 40 T Flying Boat is provided with a 100 horse-power Curtiss OX engine. This machine has been designed to answer requirements of the sportsman. The Aeromarine 130 horse-power Type L engine is supplied when desired. Span of Upper Plane 48 feet; Chord, 75 inches; gap, 78 inches; total weight 1,925 pounds; weight fully loaded, 2,485 pounds. The wing floats have a buoyancy of 264 pounds. 35 gallons of gasoline are carried

THE MANUFACTURE OF VENEER AND PLYWOOD

By B. C. BOULTON, B. S., A. E.

THE development, during the past year, of plywood in its application to aeroplane construction has been greater than that of any other material. Previous to 1918 plywood had been used more or less successfully in fuselage work, and in a somewhat crude way in rib construction. At that time but little definite information was available regarding its properties, design, or the method of applying it. Since then a great deal of experimentation has been carried on by several of the leading manufacturers of plywood and by the U. S. Government, both at McCook Field, Dayton, Ohio, and at the Forest Products Laboratory, Madison, Wis. As a result of their work the efficiency of this material, especially in fuselage and rib construction, has increased more than 100 per cent. and several new applications for it have been developed. The processes used in the manufacture of veneer and plywood are therefore of unusual interest to the aircraft designer and builder.

In the veneer industry there are two distinct manufacturing operations—the cutting of the log into thin sheets, known as veneer, and the building up of this veneer into plywood. The larger plants, as a rule, carry on both these operations simultaneously, but at the present time there are many factories devoted wholly to the cutting of veneer, while others specialize in the manufacture of plywood. Woods which are most used for veneer are birch, poplar, basswood, spruce, Spanish cedar, maple, mahogany, walnut, gum, ash and oak. For aeroplane work different species are often used in combination in plywood, depending on the properties that are desired.

As the logs are unloaded at the veneer mill they are separated according to their variety. Although it may often be impossible to cut up the logs immediately, an important principle in regard to their storage is that the sooner a log is made into veneer after being taken from the living tree the better will be the results. Season checks and cracks have less opportunity to develop. Decay, particularly in the heartwood and along the season checks, is largely prevented, and therefore much waste in sawing off the ends of the logs is eliminated. But especially for ease in cutting the veneer in the slicer and rotary cutter is it desirable to have the logs fresh and full of sap. This condition is most important in the case of gums, maples, birches, and woods with sweet sap.

Methods of Cutting

The three general processes by which veneer is produced from the log are rotary cutting, slicing and sawing. Of these methods the most important is rotary cutting in which the log is placed in a large lathe and the veneer cut tangentially in a continuous sheet. About 70 per cent. of all veneer, including all the cheaper grades, is cut in this manner. The finer woods like walnut, maple and mahogany are usually quarter cut, that the full beauty of their grain may be obtained. In this case slicing or sawing must be resorted to. However, some logs of gum and poplar give bastard (tangential) cuts of very striking figure. Where quarter-cut veneer thinner than 1/32 inch is desired it must be cut by a slicer. Small logs of the more expensive woods, that would be quarter cut if possible, must be rotary cut in order to get widths which are of any value.

The preparation of the logs varies with the process used. For slicing and rotary cutting steaming is required, while for veneer sawing and slicing it is necessary to saw the log longitudinally into a number of wedge-shaped pieces.

Rotary Cutting

With all woods which contain frost, or which are dry, steaming is necessary, as it is with the harder woods, but unless the thickness of the veneer exceeds about 3/16 inch most soft species that are fairly fresh may be rotary cut without preliminary steaming. (A description of steaming bins and the routine followed in the process will be given later in connection with slicer cutting.) As the logs come from the steam bins they are barked, and any irregularities on the surface, such as projecting swellings or overgrown limb stumps are trimmed off. They are then cut to the desired length in a large cross-cut saw and the ends squared. The center of each end is carefully located and then the log is picked up by a derrick, swung into position, and centered in the rotary cutter, as shown in Fig. 1.

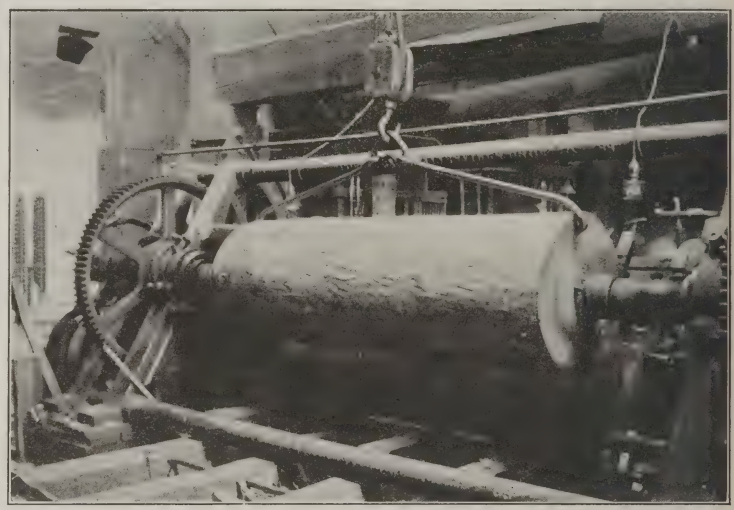


Fig. 1—Centering of log in rotary cutter

A cutter of this type is in effect a huge wood-turning lathe, with a long stationary knife fixed in position behind the log, its cutting edge at the same elevation as the axis of the chuck and spindle. Fig. 2 shows clearly the relative arrangement of the parts. The spindle into which the chuck fits is threaded for part of its length, so that when turned by a certain train of gears it advances and drives the spurs into the ends of the log, which must be very firmly gripped. Slightly forward of and above the main blade will be noticed several small adjustable knives in planes at right angles to the long knife. These are for the purpose of cutting the sheet of veneer into whatever lengths are required. The points of these knives meet the log just before it reaches the horizontal knife and cut shallow, narrow grooves around its circumference. The size of chuck used depends partly on the diameter of the log and partly on the amount of decay in the heartwood. The spurs must obtain a hold in sound wood. Since the smallest chuck is 6 inches in diameter, at least 6½ inches of log must necessarily be wasted. But, owing to the unsoundness that is usual in heartwood, this is but a slight disadvantage. In fact, it might be mentioned in passing that one of the important advantages of rotary cutting over slicing or sawing is the small influence that center decay has on the value of a log. For in the latter processes the log must be sawn into sectors, and serious decay at the center very materially reduces the width of the sheet that can be obtained.

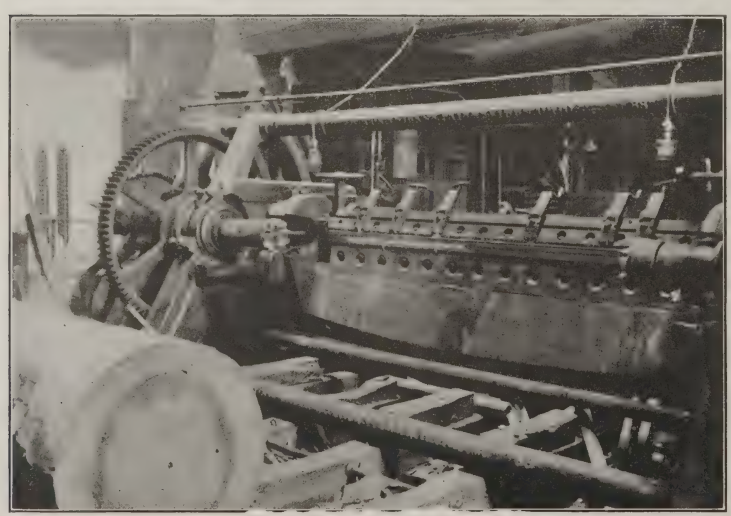


Fig. 2—Front view of rotary cutter

The sheet of veneer comes out at the back of the machine through a slot just below the edge of the long cutting knife, as shown in Fig. 3. The rate at which the veneer is cut varies as the diameter of the log because the rotary speed of the cutter, though slightly lessened when the load is excessive, is approximately constant at about 28 r. p. m., giving to the log a peripheral velocity depending on its size.

Veneer Sizes.—The maximum length to which veneer may be cut is limited by the size of the knife. The greatest length in use at the present time is 16 feet; however, the majority of knives are less than 8 feet 6 inches. With a long log the pressure of the knife acting on a large unsupported length tends to cause the log to chatter near its center. For this reason greater wastage occurs, owing to the impossibility of cutting the log to a small diameter. The sheet of veneer may be cut to any desired width if care is used to avoid breaking it in handling. Widths of 20 to 30 feet should be obtained without difficulty unless the veneer is very thin. In the preceding description the term "length" refers to the dimension parallel to the direction of the grain, and the term "width" to that perpendicular to this direction. With soft woods, thoroughly steamed, veneers up to ⅜ inch thick may be obtained, though a better maximum is 5/16 inch. In the case of oak, mahogany or maple not more than a ¼-inch thickness can be expected. On the other hands, these harder woods, with a tough fibre and fine grain, can be cut to a minimum thickness of 1/64 inch, while for poplar and gum 1/32 inch is a minimum value.

Minimum thicknesses are limited chiefly by breakage in handling, and during the past year special methods have been devised that partly remedy this difficulty.

The crew of a rotary cutter consists of five men, including one operator and two chippers. The latter catch the veneer as it falls from the knife, carry it back from the machine until the required width is reached, and then cut it off. It is necessary to obtain a given dry width, to allow for a certain shrinkage from the wet width. This increase for gum is 1½ inches per foot, for poplar 1¼ inches, and for oak 1 inch. The other two men of the crew are needed for the work of steaming and preparing the logs.

Preparation of Logs for Sawing and Slicing

Steaming.—If logs are to be cut into veneer on a slicer they must first be steamed. This operation is carried on in large bins which, if below ground, are generally of concrete, if above ground of wood with walls 6 or 7 inches thick. The rough logs are lowered by a derrick into these bins on which heavy wooden covers are then placed and tightly clamped down. Steam is now turned on. Most woods, except oak and mahogany, require steaming only over night, but with the latter 18 hours is usually needed. The size of the logs and the amount of frost they contain are factors in determining the duration of the steaming and the pressure necessary. For poplar, gum and walnut low pressure steam is sufficient, while the denser, harder woods must have steam under somewhat greater pressure. If the operator desires to accelerate the process he may do so by employing higher pressures. Some latitude is permissible in both the time and the pressure and the operator may exercise his judgment. In all cases the frost must be taken out, and after that a few woods, like walnut, unless fairly dry, need only warming through.

Sawing the Logs.—The logs are first barked and trimmed, and then placed on the carriage of a large band-saw, so that the saw will pass directly through the center of the log at each end. The carriage is seen in the foreground of Fig. 4 in its relation to the edging saw at the extreme left, and the veneer saws in the background. The sawyer next determines into how many "cants" or "pies," C, (Fig. 5) it is best to cut each half the log, his decision being based on the size and location of any defects that may be present on the diameter of the log, and on the width of the veneer desired. The cants are held by dogs on the carriage and trimmed to the flitch "F" by cutting off the corners "D," the heart, if defective, and one or two boards "E." Frequently it is necessary to saw the entire cant into boards if it appears unsuitable for veneer. The boards "E" are taken at once to the edging saw and trimmed. The waste parts are generally removed and used for fuel. The flitch "F" is now ready for either the veneer saws or the slicers.

For all quartered work the log is so placed that the cuts are radial. Occasionally, however, as with walnut, gum or poplar, in which there is no special quartered figure, flitches are prepared for bastard sawing or slicing.

A band saw crew consists of four men, the expert sawyer and three helpers, one of whom runs the edging saw for trimming up the boards.

Slicer Cutting

This process is not in such extensive use as either rotary cutting or veneer sawing, yet it has certain advantages within its own field. The chief of these, perhaps, is that the entire flitch can be utilized, whereas in veneer sawing, in spite of the thin saw employed, from 30 to 60 per cent. is wasted in saw kerfs. This becomes an important item when the wood is an expensive mahogany, curly maple or walnut. Again, if quartered veneer less than 1/30 inch thick is desired it must be cut on a slicer, for that is a minimum thickness for veneer sawing.

In slicer cutting the wood is sawn into flitches, as described above, for either quarter or bastard slices. Soft woods like poplar, especially when full of sap, do not require steaming, unless the veneer is more than 1/16 inch thick. Other woods, in a similar condition, need not be steamed if less than 1/32 inch thick, but all wood when full of frost or when dry must be steamed, particularly oak and mahogany.

Reference to Fig. 6 will help to make clear the construction of a slicer. It consists of two principal parts—the stay log, a heavy casting with a broad vertical face with grooves in which are mounted adjustable dogs that grip the flitch, and opposite this a heavy ribbed casting holding the knife. The stay log, with the flitch, is given a reciprocating motion that is forward and downward in its positive direction while the knife is stationary and slightly inclined upward, with the cutting edge of the blade up. The knife is narrow, ordinarily not more than 14 feet long, and rapidly increases in thickness from the cutting edge to give a strong and rigid backing to the latter. Through a "pressure bar" running parallel to the knife, and regulated by a hand wheel, the thickness of the veneer is controlled. This wheel is graduated along the rim, and turns past an index. One complete turn increases or decreases the thickness ¼ inch, and fractional turns change the thickness proportionally. It is impossible to cut the entire flitch into veneer, as about ¾ inch is required by the dogs that grip the flitch. If the latter is heavy or of very hard wood this unused width often increases to 1 or 1⅛ inch.

Veneer Sizes.—The maximum length of flitch that can be handled is determined by the length of knife in use, which is usually 12 to 14 feet, rarely as much as 18 feet. The softer woods may be cut to a thickness as great as ¼ inch when thoroughly steamed. The ordinary minimum thickness for any work is 1/96 inch, which, by careful adjusting, alignment and sharpening of the knife, may be decreased to 1/120 inch. Of course, only hard, fine-grained woods can be used for very thin veneer, with the exception of Spanish cedar. The maximum width is two feet. However, when great widths are wanted the maximum length is decreased somewhat.

Three men compose a slicer crew, the operator at the wheel regulating the pressure bar, and two helpers who place the strips of veneer on a table as they fall from the knife.

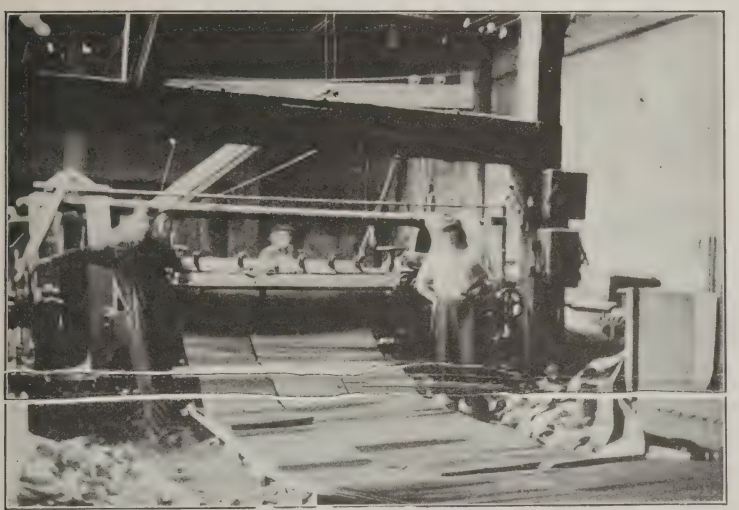


Fig. 3—Rear view of rotary cutter

Veneer Sawing

This process, possibly because of its simplicity, is more widely used than slicing for the production of quartered veneer. As is illustrated in Fig. 7, the flitch is firmly held by numerous dogs or clamps which slide up and down in grooves in a heavy stay log. This stay log, like the usual carriage of a saw, travels back and forth, carrying the flitch against the saw. This is circular with its cutting edge made up of several segments of thin steel securely bolted to the heavier steel casting which stiffens and supports the cutting segments. A kerf 1/16 inch wide is made by such a saw and, as in a slicer, at least ¾ of an inch of the flitch is required for the dogs to grip.

The sheets of veneer as they are sawn off are piled in order, and when the flitch is finished the top sheet is marked with the number of the log for purposes of later identification, a procedure which is also followed with veneer cut in a slicer.

Veneer Sizes.—The maximum length it is possible to cut is dependent on the extreme travel of the stay log. With some saws this is 24 feet, but 14 to 16 feet is the more usual limit of travel. A minimum thickness is 1/32 inch, though in ordinary practice 1/28 inch is better. A maximum width is about 18 to 20 inches. Since for quartered work the diameter of the log must be at least twice the width of the veneer, and if the heart is unsound as much as three times the width, it can be seen that for veneer sawing large and consequently expensive logs are used.

Three saws, with a total crew of five men—one expert, two sawyers and two helpers—constitute an efficient working unit. Since two men are required to operate a saw most effectively, and since it frequently happens that one of the saws has to be stopped for repairs or sharpening, this arrangement makes it possible to keep two saws busy continuously, with the expert occasionally running a third. A band-saw crew of four men is able to turn out enough flitches to keep such a unit supplied.

Drying Veneer

After the veneer has been cut by one of the

(*Continued on page* 1272)



Fig. 4—Band saw carriage

AMERICAN AERO ENGINES

By G. DOUGLAS WARDROP, M.S.A.E., A.S.M.E.

THE LIBERTY TWELVE

THE Liberty "Twelve" was comprehensively described for the first time in AERIAL AGE for December 16 and 23, with complete illustrations. It was the one purely American aeronautic contribution that got into large production, and was hailed by our Allies as an eminently useful power plant.

General Data:

Number and arrangement of cylinders	Twelve-Vee
Included angle	45°
Bore	5″
Stroke	7″
Stroke-bore ratio	1.4:1
Area of one piston	19.635 sq. in.
Total piston area	234.62 sq. in.
Swept volume of one cylinder	137.445 cu. in.
Displacement of motor	1649.5 cu. in.
Compression ratio (Army)	5.4:1
Compression ratio (Navy)	5:1
Normal brake H. P.	400 at 1750 RPM
Type of valve gear	Overhead cam shaft and valve rockers
Number of carburetors	Two Duplex Zenith

Lubrication:

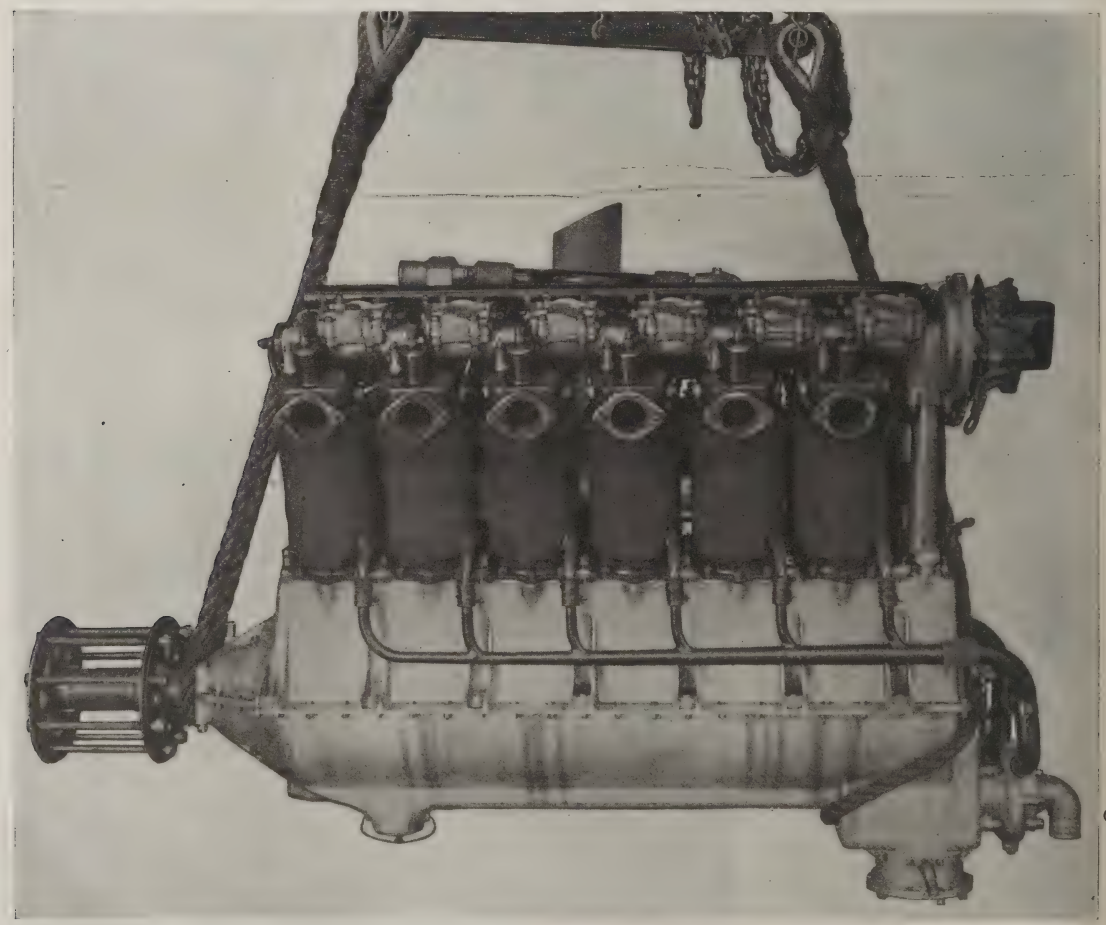
Type	Forced feed
Type of pumps	Rotary gear
No. of Pumps	1 double pressure and 1 scavenging
Ratio of pump speed to crankshaft speed	1.5:1

Ignition:

Type	Battery and generator
Firing order	L 1-9-5-11-3-7, R 8-4-12-6-10-2
Number of plugs per cylinder	2
Type of plug	A. C.
Ratio of generator speed to crankshaft speed	1.5:1

Cooling System:

Type	Water cooled
Pump	1 centrifugal
Diameter of inlet pipe	2″
Diameter of outlet pipe	1⅜″
Number of outlets	2
Diameter of rotor	3⅛″
Ratio of pump speed to crankshaft speed	1.5:1
Water temperature inlet	155° F.
Water temperature outlet	175° F.



The Liberty Motor

THE KING-BUGATTI

IN our issues of February 10 and 17 we presented to the engineers of the automotive industries the first complete discussion of the re-design and manufacture of the Bugatti engine in America, which was destined to be of very great value if the war had continued until the present spring. It was the first power plant designed to permit of the mounting of a 37 millimeter gun, which fired its shells through the hub of the propeller.

In re-designing the motor Charles B. King, to whom the work was entrusted, made very many improvements, and on the various tests made at the plant of the Duesenberg Motors Corporation, at Elizabeth, where it was manufactured, it showed marked efficiency.

General Data

Number and arrangement of cylinders
16 vertical, 2 rows of 8 in blocks of 4
Material ..... Cast iron
Bore ..... 4.33" 110m.m.
Stroke ..... 6.3" 160m.m.
Stroke-bore ratio ..... 1.435 :1
Area of one piston ..... 14.725 sq. in.
Total piston area ..... 235.6 cu. in.
Swept volume of one cylinder ..... 92.768 cu. in.
Displacement of motor ..... 1484.288 cu. in.
Compression ratio ..... 5 :1
Normal brake H. P. ..... 410 at 2,000 R.P.M.
Type of valve gear.... Overhead camshaft and valve rockers
Number of carburetors ..... Four Miller special
Ratio propeller to crankshaft speed ..... 666 :1

Ignition

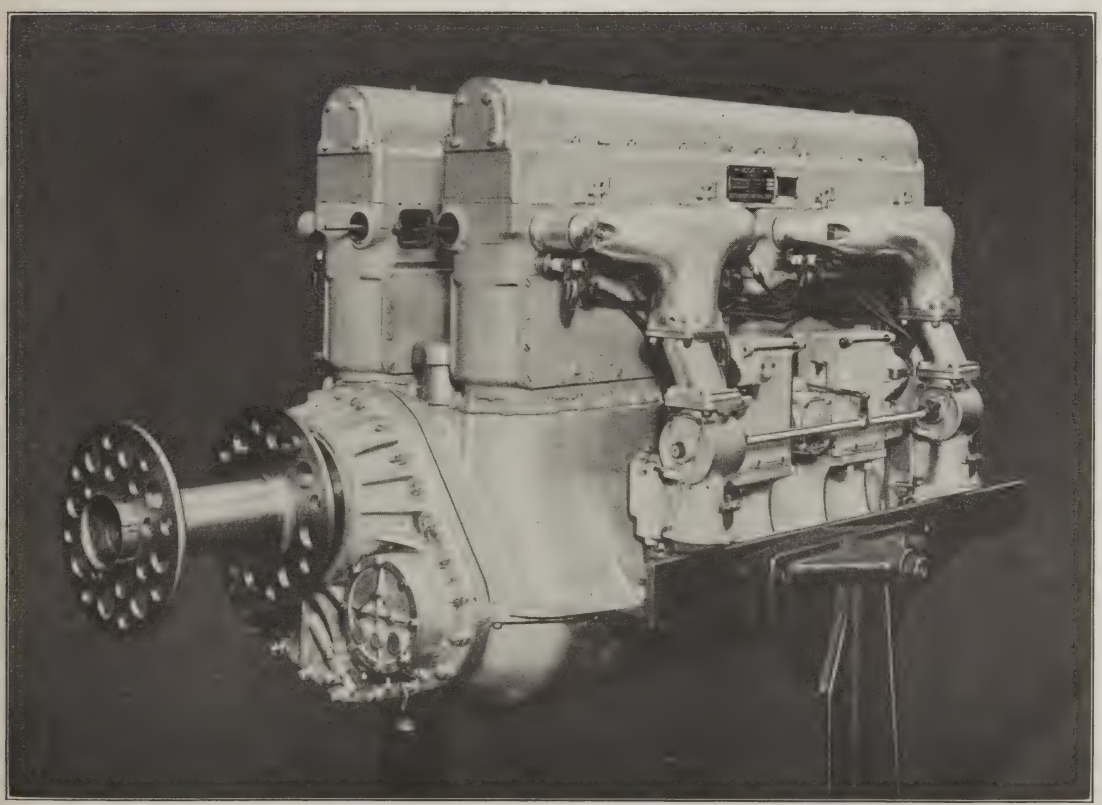
Type ..... Magneto
Number 4
Make ..... "Dixie 800"
Firing order: 1L, 7R, 5L, 4R, 3L, 8R, 7L, 2R, 4L, 6R, 8L, 1R, 2L, 5R, 6L, 3R
Number of plugs per cylinder 2
Type of plug ..... Titan A. C.
Advance ..... 38°
Magneto rotation ..... Clockwise

Cooling Systems

Type ..... Water cooled
Pump ..... 1 centrifugal
Inside diameter of inlet and outlet elbow to cylinders..... 1½"
Number of inlets 2
Number of outlets 2
Water temperature inlet ..... 150° F.
Water temperature outlet ..... 160° F.

Lubrication

Type ..... Forced feed and spray
Type of pump ..... Rotary Gear
Number of pumps ..... One pressure, one scavenging
Oil pressure ..... 30 lbs.



The sixteen cylinder King-Bugatti aviation engine

THE CURTISS K-6 and K-12

IN the design of Curtiss K-6 and K-12 motors, the form of construction adopted gives a minimum centre distance between cylinders, together with careful placing of the accessories, makes the motor compact and easily placed in the fuselage, at the same time the accessibility of the various parts is such that sub-unit may be readily inspected or overhauled without disturbing the motor in the aeroplane.

Gear Reduction

The gear reduction of the Model K-12 raises the centre of thrust to a point near the centre of gravity, and close to the centre of projected area. This enables the design of the nacelle or fuselage to be reduced in size, with consequent lower head resistance.

Ignition

Double ignition, from the two separate magnetos, gives a more instantaneous explosion, which at high engine speed is necessary to develop high mean effective pressures. The spark plugs are located near the intake valves, on the upper side, to guard against fouling and insure absolute ignition. The wire assemblies are enclosed in insulating covers of micarta, which guard against short circuit and injury.

Carburetion

A duplex carburetor (K-12 is provided with two carburetors), each tube supplying one set of three cylinders, assures a more satisfactory charge than a single carburetor equipment, due to the separate manifolds which prevent starving and eddying, and the better vaporizing properties of two small carburetors over one large one. In addition, hot water jackets are provided on the manifolds to assist in vaporizing the gasoline.

Lubrication

Pressure feed through crankshaft, propeller shaft and cam shafts, insures a continual film of clean oil on all bearings. Separate return pump with double intake absolutely prevents accumulation of oil in either end of pan, and consequent flooding of cylinders when machine is climbing or gliding. Pressure adjustment permits of individual adequacy of oil feed on each motor, and change for wear and varying conditions of service.

Type of Motor

K-6 is a six-cylinder water cooled—cylinders en bloc— aluminum construction. K-12 is a 12-cylinder motor with a 5:3 gear reduction to propeller shaft.

Horse Power

K-6 rated at 150 H.P. at 1,700 R.P.M. K-12 rated at 375 H.P. at 2,250 R.P.M. at crankshaft.

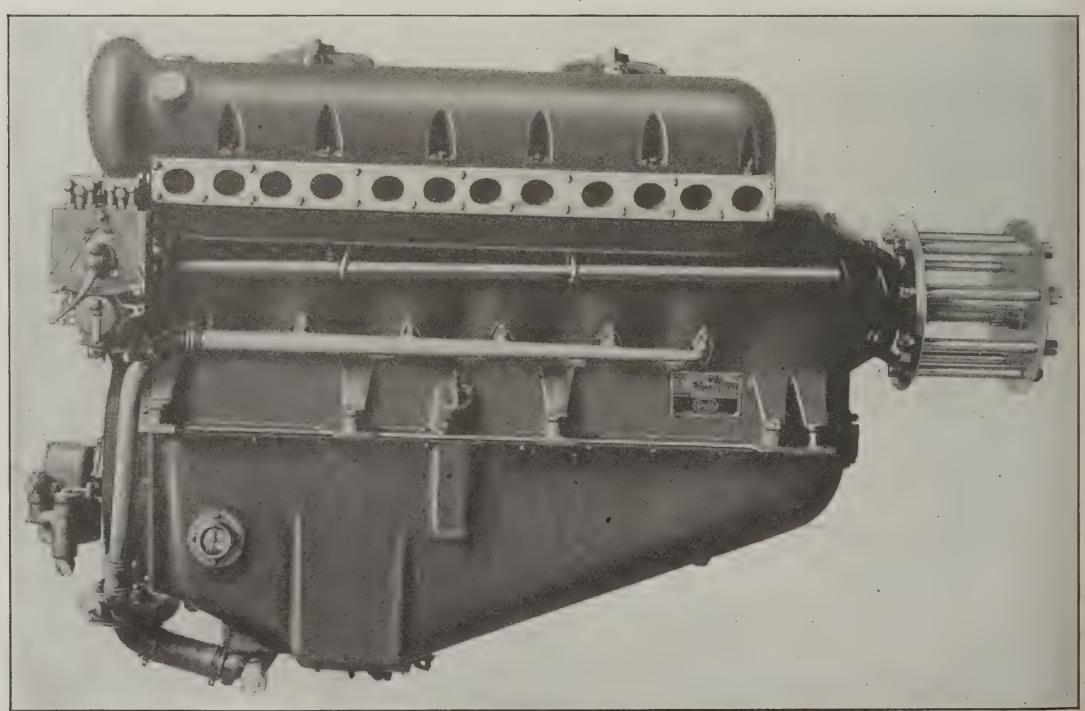
Bore and Stroke

4½" x 6".

Weights (Lbs.)	*Model K-6*	*Model K-12*
Cooling Water in Motor	—	38
Basic Motor	346	589
Carburetor and Intake Manifold	18	37
Ignition Equipment	32	37
Water Inlet Lines	4	4
Exhaust Manifold	14	28
Hand Starting Crank	3	—

Gasoline Consumption

Fifty-five lbs. per H.P. Hour.



The Curtiss Model K-12 aviation motor

THE HISPANO-SUIZA

THE Hispano-Suiza engine has been used in far larger quantities by the allied arms than any other motor and has been produced in much greater numbers than any other design of aeronautical engine.

It has been built in France, Spain, England and America, and is about to be made in Japan. Originated in Switzerland and Spain through the old Hispano-Suiza Motor Car Co. by Marc Birkight, the engineer and general manager of the company, it was quickly taken up by the French Government, being an engine which at that time was exceptionally light for its power and was also very easy to manufacture by comparison with the rotary motors and with the majority of the water-cooled fixed cylinder engines of French or British origin. For France it did so well in the air that a large number of French factories were ordered to drop their own experiments and devote all their energies to Hispano-Suiza manufacture. At the signing of the armistice there were seventeen plants in France wholly given over to Hispano work.

Meanwhile one of England's largest automobile plants had been taken over by the British Government to make a slightly modified copy of the French motor and the Wright-Martin Aircraft Co. of New Brunswick, N. J., had started to make an exact copy of the French engine, for France, before the U. S. entered the war.

The latest products of the Wright-Martin Company were completely described and illustrated in AERIAL AGE for December 30, 1918, and January 6, 1919.

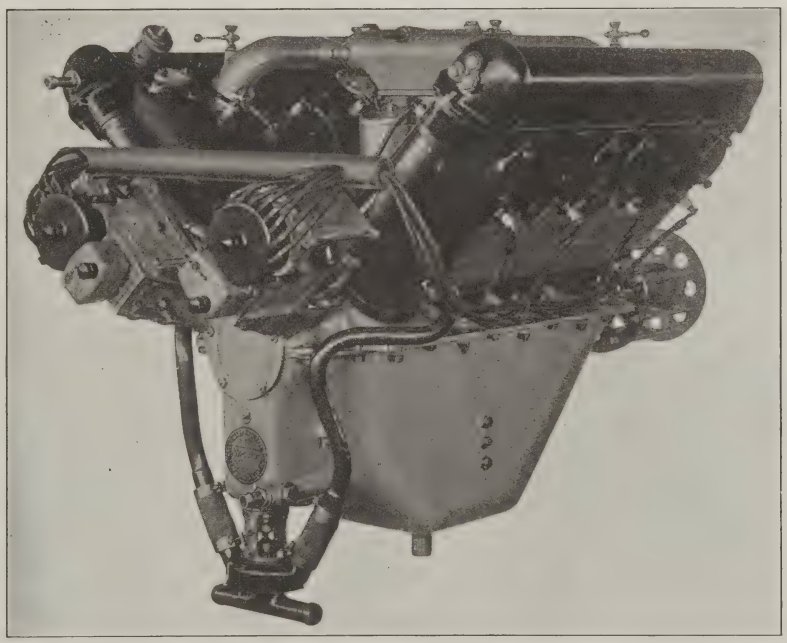
During the period from June, 1917, till the end of that year, Birkight went on with experimental work on the 300 h.p. and H. M. Crane, Vice-President of the Wright-Martin Aircraft Co., also proceeded with a design which, while it embodied most of the French features, yet differed in some very important points. When placed on test last Spring at the Bureau of Standards at Washington, and later at McCook Field, Ind., this Crane motor showed substantially more power than the French engine with the same bore and stroke and had a much lower oil consumption. It was also easier to manufacture in several details, and was stronger than the French engine, making for greater durability. The weight was slightly greater, but the power to weight ratio was slightly better in the American design.

In course of developing the 300 h.p. sundry small discoveries were made which led to alterations in the smaller motors then in production at New Brunswick, so that at present the 150 h.p. and the 180 h.p. American Hispano engines are quite distinct from the French motors of the same rated power and cylinder dimensions. The differences are, however, matters of detail and are not such as to prevent interchange of American and French engines in the same plane.

In all there are four types of Wright-Martin Hispana motors. Model A is the original and is a copy of the French 150 h.p. precisely. Model I is the improved 150 h.p. which for some time past has been supplied for American training planes.

Next comes the 180 h.p., which is known as Model E and is identical with Model I, except that the pistons are different, giving the higher compression. Finally there is the 300 h.p. or Model H.

All four engines are eight-cylinder V type with 90 degrees between the blocks, and each of the three smaller ones have the same piston displacement, their bore being 120 mm. or 4.72″ and stroke 130 mm. or 5.11″. Models A and I develop 150 h.p. at 1,450 r.p.m. Model E develops 185 h.p. at 1,750 r.p.m.



The Wright-Martin Hispano-Suiza

THE DUESENBERG MODEL H

THE Model H Duesenberg motor, developing 850-900 horse power, built by the Duesenberg Motor Corporation, of Elizabeth, N. J., is the most ambitious aero engine development that has been attempted, and carried through successfully, in the United States. It was fully described in AERIAL AGE for January 27, 1919. It was designed by F. S. Duesenberg, the pioneer builder of automobile speed engines, and he had the able assistance and coöperation of William Beckman. The motor is of the sixteen-cylinder V type, with the cylinders at an angle of 45°, and the weight of the power plant with gear drive is 1,575 lbs., without gear drive, 1,390 lbs.; remarkably low weight ratio for a power plant of its power.

General Data

Number and arrangement of cylinders	Sixteen V
Included angle	45°
Bore	6″
Stroke	7½″
Normal Brake Horsepower	800 at 1,800 r.p.m.
Type of gear	Overhead camshaft and valve rockers
Number of carburetors	Four Miller

Lubrication

Type	Forced Feed
Type of pumps	Rotary Gear
No. of pumps	1 double pressure and 1 scavenging
Ratio of pump speed to crankshaft speed	1 to 1

Ignition

Type	Battery and generator
Firing order	L: 4-8-8-2-6-1-5-3-7; R: 1-5-3-7-4-8-2-6
Type of plug	A. C.
Ratio of generator speed to crankshaft speed	2 to 1

Cooling System

Type	Water cooled
Pump	1 centrifugal
Diameter of inlet pipe	1⅝″
Diameter of outlet pipe	1⅜″
Number of outlets	2
Diameter of rotor	5¾″
Ratio of pump speed to crankshaft speed	1 to 1
Water temperature inlet	125 F.
Water temperature outlet	155 F.

Valves

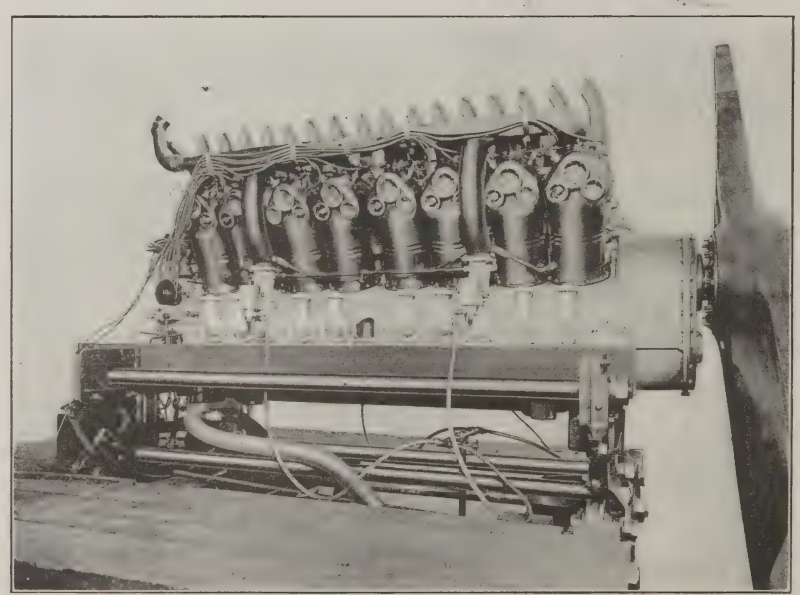
Number per cylinder	One inlet and two exhaust
Outside diameter	Exhaust 2-3/16″, Inlet 2-5/16″
Port diameter	Exhaust 1-31/32″, Inlet 2-23/32″
Width of seat	7/64″
Angle of seat	30°
Valve lift (inlet)	9/16″
Valve lift (exhaust)	½″
Diameter of stem	Inlet ½″, Exhaust 7/16″
Length of valve	Exhaust 6-27/32″, Inlet 6⅞″
Number of springs per valve	Two concentric
Length of springs in position	Outer 2⅞″, Inner 2¾–
Mean diameter of coils (large spring)	1⅛″
Mean diameter of coils (small spring)	1″
Inlet rocker clearance	.010
Exhaust rocker clearance	.015

Cylinders

Overall height of cylinders	19-1/16″
Length of projection in crankcase	2¾″
Diameter of cylinder over water jacket	6-27/32″ min.
Diameter of cylinder over water jacket	7-7/32″ max.

The ignition mountings permit of any standard make magnetos being used and recent motors have been equipped with two 8-cylinder Dixie magnetos of fixed spark and Delco special distributor with battery current furnished by Delco and Liberty generator. The Pilgrim battery ignition system has been tested on this engine also with very successful results.

In the cooling system the water is delivered from the pump through two 1⅞″ diameter tubes which connect to two headers or manifolds, one along each side and one located directly under the valves near the top of the cylinders. This header is joined to the cylinder by means of the outlet connections. At each cylinder where the water enters is welded a distributor which leads two streams of water, one directly beneath each exhaust port and a third stream to the outside of the cylinder wall or barrel.



The Duesenberg Model H 850-900 H.P. motor

THE LAWRANCE 60 H.P. AIR COOLED ENGINE

THE Lawrance Model L-1 is a three-cylinder Y-type air-cooled engine rated at 60 h.p. at 1,900 r.p.m. The accompanying graph shows that the engine delivers 30 h.p. at 800 r.p.m. and 63 h.p. at 2,100 r.p.m.

Bore, 4.25 inches; stroke, 5.25 inches. Cylinder displacement, 225 cubic inches. The weight complete with propeller hub, 130 pounds. This weight includes everything necessary for running, with the exception of the oil tank and mounting plates for which an additional weight of nine pounds is allowed. Starting handle is supplied when desired. Exhaust pipes made to individual requirements.

Cylinders

The cylinders are of cast aluminum with cooling fins machined. Shelby steel liners with walls 1/16 inch thick are cylinder and the crankcase. Liners are case-hardened and ground, which gives them a very fine wearing surface.

Each cylinder is attached to the crankcase by means of six studs.

Pistons

Pistons are of cast aluminium alloy. Crowns are flat. Each piston has four concentric cast iron rings and one wiper ring on skirt.

Crankcase

Crankshaft is of chrome nickel-steel. It has a single throw and is counterbalanced. The shaft is hollow for lubrication.

Front end of shaft is tapered to receive the propeller hub which is drawn tight by means of a differential thread nut. The shaft is sturdy and of large dimensions throughout.

Connecting Rods

Connecting rods are of chrome nickel-steel. They are round, of constant section and hollowed for lightness. They are machined all over. Each of the three rods has a segmental shoe which floats in two grooves in the big end bearing.

Bearings are of cast bronze with Babbitt lining.

Wrist pins of nickel-steel float in both the rods and pistons. Bronze buttons on the ends of wrist pins keep them from working out sidewise.

Valve Gear

Valve gear consists of three individual camshafts, each with two cams. The push rods are adjustable.

Rocker arms are provided with rollers where they come in contact with the valves so that all side thrust on the valve guides is eliminated.

Valves are of Tungsten steel, 2 1/16 inches in diameter.

Exhause valves are mercury treated so as to more readily conduct the heat from the head of valve to the stem.

Guides and valve seats are also of cast bronze, set into heads of the aluminium cylinders.

Springs are of a new type. They are conical in shape, wound of flat steel placed edgewise and tapered so that the greater width is in the large coils and lesser width in smaller coils. This permits of a shorter spring than would be possible with the usual helical coil spring.

Ignition

Two kinds of ignition are supplied. One type is a magneto designed by Mr. Kilsrath of the Simms Magneto Company which has a single breaker and one primary winding but two high tension windings, giving two absolutely synchronized sparks.

Magneto is run at 1½ times engine speed. The high tension distributor is separate and driven off one of the crankshafts.

The other ignition system is the "Philbrin," designed by the Philips-Brints Ignition Company. This system has a dual spark with two breakers; either one is used to fire the entire system; allowing perfect synchronization.

One of the accompanying illustrations shows the magneto in place.

Carburetor

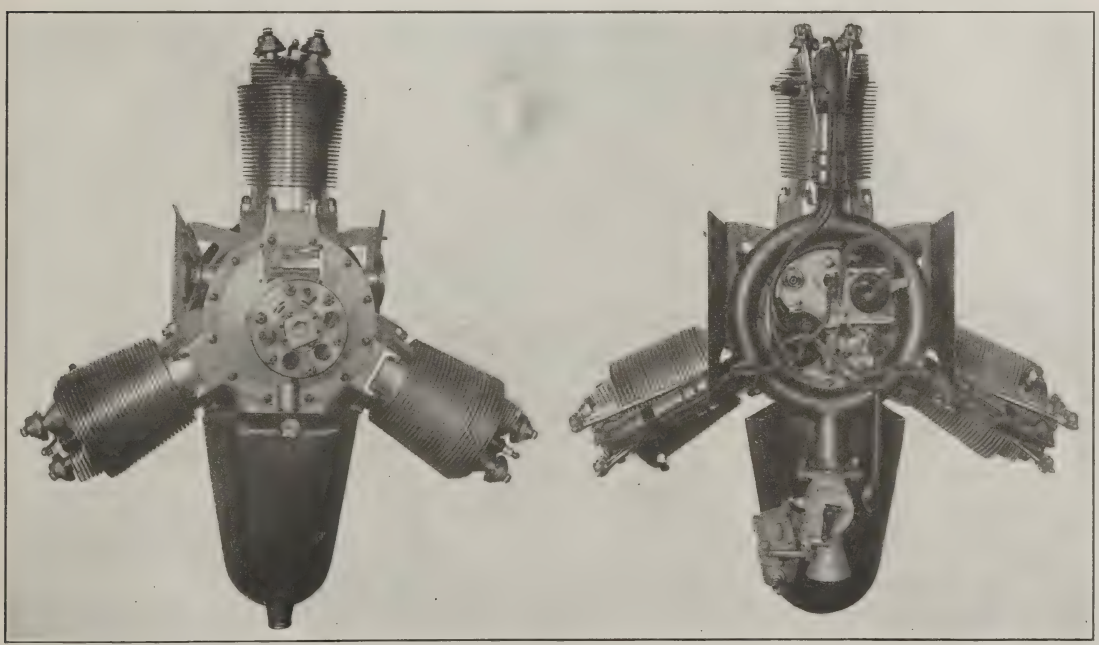
A Miller Carburetor is used. It has a throat 1¾ inches in diameter.

Lubrication

Lubrication is by means of pressure supplied by a gear pump. Pressure is maintained at 25 pounds per square inch.

The oil is fed through the rear of crankshaft to the front cover where it runs to a check valve which maintains the necessary pressure. From this valve the oil drains back to the tank immediately below it. On the front cover plate, the by-pass valve operates at a pressure of 50 pounds. It might seem that the two lower cylinders would obtain most of the oil but as a matter of fact it has been proven that the oil is evenly distributed to the 3 cylinders.

Oil is consumed at the rate of .07 lbs. per h.p. per hour.



The Lawrance 60 H.P. air cooled aero engine

THE UNION 6-CYLINDER AEROMOTOR

THE six-cylinder Union Aeromotor, manufactured by the Union Gas Engine Co., of Oakland, California, has many interesting features. It was first fully described in AERIAL AGE for July 9, 1917, and since that time has been wonderfully developed and improved.

General Description

Type—Six (6) cylinder, vertical, four-cycle, water-cooled, valve in head.

Power—120 h.p. at 1,350 r.p.m.

Weight—Engine with two carburetors, two magnetos, pumps and water piping, weighs 485 lbs.

Cylinders—Cylinders are of steel, with semi-steel head for valves and spark plugs. Base flange integral with walls of cylinder. In test, these cylinders when held by base flange only, withstood a hydraulic test of over 1,200 lbs. per square inch, or a total pressure on the head and base flange of over ten tons.

Cylinder water-jackets are of copper, with brazed joints. Upward thrust of cylinders is taken by chrome nickel studs extending from main journal caps to cylinder flanges.

Valves—Valves are of E. W. P. alloy. Stem guide is long, and water-cooled for its entire length. Valve springs are double, concentric, and of the helical type, right and left-hand.

Rocker Arms — Rocker arms are machined from solid chrome-nickel steel forgings, and heat-treated. Bearings are ¾" diameter and 2½" long. Shape of arms is such that oil leakage is prevented without the use of packing. Excessive wear of valve stem end, caused by point contact of adjusting screw, is eliminated by having line contact in place of points; length of contact between rocker end and valve stem being ⅜". Valve clearance is obtained by use of small cap with thin discs on end of stem. Cap is held by cotter so that adjustment is positive.

Camshaft Housing—Camshaft housing is split horizontally along the center line of the camshaft, permitting easy removal of shaft. To prevent flooding of camshaft housing when climbing, a drain from each end of housing leads down to main crankcase sump.

Camshaft Gears—All valve gears are of Midvale chrome nickel steel, heat-treated and operate in oil bath.

Magneto and Pump Gears—See camshaft gears.

Pistons—Pistons are of Lynnite aluminum alloy. Piston length is 6". Piston pin bearing is 1¼" x 2¾".

Connecting Rods—Connecting rods are I-beam section, of Midvale chrome nickel steel, heat-treated.

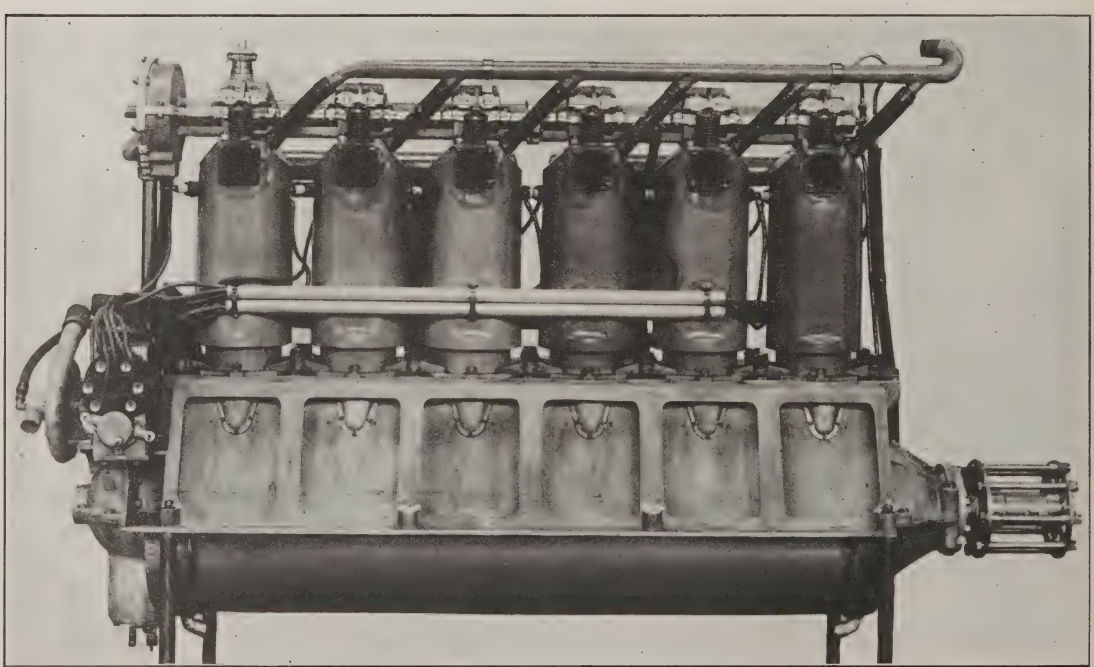
Crankshaft—Crankshaft journals are 2½" diameter by 2½" long; crank pins are 2½" diameter by 3" long. In addition to the seven main bearings, there is a bearing just outside of the thrust. Shaft is made of Midvale chrome nickel steel, heat-treated.

Thrust Bearing—Propeller thrust is taken by a two-way, self-aligning SFK bearing.

Crankcase—Crankcase is of aluminum alloy, and in addition to thorough cross-webbing, the side walls are of hollow box section. The stiffness of this construction is so great that the entire propeller torque can be taken through the length of the case without any signs of twisting or vibration, the case during this test being held from rotating at the end opposite to the propeller end only.

Lubrication—Oil is taken from the crankcase by a gear pump, delivered to a combined oil tank and cooler (located where convenient), from which it flows back to a second gear pump which sends it under a pressure of 40 to 90 lbs. to the crankshaft journals, through the shaft to the lower rod bearings and up into the piston pin. The holes in the piston for the piston pin being sealed, the oil must pass between the outer surface of the pin and its bearing. From here it is carried to the cylinder walls. The camshaft, camshaft bearings, cams, rocker arms and valve gears are lubricated by oil bypassed from the oil pressure regulator. This insured force-feed lubrication to all moving parts, even with no oil in the crankcase.

Ignition—Current is furnished by two entirely independent magnetos of either Berling or Dixie make. Each cylinder is fitted with two plugs, each plug being in close contact with a water-cooled wall for its entire circumference.



The Union 6-cylinder Aeromotor

THE KNOX TWELVE

WHEN the Knox 300 H.-P. aero engine had its first block test in November, 1916, it was then the largest power plant that had been constructed in America. Development of the motor was retarded during the war owing to the other war contracts which the Springfield Motors Company had.

The original model was a 12-cylinder, 4¾ inches bore by 7 inches stroke and is a "V" engine with six cylinders on each side, set at 60 degrees from each other.

The crankcase is a special aluminum alloy casting in one piece and extending 7 inches below from the center line of the crankshaft to give barrel section for strength.

Instead of using legs for motor supports on the crankcase, as is the general practice, this engine is supported by a shelf running the full length of the case on each side of which the motor will rest. Five (5) bolts pass through each shelf into the frame work of the aeroplane and a supporting rib or brace is cast each side of each bolt. The motor is very narrow at this point and will enter a frame 15 inches in width inside with bolt centers 17 inches.

The lower half of the crankcase is an aluminum casting in one piece and is bolted to the upper half. No mechanism is contained in this lower half and there are no pipe connections to make. A glass gauge is attached to the side of the case, showing the oil level at all times.

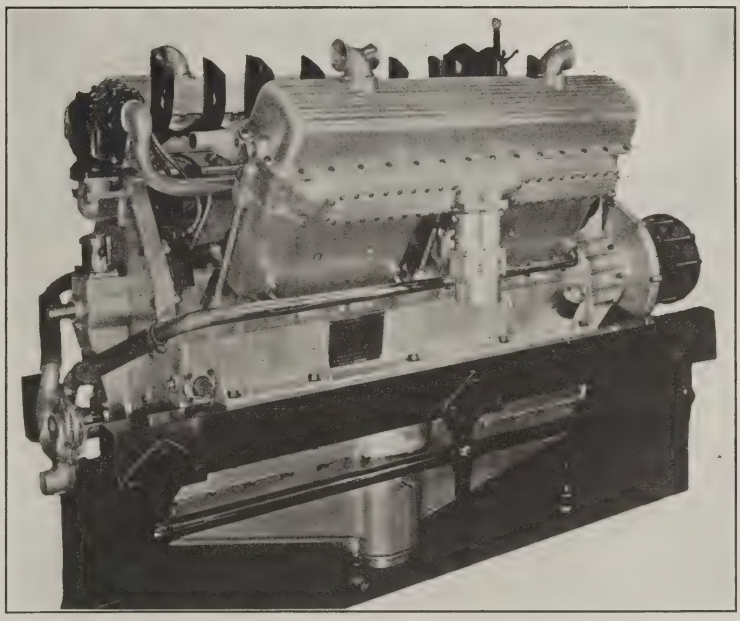
The cylinders are special aluminum alloy castings with cast iron liners ⅛ inch thick. These liners have a flange on the lower end and are pressed in from the bottom. The cylinders are cast in blocks of three and are held to the case by eight studs each. The cylinders are open at both ends and the upper portion of the bore forms the combustion chamber, which is machined all over. The corner bosses are supported by two heavy ribs each and the central bosses run clear through between the cylinders to give strong anchorage. The water jacket extends well down below the bottom of the stroke and ½ inch water space is provided between the cylinders. The piston displacement of the motor is 1,488.53 cubic inches.

The cylinder heads are cast in blocks of six, of special aluminum alloy and cast iron valve seats are cast integral with the head. The head for each six cylinders is held down by 16 nickel steel studs passing clear through the head. There are four valves to each cylinder carried in the cylinder head and the water jacketing is so arranged that each valve seat is practically surrounded by water.

Camshafts and rocker arms are carried in the head, the camshafts having eight bearings and the rocker arms being supported above it, as is well illustrated in the photographs.

The camshafts as well as the rocker arms and all mechanism in the head is under forced feed lubrication and drainage is provided back to the crankcase at the center when the motor is in normal position and at each end when the motor is tipped up or down.

Each cylinder head has an aluminum cover which completely conceals and protects all of its mechanism.



The Knox Twelve

THE HALL-SCOTT A-8

THE A-8 is a twelve-cylinder engine of advanced design, incorporating many attractive features, and developing a brake horse-power approaching 450, with an engine weight of less than 800 pounds.

Anticipating the requirements of aeronautical warfare, Lieutenant Colonel E. J. Hall, consulting engineer of the Hall-Scott Motor Car Company, and at that time active head of its experimental and production departments, began work on this twelve-cylinder A-8 model and had completed it after exhaustive tests prior to May 1, 1917. It was placed on the testing stand for its final run when Colonel Hall was called to Washington early in May, last year, to assist the Government Aircraft Production Board in the designing of an American aeroplane motor that would meet the requirements of greater power, lighter weight, and more dependability than any of those on the market at that time.

While the Hall-Scott Motor Car Company at West Berkeley, California, had completed the assembly of this equipment, and was planning on quantity production at the time it was decided to go ahead with the United States aircraft program, the diversion of Col. Hall's efforts to the Government service, and the wish of the company not to interfere with the production of the Liberty engine, resulted in the postponement until now, of the final tests, and of putting the A-8 type Hall-Scott engine into production.

The first engine of the A-8 type weighed 1100 pounds. This was equipped with the cast iron cylinders, which were made interchangeable with the 4, 6 and 8 cylinder engines of the Hall-Scott design. The company, however, had ready steel cylinders which have been substituted for those in the original engine, and which together with refinements in other parts reduce the total weight, with a built-in electric starter, to about 800 pounds or 1.75 pounds per horse-power. Besides the cylinders, many other parts are interchangeable with those of Hall-Scott 4, 6, and 8 cylinder engines of the A-5, A-7 and L-6a types.

The bore and stroke of the A-8 Hall-Scott engine is 5 by 7 inches, the same as in the A-5, A-7 and L-6a types.

The photograph of the new twelve-cylinder A-8 engine shows it mounted on the testing block, fitted with the four-blade propeller, and illustrates very clearly the propeller hub of special Hall-Scott design.

The manufacturers anticipate a similar satisfactory performance in actual service in the A-8 type, as has marked the success of the 4, 6, and 8 cylinder machines. It is thought that the A-8, designed to meet the peculiar conditions under which American aeroplane engines must function, and to fit the American manufacturing methods, will rank in performance with the better types of foreign engines.



The Hall-Scott A-8

THE 80 H.P. LE RHONE

THE 80 H.P. Le Rhone engine was manufactured in this country for the Bureau of Aircraft Production by the Union Switch & Signal Co., at Swissvale, Pa., and was used in the Thomas Morse S-4-E and Standard ME1.

The engine consists of two elements, the fixed part and the rotating part.

The fixed part consists of a hollow crankshaft, two engine supporting plates and the carburetor. The carburetor is mounted on the extreme end of the crankshaft and supplies the vaporized mixture through the hollow shaft to the crankcase. On the main supporting plate, which is keyed to the crankshaft, are mounted the magneto, the distributor brush and the oil pump. The short end crank, formed by the extension of the shaft at the propeller end, is located on the crank pin by a taper and round key and is held by a locknut. The crankshaft is machined from high grade chrome-nickel steel forging oil tempered to give high elastic limit and weighs 59.5 lb. before and 11.15 lb. after machining.

The rotating part consists of crankcase, cylinders, intake headers, pistons with connecting rods and thrust block, valve gear and ignition distributor.

Ball bearings are used exclusively for rotating elements. There are nine sets of ball bearings on the crankshaft. All the ball bearings within the crankcase and housings are of the retainer type.

The crankcase is in the form of a steel cylinder provided with nine bosses having threaded openings into which the cylinders are screwed. It is a 40 to 50 per cent. carbon open hearth steel forging, specially heat treated and weighing 274 lb. before, and 28¼ lb. after machining. The propeller shaft is made integral with the front crankcase cover and is machined from a chrome-nickel steel forging, oil tempered. The thrust bearing housing is bolted on the rear of the crankcase, and on it are mounted the magneto and oil pump drive gear and the ignition distributor ring. The crankcase parts revolve about the shaft on three sets of ball bearings, the propeller thrust is absorbed by a double row ball thrust bearing.

The cylinder is a 40 to 50 per cent. carbon open hearth steel forging weighing 62½ lb. before and 7¾ lb. after machining, specially heat treated after rough turning and has cooling fins turned on the outside barrel and on the head. It is provided with a cast iron liner pressed into place.

The cylinder, held in the crankcase by threads cut at its base, is prevented from further rotation about its own axis by a locknut which screws down against the crankcase boss. In each engine assembly, in order to prevent vibration, such cylinders are selected as have equal weights. They must have not only equal total or static weight, but they must also have the same dynamic weight or moment about the center of engine rotation.

The two valves, with seats provided in the steel cylinder head, are actuated by an oscillating rocker arm and a single push rod, the rocker arm being supported on two ball bearings. The valves are made of chrome-nickel steel, and are provided with a screw driver slot for grinding in the 36½ deg. seat. The guide is a cast iron bushing pushed into a steel retaining sleeve which is screwed into the valve cage and held by a locknut.

The valve spring is of steel wire single coil, of 3½ lb. tension with the valve in a closed position. No spring is required except at starting; at a speed of 1,200 r.p.m. the centrifugal force acting on the valve is about 85 lb.

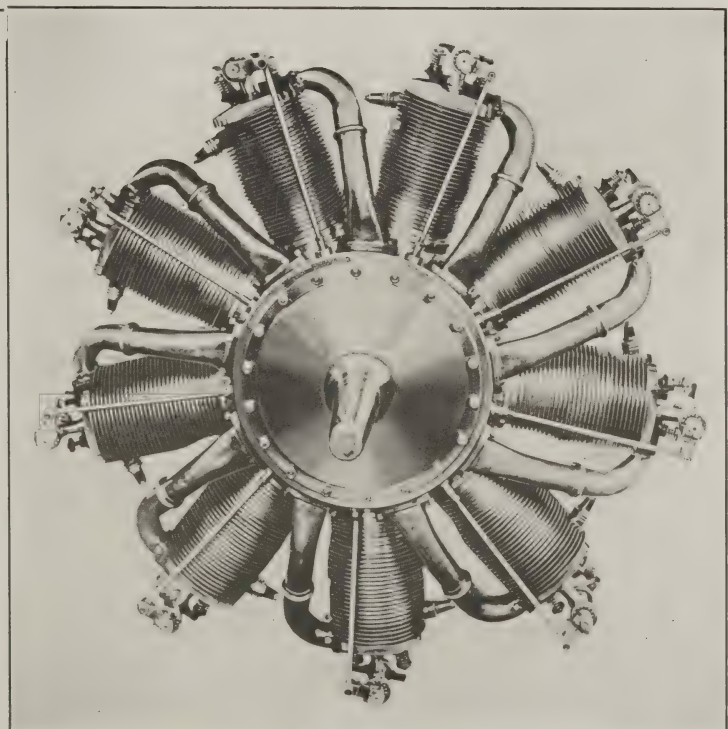
The copper intake headers which convey the carbureted mixture from the crankcase to the inlet valve cages are made in two pieces with a slip joint sealed by a rubber ring.

Specifications

80 H. P. Le Rhone Engine

Type of engine	Radial revolving, four stroke
Rated horsepower	80
Normal speed	1200 r.p.m.
Number of cylinders	9
Cylinder bore	105 mm. (4.1369 in.)
Stroke	140 mm. (5.5120 in.)
Piston displacement	667 cu. in.
Compression ratio	4.8 (70½ lb. absolute)
Order of firing	1-3-5-7-9-2-4-6-8
Method of cooling	Air
Diameter of inlet and exhaust valves	1.8 in.
Diameter of valve stems	0.315 in.
Lift of inlet and exhaust valves	18/32 in.
Carburetor (mixing valve with gate throttle and metering pin)	Block tube type.
Magneto	Fixed spark
Direction of rotation	Clockwise

(*Continued on page* 1283)



The 80 H.P. Le Rhone

CHARACTERISTICS OF LEADING AERO ENGINES

Engine	Rated H.P.	Type	No. of Cyls.	Bore		Stroke		Bore and Stroke Ratio	B.H.P. & R.P.M. at Ground Level				Compression Ratio	Piston Speed, Ft. Min.	Order of Firing	Method of Cooling	M. E. P. Lbs. per Sq. In.	Valves per Cylinder							
									Normal		Maximum							Inlet				Exhaust			
				Mm.	Ins.	Mm.	Ins.		B.H.P.	R.P.M.	B.H.P	R.P.M.						No.	Dia., Ins.	Total Area, Sq. Ins.	Lift, Ins.	No.	Dia., Ins.	Total Area, Sq. Cms.	Lift, Ins.
Curtiss OX5	90	V-90°	8	101.5	4	127	5	1.25 -1	93	1400	95	1450	4.5	1166	1L, 1R, 2L, 2R, 4L, 4R, 3L, 3R.	W	111	1	1.9094	2.0623	.3437	1	1.9094	2.3267	.3878
Curtiss VX	160	V-90°	8	127	5	177.8	7	1.41 -1	206	1350	214	1450	4.71	1575	1L, 1R, 2L, 2R, 4L, 4R, 3L, 3R.	W	110	1	2.7559	3.2366	.3740	1	2.7559	3.2366	.3740
Liberty 8	270	V-45°	8	127	5	177.8	7	1.40 -1	270	1700	285	1850	18%	1980	.....	W	115	1	2.5	3.4344	.4375	1	2.5	2.9437	.3750
Liberty 12A	400	V-45°	12	127	5	177.8	7	1.40 -1	400	1700	430	1800	18%	1980	1L, 6R, 5L, 2R, 3L, 4R, 6L, 1R, 2L, 5R, 4L, 3R	W	115	1	2.5	3.4344	.4375	1	2.5	2.9437	.3750
Hispano Suiza	150	V-90°	8	120	4.72	130	5.12	1.08 -1	150	1450	170	1700	4.8 -1	1240	1L, 4R, 2L, 3R, 4L, 1R, 3L, 2R	W	114	1	1.9685	2.4350	.3937	1	1.9685	2.4350	.3937
Hispano Suiza	180	V-90°	8	120	4.72	130	5.12	1.08 -1	180	1700	205	1800	5.3 -1	1450	1L, 4R, 2L, 3R, 4L, 1R, 3L, 2R	W	122	1	1.9685	2.9350	.3937	1	1.9685	2.4350	.3937
Hispano Suiza	300	V-90°	8	140	5.5	150	5.90	1.07 -1	300	1600	340	1800	5.3 -1	1578	1L, 4R, 2L, 3R, 4L, 1R, 3L, 2R	W	125	1	.....	.....	.....	1	.....	.....	.....
LeRhone	80	Rotary	9	106	4.13	140	5.51	1.32 -1	80	1200	85	1300	1.33-1	1100	1, 3, 5, 7, 9, 2, 4, 6, 8	A	81	1	1.5629	1.7313	.3593	1	1.5629	1.4492	.2952
Gnome	100	Rotary	9	110	4.33	150	5.90	1.36 -1	103	1200	110	1300	4.0 -1	1180	1, 3, 5, 7, 9, 2, 4, 6, 8	A	88.7	0	.....	.....	.....	1	.....	.....	.....
ABC Wasp	170	Radial	7	114.3	4.5	.....	5.9	1.31 -1	170	1750	200	1850	4.025	1690	1, 3, 5, 7, 2, 4, 6	A	115	1	2.17	3.33	.4700	2	1.338	2.4800	.2950
ABC Dragon-Fly	320	Radial	9	140	5.5	165	6.5	1.18 -1	320	1650	350	1750	4.025	1785.5 1650	1, 3, 5, 7, 9, 2, 4, 6, 8	A	114	1	2.6559	5.4537	.6535	2	1.6929	2.2992	.4330
BR1	150	Rotary	9	.....	6.72	.....	6.66	1.42 -1	154	1250	156	1300	5.9 -1	1394	1, 3, 5, 7, 9, 2, 4, 6, 8	A	94	1	1.77	2.41	.4300	1	2.000	2.7300	.4300
BR 2	200	Rotary	9	.....	5.51	.....	7.08	1.285-1	238	1300	242	1350	5.3 -1	1475	1, 3, 5, 7, 9, 2, 4, 6, 8	A	95.2	1	2.47	3.9554	.5100	1	2.28	3.6510	.5100
Beardmore	160	Vert.	6	142	....	175	....	1.23 -1	178	1350	192	1450	4.56-1	1135	1, 5, 3, 6, 2, 4	W	103	1	2.559	.....	.....	1	2.5590	.....	.....
Galloway	240	Vert.	6	145	5.71	190	7.48	1.31	236	1400	250	1500	4.96-1	1558	1, 5, 3, 6, 2, 4	W	116	1	2.7165	4.0455	.4724	2	1.8110	4.2346	.4724
Siddeley	240	Vert.	6	.....	5.71	.....	7.48	1.31	240	1400	250	1500	5 -1	1558	1, 5, 3, 6, 2, 4	W	118.1	1	2.5984	3.9060	.4724	2	1.7322	5.2080	.4724
Hispano	150	V-90°	8	.....	4.72	.....	5.12	1.08 -1	156	1500	165	1600	4.8 -1	1280	1, 4, 2, 3, 4, 1, 3, 2	W	114.75	1	1.9685	2.4350	.3937	1	1.9685	2.4350	.3900
Hispano	180	V-90°	8	.....	4.72	.....	5.12	1.08 -1	220	2000	225	2100	5.3 -1	1707	1, 4, 2, 3, 4, 1, 3, 2	W	121.8	1	1.9685	2.4350	.3937	1	1.9685	2.4350	.3900
Rolls-Royce Falcon 3	220	V-60°	12	.....	4.00	.....	5.75	1.44 -1	270	2200	280	2300	5.3 -1	2108	Rbt. 1, 2, 5, 4, 3, 1, 6, 5, 2, 3, 4, 6	W	114	1	1.7496	2.4211	.4437	1	1.7496	2.4211	.4400
Rolls-Royce Eagle 8	360	V-60°	12	.....	4.5	.....	6.5	1.44 -1	350	1800	360	1900	5.3 -1	1950	Rht. 1, 2, 5, 4, 3, 1, 6, 5, 2, 3, 4, 6	W	124	1	2.0000	2.9155	.4850	1	2.0000	2.9155	.4800
Sunbeam Arab	200	V-90°	8	120	4.72	130	5.12	1.08 -1	217	2000	224	2100	5.3 -1	1710	1, 1A, 2, 2A, 4, 4A, 3, 3A	W	115	1	2.126	2.3631	.3543	2	1.2598	2.8088	.3543
Sunbeam Maori	250	V-60°	12	.....	3.94	.....	5.31	1.35 -1	265	2100	280	2200	5.6 -1	.....	1, 5, 3, 6, 2, 4	W	125	2	.....	.....	.3543	2	.....	.....	.3500
Sunbeam Cossack	320	V-60°	12	.....	4.33	.....	6.30	1.45 -1	350	2000	364	2100	5 -1	2100	1, 5, 3, 6, 2, 4	W	124	2	1.6142	3.6952	.3543	2	1.6142	1.8476	.3500
Clerget 92	110	Rotary	9	120	4.72	.....	6.30	1.33 -1	122	1250	123	1300	4.36-1	1260	1, 3, 5, 7, 9, 2, 4, 6, 8	A	78	1	1.5748	1.9423	.3937	1	1.9685	2.8031	.4528
Clerget 92	130	Rotary	9	.....	4.72	.....	6.30	1.33 -1	127	1250	....	....	4.56-1	1312	1, 3, 5, 7, 9, 2, 4, 6, 8	A	81	1	1.692	2.24	.3900	1	1.9685	3.038	.4527
Hispano*	180	V-90°	8	.....	4.72	.....	5.12	1.08 -1	208	2000	225	2100	5.3 -1	1707	1, 4, 2, 3, 4, 1, 3, 2	W	121.8	1	1.9685	2.4350	.3900	1	1.9685	2.4350	.3931
Hispano*	200	V-90°	8	.....	4.72	.....	5.12	1.08 -1	220	2000	215	2100	4.8 -1	1707	1, 4, 2, 3, 4, 1, 3, 2	W	115	1	1.9685	2.4350	.3900	1	1.9685	2.4350	.3937
Lorraine Dietrich	275	V-90°	8	120	4.72	175	6.89	1.46 -1	278	1650	....	....	.....	.....	.....	...	.....	...	.....	.....	.....	...	.....	.....	.....
Fiat A12bis	275-300	Vert.	6	160	6.3	180	.....	1.12	304-290	1600	325	1760	4.31-1	1653	1, 5, 3, 6, 2, 4	W	105	2	2.00	5.5180	.4300	2	2.0078	5.518	.4375
Fiat A14	600	Vert.	12	.....	6.69	.....	8.27	1.235-1	700	1500	725	1600	.....	.....	.....	W	108	.	.....	.....	.....	.	.....	.....	.....
I.F. V5	200	Vert.	8	130	....	190	....	. . . .	250	1400	268	1600	5	1995	.....	W	107.6	.	.....	.....	.....	.	.....	.....	.....
Spa 6A	200	.....	6	135	....	170	....	.....	210	1600	225	1700	5	1895	.....	....	116.6	.	.....	.....	.....	.	.....	.....	.....
Benz	220	Vert.	6	145	....	190	....	.....	230	1400	252	1650	4.93	1745	.....	W	113	.	2.244	.....	.....	.	2.244	.....	.....
Maybach	200	Vert.	6	150	....	190	....	.....	200	1200	....	....	.....	1496	.....	W	107.4	.	1.8998	.....	.....	.	1.3779	.....	.....
Mercedes	160	Vert.	6	140	....	160	....	.....	150	1250	....	....	4.8-4.52	1312	.....	....	105.2	.	.....	.....	.....	.	.....	.....	.....
Mercedes	260	Vert.	6	160	....	180	....	.....	252	1400	260	1500	4.94	1635 at 1400	.....	....	107.5	.	2.3622	.....	.....	.	2.3622	.....	.....
Oberursel	110	.....	....	.....	....	.....	....	.....	.....	....	....	....	.....	.....	.....	....	.....	.	.....	.....	.....	.	.....	.....	.....

Engine	Carburetor			Magneto				Oil Pump			Water Pump			Air Pump			Ratio of Gear Reduction	Speed of Propeller	Tractor or Pusher	Overall Dimensions		
	No.	Type	Weight Each, Lbs.	No.	Type	Speed x E. S.	Weight Each, Lbs.	No.	Type	Weight, Lbs.	No.	Type	Weight, Lbs.	No.	Type	Weight, Lbs.				Length, M/M.	Width, M/M.	Height, M/M.
Curtiss OX5	1	Zenith Duplex	4.2	1	Berling	2	21	1	Gear	.....	1	Centrif.	.....	.	Nil	.....	Nil	E. S.	Either	1408	753	841
Curtiss VX	2	Zenith Duplex	.....	1	.....	2	.....	3	Gear	.....	1	Centrif.	.....	.	Nil	.....	Nil	E. S.	.....	.....	.....	.....
Liberty 8	1	Zenith Duplex	7	1	Twin Delco Generator, 8-volt	1.5	.....	3	Gear	.....	1	Centrif.	.....	1	Plunger	.....	Nil	E. S.	Either	.....	.....	1020
Liberty 12A	2	Zenith Duplex U. S. 52	.....	1	Twin Delco Generator, 8-volt	1.5	.....	3	Gear	.....	1	Centrif.	.....	1	Plunger	.....	Nil	E. S.	Either	1755	.....	1020
Hispano Suiza	1	Zenith Duplex 48 D.C.	7.0	2	8-Cyl. Dixie Transverse	2	.....	1	Eccentric Vane Type	.....	1	Centrif.	.....	1	Plunger	.....	Nil	E. S.	Either	1308	851	832
Hispano Suiza	1	Zenith Duplex 58 D.C.	9.5	2	8-Cyl. Dixie Transverse	2	.....	1	Eccentric Vane Type	.....	1	Centrif.	.....	1	Plunger	.....	Nil	E. S.	Either	1308	851	832
Hispano Suiza	1	Zenith Duplex 58 D.C.	9.5	2	8-Cyl. Dixie Transverse	2	.....	1	Gear	.....	1	Centrif.	.....	1	Plunger	.....	Nil	E. S.	Either	.....	.....	.....
LeRhone	1	Mixing Valve	4.19	1	A.D.S. 26° Early	9/4	9.10	1	Plunger	4.125	.	.....	.....	.	.....	.....	Nil	E. S.	Either	.....	.....	.....
Gnome	1	Mixing Valve	.....	1	.....	9/4	.....	1	Two Plunger	...	.	.....	.....	.	.....	.....	Nil	E. S.	Either	.....	.....	.....
ABC Wasp	2	A. B. C. Injectors	.....	2	P. L. 7. M. L. P.	1.75	.....	1	Gear	.....	.	.....	.....	.	.....	.....	Nil	E. S.	T.	35.7″	42.20″	42.20″
ABC Dragon-Fly	2	H. C. 8	.....	2	M. L. 9	1.18	13.5	1	Plunger Distributed	.....	.	.....	.....	.	.....	.....	.....	E. S.	T.	1070	1232	1207
BR1	1	Block Tube	5	2	A. D. S. M. L.	2.25	10	1	Plunger	6.63	.	Nil	.....	1	Plunger	4.7	Nil	E. S.	Either	43.5″	47.50″	41.57″
BR 2	1	Block Tube	.....	2	M. L.	.....	10	1	Plunger	6.63	.	Nil	.....	1	Plunger	.....	Nil	E. S.	Either	.....	.....	.....
Beardmore	2	Zenith	5.75	2	D. U. 6 S.	1.5	16	1	.....	.....	1	Centrif.	4.9	.	.....	.....	Nil	E. S.	Either	57.08″	19.92″	31.88″
Galloway	2	48 Zenith RA	3.25	2	E. M. 6	1.5	15	1	Rotary	4.06	1	Centrif.	6.51	1	Plunger	.88	Nil	E. S.	Either	67.32″	20.07″	42.91″
Siddeley	2	Zenith	4.2	2	E. M. 6	1.5	15	2	Gear	4.1	1	Centrif.	7.2	1	Plunger	.7	Nil	.....	Either	69.88″	24.09″	43.62″
Hispano	1	Zenith Duplex 48 D.C.	7.0	2	1A8S	E. S.	17.75 18.12	1	Eccentric Vane	.....	1	Centrif.	2.69	1	Plunger	15 oz.	Nil	E. S.	Either	51.53″	33.46″	32.67″
Hispano	1	Zenith Duplex 58 D.C.	9.5	2	1A8S. 1AB	E. S.	18.12 17.75	2	Eccentric Vane	.....	1	Centrif.	2.69	.	Plunger	.....	Nil	E. S.	Either	47.24″	33.46″	33.34″
Rolls-Royce Falcon 3	2	R.R.C.H. 38M.	.....	2	Watford	1.5	14.25	1	Rotary	.....	1	Centrif.	.....	2	Plunger	2.75	.59–1	1300 r.p.m.	Either	72.04″	37.24″	42.00
Rolls-Royce Eagle 8	2	R.R.C.H. Duplex 42 m/m.	13.000	4	Watford	1.5	14.25	2	Gear	8.75	1	Centrif.	4.625	1	Plunger	2.875	.6–1	1080	Either	75.98″	42.52″	48.03
Sunbeam Arab	1	C.H.H.C. 7	.....	2	B.T.H. A8S	E. S.	12.8	3	Gear	.....	1	Centrif.	3	1	Plunger	.....	45–27	1200	T.	1105	810	903
Sunbeam Maori	4	C.H.B.Z.S. 42 m/m.	.....	4	W.B.G.	1.5	19.1	3	Gear	.....	1	Centrif.	.....	1	Plunger	.....	2–1	½ E. S.	Either	55.11″	35.46	38.85
Sunbeam Cossack	4	C.H.B.Z.S. 42 m/m.	.....	4	B6 or W.B.G.	1.5	19.1	3	Gear	.....	1	Centrif.	.....	1	Plunger	.....	2–1	½ E. S.	Either	61.81″	37.79	38.89
Clerget 92	1	Block Tube Bush D.A.L.	4.41	2	A.D.S.	E. S.	9–10	1	Gear	6.63	.	.....	.....	1	Plunger	4.8	.....	E. S.	Either	36.22″	40.15″	40.15″
Clerget 92	1	Block Tube	5.0	2	A.D.S.	2.25	9–10	1	Plunger	6.63	.	Nil	.....	1	Plunger	4.7	Nil	E. S.	Either	36.22″	40.15″ Dia.	40.15″
Hispano*	1	Zenith Duplex 58 D.C.	9.5	2	1ABS. 1AB	E. S.	18.12 17.75	2	Ecccentric Vane	.....	1	Centrif.	2.69	1	Plunger	15 oz.	Nil	E. S.	Either	47.24″	33.46″	33.34″
Hispano*	1	Zenith Duplex 58 D.C.	9.5	2	S.E.V.	E. S.	16–3	1	Eccentric Vane	.....	1	Centrif.	.....	1	Plunger	13 oz.	24x41 or 21x28	1170 or 1500	Either	51.18″	33.46″	33.26″
Lorraine Dietrich	.	.....	.....	.	.....	.....	.....	.	.....	.....	.	.....	.....	.	.....	.....	.....	.....	.....	.....	.....	.....
Fiat A12bis	1	Siemens	.....	2	6-Cyl. Dixie 60-V.	1.5	.....	3	Gear	.....	1	Centrif.	.....	1	Plunger	.....	Nil	E. S.	Either	.....	.....	.....
Fiat A14	.	.....	.....	.	.....	.....	.....	.	.....	.....	1	Centrif.	.....	.	.....	.....	.....	.....	.....	.....	.....	.....
I.F. V5	.	.....	.....	2	.....	.....	.....	.	.....	.....	.	.....	.....	.	.....	.....	.....	1400	Either	.....	.....	.....
Spa 6A	.	.....	.....	2	.....	.....	.....	.	.....	.....	.	.....	.....	.	.....	.....	.....	1600	Either	.....	.....	.....
Benz	.	.....	.....	2	2H6 Bosch	.....	.....	.	Gear	.....	.	Centrif.	.....	.	.....	.....	.....	.....	.....	.....	.....	.....
Maybach	2	Maybach	.....	2	2H6 Bosch	.....	.....	1	Plunger	.....	.	Axial Turb.	.....	.	.....	.....	.....	.....	.....	.....	.....	.....
Mercedes	.	Duplex	.....	2	2H6 Bosch	.....	.....	2	Plunger	.....	.	.....	.....	.	.....	.....	.....	.....	.....	.....	.....	.....
Mercedes	1	Mercedes	.....	2	Bosch	.....	.....	.	Mercedes 4-Plunger	.....	.	Axial Turb.	.....	.	.....	.....	.....	.....	.....	.....	.....	.....
Oberursel	.	.....	.....	.	.....	.....	.....	.	.....	.....	.	.....	.....	.	.....	.....	.....	.....	.....	.....	.....	.....

Engine	Total Fuel & Oil per Hr.		Consumption per B.H.P. Hour						Weight of Engine Dry		Weight of Engine in Running Order Less Fuel Oil and Tanks		Weight of Engine with Fuel Oil and Tanks for 6 Hours Running		Torque in Lbs. Ft.	Estimated B.H.P. at				Estimated Fuel Consumptions Pints per Hour Ground Level Carburetor Adjustments, No Altitude Control			
			Pints		Lbs.		Combined																
	Pts.	Lbs.	Fuel	Oil	Fuel	Oil	Pts.	Lbs.	Lbs.	Lbs./ B.H.P.	Lbs.	Lbs./ B.H.P.	Lbs.	Lbs./ B.H.P.		6000 Ft.	10,000 Ft.	15,000 Ft.	20,000 Ft.	6000 Ft.	10,000 Ft.	15,000 Ft.	20,000 Ft.
Curtiss OX5	48.66	44.16	.51	.018	.46	.02	.528	.48	385	4.2	445	4.8	6765	7.3	371	76	67.3	57.5	49.4	42.6	40.1	37.1	34.4
Curtiss VX	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Liberty 8	182.24	182.2	.606	.0214	.547	.050	.627	.597	575	2.12	.....	.....	.....	.....	.....	260	181	148	116	112	100	87	75
Liberty 12A	192.8	192.8	.565	.0199	.509	.037	.585	.546	845	2.11	1151.5	2.88	.....	.....	.....	320	272	220	172	163	144	125	108
Hispano Suiza	.....	85.5	....	.....	.52	.05	....	.57	440	2.93	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hispano Suiza	.....	127.2	....	.....	.52	.056	....	.576	485	2.69	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hispano Suiza	.....	.....	....	.....	....	....	....	....	596	1.98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
LeRhone	.....	.....	....	.....	.56	.19	....	.75	245	3.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gnome	.....	.....	....	.....	.72	.18	....	.90	270	2.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ABC Wasp	94.8	85	.55	.026	.495	.019	.567	.514	260	1.53	260	1.53	820	4.82	510	138.11	122.24	104.37	89.67	83.53	78.56	72.68	67.34
ABC Dragon-Fly	.....	191.5	....	.....	.56	.02	....	....	600	1.88	600	1.88	.....	....	1019	256	218	176	138	149	134	116	100
BR1	118.2	109.75	.661	.097	.59	.109	.758	.699	405	2.6	405	2.6	1129.35	7.8	655	129	114.2	97.5	83.7	93.7	88.1	81.5	75.5
BR 2	176.2	162	.7	.066	.63	.074	.766	.702	475	2	475	2	1544	6.5	961	196.8	174.2	148.75	127.8	146.2	137.5	127.2	117.8
Beardmore	108.5	98.96	.52	.032	....	....	.609	.552	592	3.3	713	4	1366	7.6	692	147.2	130.3	111.25	95.6	93.7	88.1	81.5	75.5
Galloway	143.2	130.45	.58	.027	.52	.03	.607	.55	690	2.95	843	3.57	1704	7.2	885	195.2	172.75	147.5	126.7	124.2	116.8	108	100.1
Siddeley	147.6	135.85	.56	.055	.50	.062	.615	.562	625	2.6	781	3.25	1677.6	7.0	900	198.5	175.7	150	129	122	114.7	106.2	98.4
Hispano	96.5	88.2	.58	.038	.52	.043	.618	.563	455	2.9	657.4	4.29	1239.5	7.9	546	129	114.2	97.5	83.8	82.2	77.3	71.5	66.25
Hispano	138.6	127.8	.58	.05	.52	.056	.63	.576	510	2.32	653	2.97	1492	6.67	583	182	161	137.5	118	115.8	109	100.8	93.5
Rolls-Royce Falcon 3	161.15	146.6	.56	.026	.53	.026	.586	.559	723	2.68	912	3.38	1880	6.9	694	227.4	201.3	171.8	147.6	139.8	131.5	121.6	112.7
Rolls-Royce Eagle 8	204.7	186.2	.56	.025	.5	.028	.585	.528	933	2.66	1177	3.37	2406	6.9	1020	289.5	256.2	218.75	188	178	167.4	154.8	143.5
Sunbeam Arab	116.3	106.46	.50	.036	.45	.04	.536	.49	550	2.5	686	3.16	1389	6.4	570	179.5	158.8	135.6	116.5	98.5	92.6	85.7	79.4
Sunbeam Maori	161.2	141.97	.56	.023	.51	.026	.583	.536	890	3.3	1065	3.95	2002	7.8	662	219	194	165.6	142.3	136.2	128.1	118.5	109.8
Sunbeam Cossack	208	189.9	.56	.034	.50	.038	.594	.538	1118	3.2	1345	3.8	2598	7.4	919	289.5	256.2	218.75	188	178	167.4	154.8	143.5
Clerget 92	97.5	91.35	.667	.131	.6	.147	.798	.747	367	3	367	3	970	8	512	101	89.3	76.25	65.5	74	69.6	64.4	59.6
Clerget 92	99.05	92.26	.67	.109	.60	.123	.779	.723	400	3.15	400	3.15	1009	8	533	105	93	79.4	68.2	77.3	72.7	67.3	62.3
Hispano*	138.6	127.8	.58	.05	.52	.056	.63	.576	510	2.32	653	2.97	1492	6.67	583	182	161	137.5	118	115.8	109.0	100.8	93.5
Hispano*	137.8	126.9	.6	.06	.54	.067	.66	.607	503	2.42	638	3.1	1475.6	7.8	546	172	152.25	130	111.7	113.3	106.6	98.6	91.3
Lorraine Dietrich	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fiat A12bis	162.8	147.6	.55	.024	.49	.027	.574	.517	928	3.32	1110	3.96	2084	7.44	920	215	190.3	162.5	139.6	141.6	133.2	123.2	114.2
Fiat A14	396.7	363.7	.52	.042	.47	.047	.562	.517	1565	2.36	2020	2.9	4420	6.3	2450	580	512.4	430.75	370.6	306.2	313.7	290.25	268.9
I.F. V5	.....	.....	....	.....	.485	.033	....	....	825	3.95	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Spa 6A	.....	.....	....	.....	.473	.033	....	....	539	3.21	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Benz	.....	.....	....	.....	.653	.02	....	....	829	3.68	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Maybach	.....	.....	....	.....	....	....	....	....	....	....	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Mercedes	.....	.....	....	.....	.6	.029	....	....	618	3.86	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Mercedes	.....	.....	....	.....	.605	.032	....	....	935	3.75	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....
Oberursel	.....	.....	....	.....	....	....	....	....	....	....	.....	....	.....	....	....	.....	.....	.....	.....	.....	.....	.....	.....

HONOR ROLL OF THE AIR SERVICE

The following officers of the American flying arm have been decorated for conspicuous bravery in action. The list, which includes both American and foreign awards, has been carefully compiled from available official sources, but the records are not yet complete.

Distinguished Service Cross

Thomas J. Abernathy....2d Lieut
Perry H. Aldrich....1st Lieut.
Arthur H. Alexander....1st Lieut.
Sterling C. Alexander....1st Lieut.
Gardner Philip Allen....1st Lieut. C. A. C.
Flynn L. A. Andrew....1st Lieut.
Paul Armengaud....Major
Rodney M. Armstrong....1st Lieut.
Dogan H. Arthur....1st Lieut.
Benjamin L. Atwater....1st Lieut.
Walter L. Avery....1st Lieut.
Philip R. Babcock....Captain
David H. Backus....1st Lieut.
Wm. T. Badham....1st Lieut.
Paul Frank Baer....1st Lieut.
Ralph S. Bagby....1st Lieut.
Herbert B. Bartholf....1st Lieut.
Byrne V. Baucom....1st Lieut.
James D. Beane....1st Lieut.
David C. Beebe....2d Lieut.
Franklin B. Bellows....2d Lieut.
William Belzar....2d Lieut.
Otto E. Benell....2d Lieut.
Louis G. Bernheimer....1st Lieut.
Chas. Raymond Blake....1st Lieut.
Erwin R. Bleckley....2d Lieut.
Hugh D. Bloomfield....1st Lieut.
Allen F. Bonnalie....1st Lieut.
Horace L. Borden....2d Lieut.
Lloyd G. Bowers....1st Lieut.
Samuel C. Bowman....2d Lieut.
Theodore E. Boyd....1st Lieut.
Lewis H. Brereton....Lt. Colonel
Hugh Brewster....1st Lieut.
Arthur R. Brooks....1st Lieut.
Wm. E. Brotherton....2d Lieut.
Mitchell H. Brown....2d Lieut.
Harold H. Buckley....Captain
Edward Buford, Jr....Captain
Valentine Burger....2d Lieut.
James S. D. Burns....2d Lieut.
Byron T. Burt, Jr....1st Lieut.
Alan Butt....1st Lieut.
Douglas Campbell....Captain
George D. Carrol....1st Lieut.
John R. Castleman....1st Lieut.
Reed M. Chambers....Captain
Chas. W. Chapman....2d Lieut.
Kenneht S. Clapp....1st Lieut.
Sheldon V. Clarke....1st Lieut.
Wallace A. Coleman....1st Lieut.
Harvey Conover....1st Lieut.
Everett R. Cook....Captain
Weir H. Cook....1st Lieut.
Hamilton Coolidge....Captain
John E. Cousins....Captain
Edward P. Curtis....1st Lieut.
Edward B. Cutter....1st Lieut.
Ralph E. de Castro....1st Lieut.
Willis A. Diekema....Captain
Raymond P. Dillon....1st Lieut.
Charles R. D'Olive....1st Lieut.
Kingman Douglass....1st Lieut.
Meredith L. Dowd....2d Lieut.
Chas. W. Drew....1st Lieut.
Arthur William Duckstein....1st Lieut.
Arthur C. Esterbrook....1st Lieut.
Warren Edwin Eaton....1st Lieut.
Robert P. Elliott....1st Lieut.
William P. Erwin....1st Lieut.
J. Dickinson Este....1st Lieut.
Leo C. Ferrenbach....1st Lieut.
Howard F. Fleeson....1st Lieut.
Justin P. Follette....1st Lieut.
Hugh L. Fontaine....1st Lieut.
Christopher W. Ford....Captain
Wm. F. Frank....1st Lieut.
John Frost....1st Lieut.
George Willard Furlow....1st Lieut.
Bradley J. Gaylord....1st Lieut.
Harold H. George....1st Lieut.
Ernest A. Giroux....1st Lieut.
Harold E. Goettler....1st Lieut.
George E. Goldthwaite....1st Lieut.
Alfred A. Grant....Captain
Fred C. Graveline....Sergeant
Charles G. Grey....Captain
Andre P. Gundelach....1st Lieut.
Murray K. Guthrie....1st Lieut.
James Norman Hall....Captain
Lloyd A. Hamilton....1st Lieut.
Leonard C. Hammond....Captain
Percival G. Hart....2d Lieut.
Harold E. Hartney....Major
Benjamin P. Harwood....1st Lieut.
Frank K. Hays....2d Lieut.
James A. Healey....1st Lieut.
Phil. A. Henderson....1st Lieut.
T. A. Higgs....1st Lieut.
Maury Hill....Captain
Raymond C. Hill....1st Lieut.
Roger W. Hitchcock....1st Lieut.
Lansing C. Holden....1st Lieut.
Spesserd L. Holland....1st Lieut.
William T. Hoover....1st Lieut.
Donald Hudson....1st Lieut.
D. G. Hunter....1st Lieut.
Frank O'Driscoll Hunter....1st Lieut.
Livingston Gilson Irving....1st Lieut.
John N. Jeffers....1st Lieut.
Thomas M. Jersey....1st Lieut.
Arthur H. Jones....1st Lieut.
Clinton Jones....2d Lieut.
John W. Jordan....2d Lieut.
Clarence C. Kahle....1st Lieut.
Samuel Kaye, Jr....1st Lieut.
Asher E. Kelty....1st Lieut.
Geo. C. Kennedy....1st Lieut.
Field E. Kindley....1st Lieut.
Clair A. Kinney....1st Lieut.
Wilbert E. Kinsley....2d Lieut.
James Knowles....1st Lieut.
John H. Lambert....1st Lieut.
German De Freest Larner....1st Lieut.
Walter R. Lasson....Captain
John B. Lee....2d Lieut.
Robert Lindsay....1st Lieut.
Frank A. Llewellyn....1st Lieut.
K. P. Littauer....Major
William O. Lowe....2d Lt., U. S. M. C.
Francis B. Lowry....2d Lieut.
Frank Luke, Jr....1st Lieut.
Frank Luke, Jr....1st Lieut.
Joel H. McClendon....1st Lieut.
Cleveland W. McDermott....2d Lieut.
James A. McDevitt....1st Lieut.
Harry O. McDougall....1st Lieut.
Elmore E. McKay....2d Lieut.
James R. McKay....1st Lieut.
Ora R. McMurry....1st Lieut.
John MacArthur....2d Lieut.
Winfred C. MacBrayne....1st Lieut.
James E. Manning, Jr....1st Lieut.
Russell L. Maughan....1st Lieut.
James A. Meissner....Major
John F. Michenor....1st Lieut.
John Mitchell....Captain
William Mitchell....Brig. General
Edward Russell Moore....1st Lieut.
Edw. M. Morris....2d Lieut.
Oscar B. Myers....1st Lieut.
Roland H. Neel....2d Lieut.
Harlow P. Neibling....1st Lieut.
George R. Nixon....1st Lieut.
Sigbert A. G. Norris....2d Lieut.
Fred W. Norton....1st Lieut.
Stephen H. Noyes....1st Lieut.
Alan Nutt....1st Lieut.
Paul J. O'Donnell....2d Lieut.
Ralph A. O'Neill....1st Lieut.
Edward Orr....1st Lieut.
Richard C. M. Page....1st Lieut.
Joseph A. Palmer....2d Lieut.
William W. Palmer....1st Lieut.
Alfred B. Patterson, Jr....1st Lieut.
Karl C. Payne....1st Lieut.
Elmer Pendell....1st Lieut.
Josiah Pegues....1st Lieut.
David McK Peterson....Major
Glen Phelps....1st Lieut.
Geo. R. Phillips....1st Lieut.
Chas. W. Plummer....2d Lieut.
Lewis C. Plush....1st Lieut.
Britton Polley....1st Lieut.
William Thomas Ponder....1st Lieut.
Carl W. Porter....2d Lieut.
Charles P. Porter....2d Lieut.
Kenneth L. Porter....2d Lieut.
Glen A. Preston....2d Lieut.
Percy Rivington Pyne....1st Lieut.
John J. Quinn....1st Lieut.
Joseph C. Raible, Jr....1st Lieut.
John I. Rancourt....1st Lieut.
Howard G. Rath....1st Lieut.
Robert F. Raymond, Jr....1st Lieut.
Clearton H. Reynolds....Captain
John N. Reynolds....Lt. Colonel
James M. Richardson....2d Lieut.
Edward V. Rickenbacker....Captain
Paul N. A. Rooney....1st Lieut.
Hermon C. Rorison....1st Lieut.
Cleo J. Ross....1st Lieut.
Edward W. Rucker, Jr....Captain
Leslie J. Rummell....1st Lieut.
Alexander P. Schenck....1st Lieut.
Karl J. Schoen....1st Lieut.
Arthur P. Seaver....1st Lieut.
Cecil G. Sellers....Captain
Sumner Sewall....1st Lieut.
Richard B. Shelby....1st Lieut.
Louis C. Simon, Jr....2d Lieut.
John H. Snyder....1st Lieut.
Carl Spatz....Major
Richard Wilson Steele....2d Lieut.
John H. Stevens....2d Lieut.
John Y. Stokes, Jr....1st Lieut.
Penrose V. Stout....1st Lieut.
Wm. H. Stovall....1st Lieut.
Victor H. Strahm....Captain
W. J. R. Taylor....1st Lieut.
Walton B. Ten Eyck, Jr....2d Lieut.
William Thaw....Lt. Colonel
Fred A. Tillman....2d Lieut.
Edgar G. Tobin....Captain
Wm. H. Vail....1st Lieut.
Remington D. Vernam....1st Lieut.
James E. Wallis....Captain
William W. Waring....1st Lieut.
Donald B. Warner....1st Lieut.
Pennington H. Way....2d Lieut.
Joseph F. Wehner....1st Lieut.
Wilbert W. White....1st Lieut.
Alan F. Winslow....2d Lieut.
Chester E. Wright....1st Lieut.

Distinguished Service Medal

Charles T. Menoher....Maj. General
Mason M. Patrick....Maj. General

Distinguished Service Order—British

A. F. Bonnallie....1st Lieut.

Distinguished Flying Cross—British

H. L. Bair....1st Lieut.
M. L. Campbell....1st Lieut.
Henry Robinson Clay, Jr....1st Lieut.
John O. Donaldson....2d Lieut.
Floyd Andrews Hamilton....1st Lieut.
Charles L. Heater....1st Lieut.
Thomas John Herbert....1st Lieut.
P. T. Iaccaci....1st Lieut.
James Alfred Keating....1st Lieut.
Field E. Kindley....1st Lieut.
Reed G. Landis....Captain
Frederick E. Luff....1st Lieut.
Elliott W. Springs....Captain
George Augustus Vaughn....1st Lieut.

Legion of Honor—French (Commander)

Maj. Gen. Charles T. Menoher
Brig. Gen. William Mitchell

Cross of the Legion of Honor—French

Charles W. Miller....2d Lieut.
David E. Putnam....1st Lieut.

Croix de Guerre—French

Thomas J. Abernathy....2d Lieut.
James H. Ackerman....1st Lieut.
Floyd H. Allport....2d Lieut.
Paul Frank Baer....1st Lieut.
Walter V. Barneby....1st Lieut.
James Henry Baucham....??°
James D. Beane....1st Lieut.
Charles John Biddle....Major
Stewart Bird....1st Lieut.
William O. Butler....Captain
Douglas Campbell....Captain
Richard Carside....1st Lieut.
Thomas G. Cassady....1st Lieut.
Chas. Wesley Chapman, Jr....2d Lieut.
Arthur J. Coyle....Captain
Kenneth P. Culbert....2d Lieut.
Karl H. Eymann....2d Lieut.
Charles C. Fleet....1st Lieut.
Christopher Wm. Ford....Captain
Ernest A. Giroux....1st Lieut.
James A. Healy....1st Lieut.
Raymond C. Hill....1st Lieut.
Amos L. Hopkins....1st Lieut.
Sidney I. Howell....1st Lieut.
Frank O'Driscoll Hunter....1st Lieut.
Arthur H. Jones....1st Lieut.
Henry Jones....1st Lieut.
Henry P. Jones....Sergeant
Charles Maury Jones....Captain
Charles Wayne Kerwood....Sergeant
Charles Kinsolving....1st Lieut.
George Marion Kyle....1st Lieut.
G. DeFreest Larner....1st Lieut.
Manderson Lehr....1st Lieut.
Kenneth Marr....Major
James A. Meissner....Major
Charles T. Menoher....Maj. Gen.
Charles I. Merrick....1st Lieut.
Paul Meyers....2nd Lieut.
Robert Moore....1st Lieut.
Leo L. Murphy....1st Lieut.
Ralph A. O'Neill....1st Lieut.
Carter Landram Ovington....1st Lieut.
David MmK. Peterson....Major
Granville Pollock....1st Lieut.
William Ponder....2d Lieut.
Charles P. Porter....2d Lieut.
Kenneth L. Porter....2d Lieut.
John A. Posey....2d Lieut.
Clifford R. Powell....1st Lieut.
David E. Putnam....1st Lieut.
Joseph C. Raible, Jr....1st Lieut.
Rufus Randall Rand....Sergeant
Walter Davis Rheno....Captain
Edward V. Rickenbacker....Captain
Ralph Royce....Lt. Colonel
Malcolm A. Sedgwick....2d Lieut.
Morteu Seymour....1st Lieut.
Harry Shaffer....2d Lieut.
Reginald Sinclaire....Sergeant
Louis C. Simon, Jr....1st Lieut.
Donald Stone....Corporal
William Thaw....Lt. Colonel
George Evans Turnure....1st Lieut.
James E. Wallace....1st Lieut.
William E. Wass....1st Lieut.
Charles Herbert Wilcox....1st Lieut.
Alan Winslow....2d Lieut.
Joseph Volney Wilson....1st Lieut.
Houston Woodward....Corporal
James Norman Hall....Captain

French Citations

Valentine J. Burger....Lieut.
Alexander T. Grier....2d Lieut.
Horace A. Lake....2d Lieut.

Italian Croce al Merito di Guerra

The following American Officers serving with

(*Continued on page* 1281)

THE AERONAUTICAL RADIATOR

By S. R. SWENSON

Head of Radiator Section, Division of Aeronautics, Bureau of Steam Engineering

Types in General

BEFORE going into the theory of design of the best radiator for use on aeroplanes, it is believed that the reader should be familiarized with the general types being made in this country as these are now being used for this purpose and will undoubtedly be in such use for some time to come; for, although they do not represent good design (except from the point of view of cheap and rapid production and automobile use) there is no radiator in production at the present time which can be turned to.

The commercial radiators fall almost entirely into the ribbon type. They are constructed from thin bronze or brass ribbons, which are in general passed through automatic stamping machines or rollers where they take on the desired form. A particularly common type is illustrated in figure one, this form of radiator being manufactured by several concerns, with very minor respective variations. Other forms are illustrated in figures two and three. These three types represent those in which there is not an excess of indirect radiating surface. There are also a number of types in which a very large percent of the total surface is not in contact with the water, this indirect radiating surface consisting in general of variously stamped metal ribbons inserted between the water-carrying assemblies. These latter types of radiators may be set aside immediately as being suitable only for automobile, truck, tractor and stationary use, because their ability to give up their heat to the air, at high air speeds does not compare favorably with other types, and their resistance to air flow (hereafter termed "head resistance") is apt to be high. They are therefore unsuitable for aeroplane work; and we may confine ourselves to a consideration of radiators which, when viewed from the front, *present clear, unobstructed air passages,* and in which *every individual vertical section is a water passage.*

Radiators of this type are constructed with approximately square air passages, whose sides vary from one quarter of an inch to three tenths of an inch, according to the manufacturer of the radiator. In many cases one concern builds them in two or more sizes of air passage, but the larger sizes should always be chosen, as the smaller do not as a rule dissipate any more heat at high speeds, and the radiators weigh more and present a higher resistance to the air.

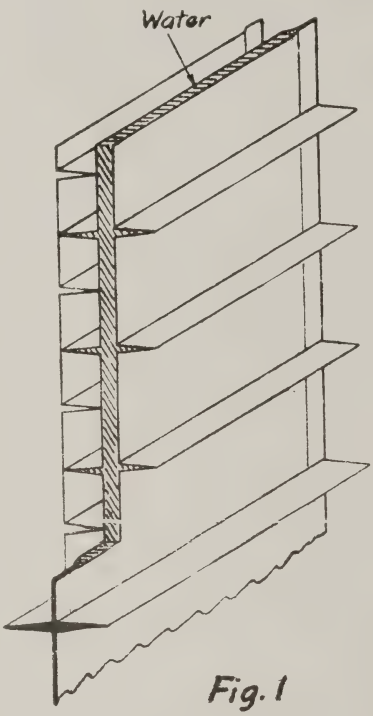
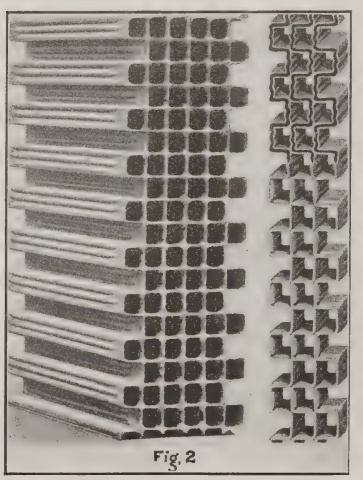


Fig. 1


Fig. 2

Although this statement in regard to heat dissipation is not by any means evident, and is in fact entirely contradicted by the heavy curve in figure four, which covers the relation between cooling surface and the size of the air passage on a given radiator, it has nevertheless been established in wind-tunnel tests and is accounted for by the assumption that the air tends to bank up in front of very small tubes rather than flow through, so that the cooling capacity probably varies in accordance with the dotted curve of Fig. 4 rather than directly as the cooling surface. Experiments on very small air passages in this connection have not been extensive, and there is no reason, except as matters of scientific interest, why they hould be; for it has been definitely proved that the resistance tends to increase at a greater rate than the cooling capacity, as the size of the air passage is reduced.

As to the thickness of the cooling section, ribbon type radiators can be obtained in various depths from two and a half inches to five inches. The thickness of the metal in the cooling section may vary anywhere from three thousandths of an inch to five thousandths; but the former thickness has been found too thin in actual use because of two things: first, its inherent weakness, and second, the fact that fine particles of dirt are often rolled into the metal, whose thinness allows this dirt to go all the way through and form leaks as soon as it works out. Metal four thousandths of an inch thick gives satisfactory results, and is therefore recommended.

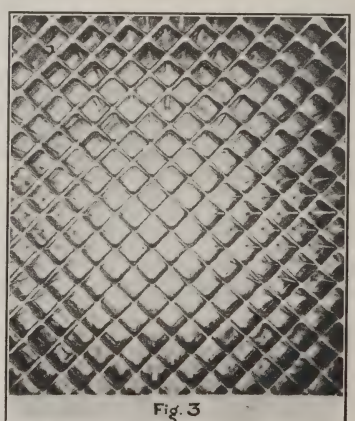
The thickness of the water passages varies from fifty-five thousandths to eight hundredths of an inch, according to the maker of the radiator. Consideration of this, however, will not be taken in this article.

In addition to the types mentioned above, a type in use by the British (illustrated in Fig. 5), which presents several good points, is on the market. Its core or cooling section consists of an assemblage of round tubes with expanded hexagonal ends, which make the tubes assemblable and prevent the round portions from coming into contact, thus forming the water passages. An exceptionally sturdy construction, in which the soldered joints are all very ample and evenly distributed, this type has given great satisfaction in service. Its ability to cool, however, is not very great and its head resistance is rather high.

Having now touched upon the general types in present day use, with a few recommendations, we may turn to the methods of manufacture.

The stamping or rolling machines are practically automatic, requiring attendance only for the sake of keeping up a fresh supply of metal ribbon and removing the sections as they are cut off. Both ribbons for each small section, containing one water passage, are usually fed through at the same time, and in some cases the sides of one ribbon are cut and automatically folded over corresponding places on the other ribbon, thus locking the two together. Where this is done, individual soldering together of the two sides of each water tube is unnecessary; and no soldering is done until all the small sections are assembled into the complete cooling section.

In any case, the latter is assembled, clamped in a frame of the size and shape of the cooling section, and the whole is dipped on each side in an acid bath, and then in a shallow pool of solder, which is contained in a cast iron dipping vat.


Fig. 3

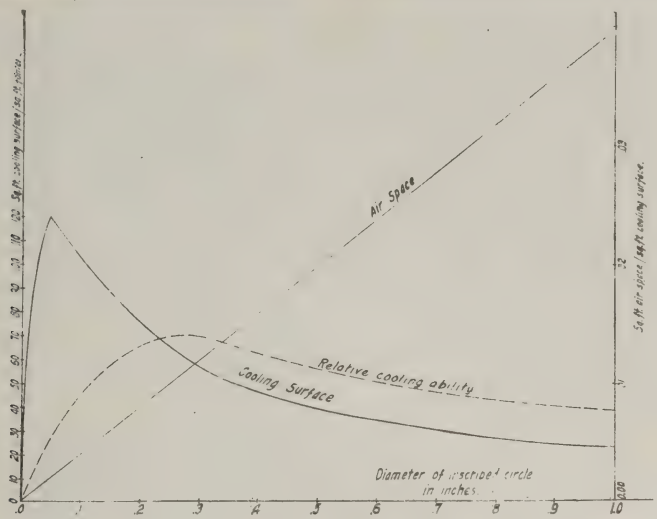


FIG.-4.

After each dip the core is lifted and shaken up and down several times in order to remove all surplus solder. It is then removed from its frame and the ends of the water passages are spread open by means of a small steel wedge. The water headers, or upper and lower tanks are now put in position and tacked on by several small beads of solder, whereupon their location is checked and they are finally soldered on.

In the case of the British or round tube type, the tubes are usually extruded and cut, whereupon the ends are bulged into the hexagonal shape; and the tubes are assembled together. From this point on the construction of the radiator follows the same routine as does the ribbon type.

Design in General

Although a good deal of theoretical discussion must go hand in hand with a full understanding of why to design a radiator for a certain aeroplane in a certain way, as much of this as possible will be set aside, and in this chapter an effort will be made to establish a few general tendencies which should be followed.

Foremost of these is the admonition, DO NOT BE FOOLED BY APPEARANCES. As an example of what is meant by this recommendation, consider

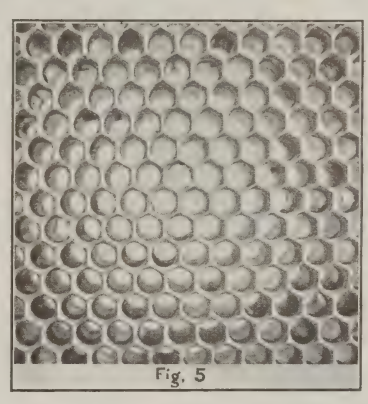


Fig. 5

the nose radiator (Fig. 6). The radiator has, as far as appearances are concerned withdrawn itself from the air into the aeroplane; it does not project into the air stream; it seems to permit of an approximate streamlining of the fuselage and power plant; and it apparently adds no resistance to the machine. Quite contrary to these appearances, however, its use has added an enormous amount of head resistance and an excessive amount of weight, and has partly destroyed the streamlining of the fuselage.

A somewhat analogous case, that of the wing radiator, must be covered later.

An important principle, which should be used where possible is to enclose the engine in a streamline housing entirely, excepting such small parts as should be cooled by the air (such as exposed valve springs and stems); then put the radiator by itself in the free air stream. The reason for this is that although the engine will radiate a certain amount of its own heat if exposed to the wind, it will not do it as *efficiently as a radiator, for the latter is designed to do so and should therefore be given the whole task.

Various objections to enclosing the engine will sometimes arise in machines where it is located out between the wings, such as inaccessibility; and in the event that the engine is left entirely or mostly exposed to the air, the best location for the radiator will probably be directly in front of the engine. If the machine is a tractor, this location will expose the radiator to the high air speed of the slipstream; but, although the radiator would be somewhat more * efficient if located outside of the slip stream, an attempt to locate it there will undoubtedly lead to very long piping and other objectionable installation troubles.

Good practice is to design the radiator in the form of a rectangle, without any tendency toward irregularities in its outline or cooling section. There is at present too great a leaning toward shaping the radiator to fit around the end of the crank case; and this tendency leads to intricate constructional work, greatly weakened radiators and, in many cases, obstructed water flow. Fig. 7, a typical nose radiator, is an excellent example of this kind of design.

Fig. 8 is a good example of a rectangular radiator, which has been designed to offer as little obstruction as possible to the pilot's view. This extreme condition of great height and small width, however, should be avoided and a condition of width slightly greater than height adhered to as closely as possible, although no very great differences in the size of the radiator required for a given job will result from

*The use of the word "Efficient" is merely a convenience. A radiator has no true efficiency, but an analogous term, the "Figure of Merit," can be applied. It is the ratio of the power dissipated by the radiator to the power absorbed in sustaining it in flight.



Fig. 6

different proportions. Appearance alone in this regard is a large factor.

Much trouble has been experienced in the past in estimating the size of radiator required and allowing for it in the general preliminary design of the aeroplane. But the resultant difficulties have confined themselves largely to machines designed for nose radiators; the size and shape of the cowling and nose have in many instances been determined on paper, for a radiator of a certain size, only to result in finding that a larger or smaller radiator must be installed in actual use. There has then followed, of necessity, a general redesigning of the nose and cowling in accordance with the new radiator, which in turn has to be estimated before it can be installed and tried out. With the free air radiator, however, limitations as to size and shape are much wider.

A method of design based on an empirical formula established in the wind tunnel and checked by practice is covered by Fig. 9. Naturally it cannot automatically cover all variations arising from different types of engines and conditions of installation; and it is therefore intended for use only in determining the first trial installation.

The following procedure in using this method should be followed:

Lay a straight-edge between the horsepower and the air-speed, and from the intersection of the straight-edge with the reference line project to the curve and take the reading at the top or bottom. The frontal area of the radiator is then to be taken as

$X \times K_1 \times K_2 \times K_3 \times K_4$ square inches.

Where

X = reading
K_1 = radiator constant
K_2 = radiator position constant
K_3 = engine installation constant
K_4 = engine constant



Fig. 8

and these constants are to be determined as follows:

K_1 is to be taken as .68 sq. in. if a five inch core is to be used and as .82 sq. in. if a four inch core is to be used. (For obvious reasons the constants for different makes of radiators cannot be given, but these values may be taken as applying roughly to the types previously described and recommended.)

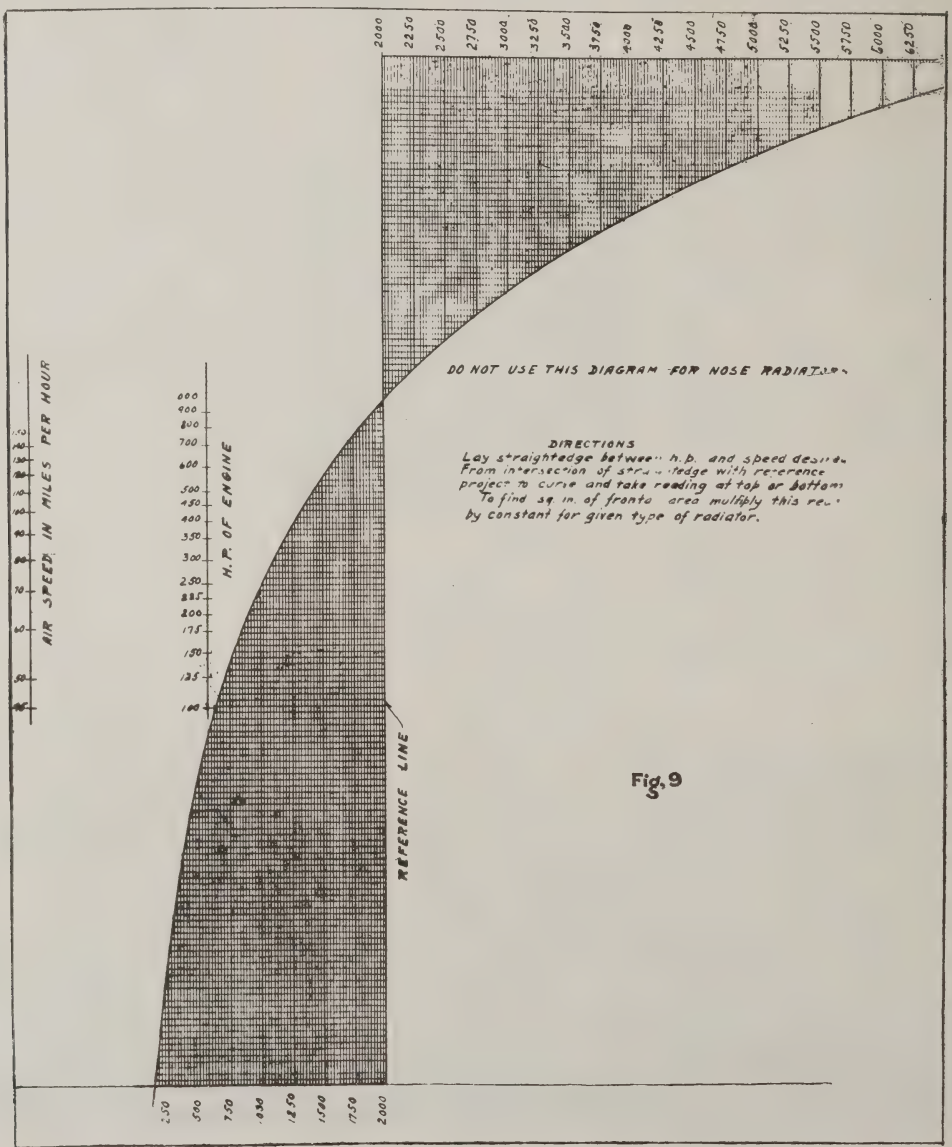


Fig. 9

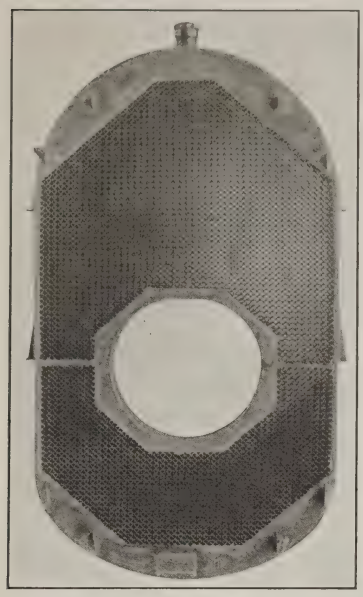


Fig. 7

$K_2 = 1$ if the radiator is to be placed in front of the engine, but should be taken as .9 if the radiator has no obstruction behind.

$K_3 = 1.00$ if engine is exposed

$K_3 = 1.05$ if engine is exposed, but has monoblock cylinder assemblies.

$K_3 = 1.10$ if engine is to be housed in and

$K_4 = \frac{Q}{P} \times .0284.$

Where Q = B.t.u. per minute removed by jacket water in laboratory test

P = Corresponding brake horsepower of engine.

If information leading to the determination is not available, K_4 is to be taken as unity.

Then, having determined upon the trial size, install it in the machine, and determine the following in best climb:

Radiator inlet temperature = T_1

Radiator outlet temperature = T_o

Air temperature = T_a

Then, where

S = correct size of radiator

s = size used in trial

D = desired difference in degrees between air temperature and radiator inlet temperature (usually about 100).

$$S = s\frac{T_1 + T_o - 2T_a}{2D - T_1 + T_o}$$

The derivation of this formula will be covered in a later chapter.

If for any reason the trial radiator is so small that the water temperature reaches the boiling point, the test will be practically valueless unles the amount of steam forced is very small indeed. The formation of steam and its rejection into the air will do away with a great deal of heat, which, of course, would be automatically credited to the radiator in the calculations.

For flying boats and seaplanes intended for training purposes, where a great deal of taxi-ing is done, the size of the radiator should be increased by twelve percent above that determined from the diagram, and the value of "D" should be taken as 90 instead of 100.

In medium size radiators—in the neighborhood of three or four hundred square inches of frontal area—the addition of a small projecting lip extending around the cooling sections may reduce the required size of the radiator by as much as eight percent, but its addition is not recommended unless a special effort must be made to reduce weight or size, as an increase in head resistance which more than offsets the saving in weight is entailed in its use. On small, very narrow radiators, designed to offer little obstruction to view, however, it should be brought into use, as the tendency for the air to slip off the face is very great.

An increase in the heat dissipation and a consequent decrease in the size of radiator required can also be obtained by turning the radiator out of its normal position, the maximum increase in cooling, about twenty percent, coming at about thirty-three degrees away from the normal; but the increase in resistance is so great that this procedure is in no case recommended.

We may now turn to the design of the upper water tank, and in so doing immediately have to determine its exact function. Is it intended merely as a distributor, or should it be a reserve water tank, containing enough water to allow for evaporation? Several considerations affect the answer to this question; but, undoubtedly, on small machines where complication is to be avoided and which are not intended for long flights, the upper tank should serve both as a distributor and as a carrier of reserve water. On large machines intended for flights of very long duration, it should act simply as a distributor or header, and the reserve water

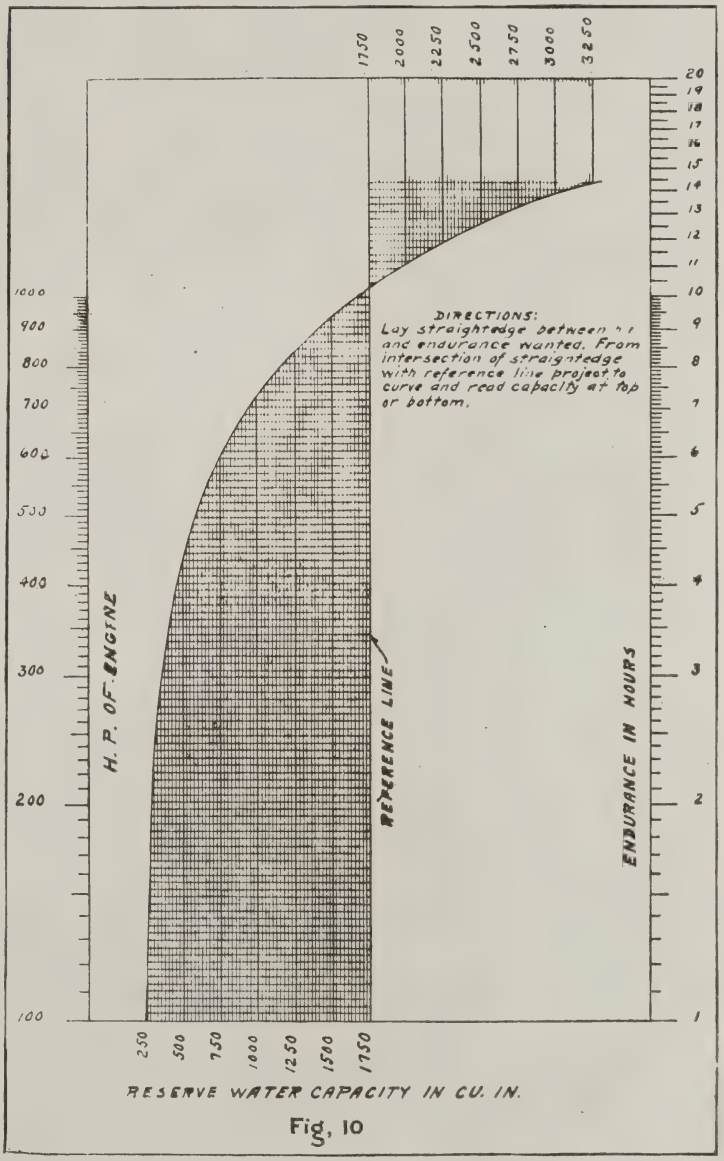


Fig. 10

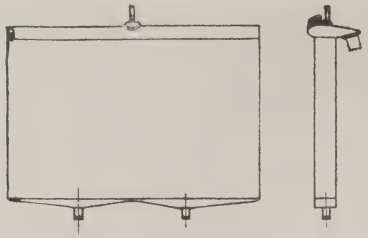


Fig.11

should be removed from the wind and placed elsewhere.

In either case, it is needless to say that the upper tank or header should be streamlined as well as possible.

Fig. 10 covers a method of determining the amount of reserve water, and is based on the British formula:

$$\text{Gallons} = \frac{\text{h.p. x (endurance in hours)}}{1600}$$

which is entirely empirical and is not believed to be final by any means. Its use, however, has given entirely satisfactory results.

There are various opinions concerning the location of the separate reserve water tank, one of these being that it should be carried below the engines and operated by a hand pump. The fallacial reason for this opinion is that if the cooling system leaks the reserve water will not run out. But the absurdity is only too apparent when it is remembered that it will be necessary to pump in the reserve water as soon as a leak occurs. It does not seem feasible to make provision against leakage, as no limit to the amount of extra water can be determined.

An excellent place for the reserve water tank is in the wing, but this location should not be adopted on a machine which is apt to encounter freezing temperatures at a time of the year when it is not desired to carry a non-freezing solution.

The lower header should act entirely as a collector; and should therefore be made as small as possible and on the general lines of that shown in Fig. 11.

Before turning entirely from the consideration of the size of the radiator, a special case must be brought to mind—that of the twin-engined dirigible. This type of craft is very often purposely flown with only one of its two engines in operation; and if the cooling systems are entirely separate, each radiator must of necessity be large enough to cool one engine operating alone; and it should be designed for the speed at which the ship will fly when only one engine is in operation, and should be tested under these conditions. But an especially good installation (Fig. 12) which obviates the use of these larger radiators can be made if the cooling systems of the two engines can be so arranged as to be connected in series at will (assuming that the water pump of each engine is of such a construction as will allow water to pass when it is idle). The radiator of the engine which is not in use is thus made available for furnishing the additional cooling required by the engine which is in operation; the idle engine is kept warm, and in the case of very cold weather the water in the cooling system of the idle engine is kept from freezing. In connection with such an installation, the importance of using shutters or of making the radiators retractable cannot be overestimated.

A Consideration of D

In order to establish the formula $S = s \times \frac{T_1 + T_o - 2T_a}{2D - T_1 + T_o}$ a consideration of what it is based on must be made. It need not be stated that the heat dissipated by a radiator is proportional to the difference between the average radiator temperature and the average air temperature, the former being the mean value of the inlet and outlet water temperatures, and the latter being the mean value of the entering and leaving air temperatures. The temperature of the leaving air, however, may be set aside from consideration for practical purposes because of the general difficulty of determining it, and because the error involved in leaving it out is smaller by far than the probable errors involved in taking the remaining readings. Then, for practical purposes we may take the cooling power of the radiator as being proportional to the difference between the mean radiator temperature and the air temperature; and this difference will hereafter be called the *mean difference*.

Now consider a radiator, of size s, which has been tested in flight, the following conditions having prevailed during this test:

T_1 = radiator inlet temperature
T_o = radiator outlet temperature
T_a = air temperature

Now let m = the mean difference

$$m = \frac{T_1 + T_o}{2} - T_a$$

Now suppose T_1 proved the radiator to be of incorrect size, and it is desired to find the correct size. To do this let

T'_1 = New inlet temperature
T'_o = New outlet temperature
m' = New mean difference
D = Desired $T'_1 - T_a$
S = New size.

Then

$$S = s\frac{m}{m'}$$

$$m' = \frac{T'_1 + {}_1T'_o}{2} - T_a$$

$$D = T'_1 - T_a$$

$$T'_1 = D' + T_a$$

$$T'_o = T_1 - (T_1 - T_o)$$

$$= D + T_a - T_1 + T_o$$

and

$$m' = \frac{D + T_a + D + T_a - T_1 + T_o}{2} - T_a$$

$$= \frac{2D - T_1 + T_o}{2}$$

$$\text{Therefore } \frac{m}{m'} = \frac{\frac{T_1 + T_o - 2T_a}{2}}{\frac{2D - T_1 + T_o}{2}}$$

$$= \frac{T_1 + T_o - 2T_a}{2D - T_1 + T_o}$$

and

$$S = s \times \frac{T_1 + T_o - 2T_a}{2D - T_1 + T_o}$$

Having now established this formula, some consideration should be given to the assigning of values to D; and in so doing it should be borne in mind that although

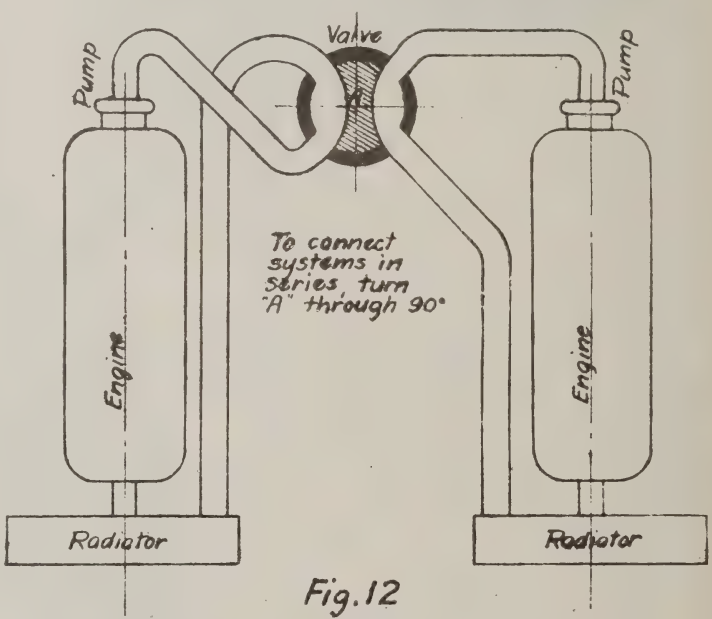


Fig.12

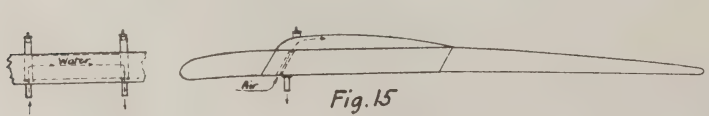


Fig.15

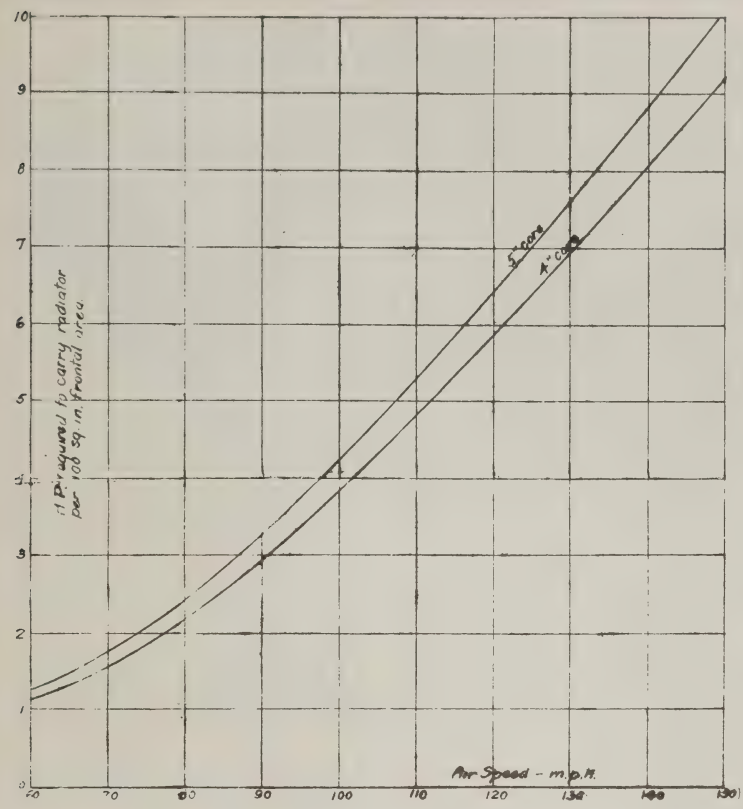


Fig. 14

the size of the radiator does not vary directly as the air temperature (but varies inversely as the mean difference), the temperature of the water in any given installation does very directly as the air temperature. Thus an increase of x degrees in the temperature of the air will give an increase of x degrees in the temperature of the water.

Therefore, to D should be assigned such a value as will not allow the water temperature to go above a desired maximum in best climb at the highest air temperature to be encountered.

A consideration of the effects of altitude on water temperatures in this connection is furthermore necessary; and the following may be taken, in general, as being very nearly true: The density of the air decreases with altitude, the power of the engine varies as the density of the air, but the cooling power of the radiator also varies as the density of the air. Therefore, the only consideration affecting the water temperature, or size of radiator required, is the air temperature (assuming that the percentage of throttle opening on the engine does not change).

The value of D should be based on the average highest air temperature at the ground which will be encountered, and it will be fair to assign a value of one hundred and ninety degrees to the highest desired water temperature. Thus, assuming the average highest air temperature to be ninety degrees D will have a value of one hundred. But although D, in this case, is to be based on the ground temperature, *in all tests the air temperature should be taken* in flight, as it cannot be counted upon as varying in any definite way with altitude. And in all cases the engine should be thoroughly warmed up before taking off.

In the special case of a machine which is to make certain definite trips (such as mail carrying), and can make these in general at an altitude above 5,000 feet, it will be quite possible to assign a value to D as high as one hundred and fifteen.

There is another element which affects the size of the radiator to be used and the value of D, and that is the fact that certain types of engines, due to inherent defects in design, develop more power at lower temperatures than others. If it is noted from the power curve of the engine that it will develop more power at a low temperature, it will, of course, be necessary to determine whether the accompanying increase in size of the radiator will or will not offset the actual gain in the power of the engine. In order to facilitate decisions in this regard the following table, giving a good average relation between values of D and the size of the radiator (given in percent of that *determined from the chart, Fig. 9) is given:

D		Size in percent of that *determined by the chart, Fig. 9.
100	:	100
90	:	112
80	:	127
70	:	148
60	:	175
50	:	216

Fig. 13.

* The size "determined from the chart" is to be taken as the reading taken on the chart plus times the four constants.

In connection with this table the curves, Fig. 14, are intended for use, and may be considered to give fair values of the power required to carry the radiator. Thus, if it is found that by operating the engine at a hundred and sixty degrees instead of at a hundred and ninety degrees, the power will be increased by x horsepower, we assign D a value of 70 and find that the size of the radiator will increase forty-eight percent. We determine from the design chart, Fig. 9, how many square inches of frontal area are entailed by this additional forty-eight percent and refer them to Fig. 14. We then find that an additional y horsepower will be required to carry the radiator, and a direct comparison between x and y can be made.

It is to be noted, however, that if the machine will probably operate at great altitudes there will be no objection to giving D its usual value, as most of the flying is to be done at a considerably lower temperature than that obtaining at the ground and the engine will probably be running at the desired low temperature. In this connection a drop in temperature of 3½ degrees per thousand feet may be expected, but this should never be counted upon in assigning a value of more than a hundred and fifteen to D, as there will probably be many instances where the air temperature will vary irregularly with altitude.

The Fallacy of the Nose Radiator

Practice is slowly abandoning the nose radiator, but all too slowly; and it is believed that in many cases the abandonment has been made solely because of its excess weight and cumbersome construction, with considerable doubt still existing as to whether, taking everything into consideration, it should really and finally become a thing of the past or not. Undoubtedly, it makes a very neat installation, becoming an integral part of the fuselage, as far as appearances are concerned and apparently offering no additional head resistance to the aeroplane. So there are still its advocates.

The argument that a radiator operating in a slow air flow does its work with a smaller amount of energy being spent on it is often brought forward in its favor; and is quite correct as applied to the nose radiator by itself. It does operate in a slow air flow, and is undoubtedly efficient by itself. But the argument should not confine itself to the radiator alone, but to the conditions resultant from its installation, for the air speed is slow because of the enormous amount of resistance which it encounters behind the radiator — in swirling around the engine, pipes, wires and braces, and in finally finding its way out through some opening which is entirely too small. Furthermore, allowing the air to flow into the nose of the machine destroys the effectiveness of its streamlining. The result is that the head resistance due to the radiator is very much greater when the radiator is in the nose than it would be if the radiator were out in the free air stream; and because of the small amount of air flowing through it, it has to be unusually large and heavy.

It has been found that when the nose radiator is partly covered the speed of the machine will increase. This fact, and the instance of a British machine from which the nose radiator was removed, are excellent practical examples of the case against this kind of an installation.

On the machine in question an increase of fourteen percent in rate of climb at

(*Continued on page* 1286)

NAPIER "LION" IN AERO ENGINE

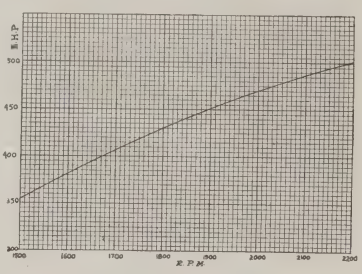
By G. DOUGLAS WARDROP, M. S. A. E., A. S. M. E.

THE Napier "Lion" 12-cylinder aero engine, manufactured by D. Napier & Sons, Ltd., of England, attracted international interest recently because of the unofficial record which it enabled Capt. Lang of the British Air Force to make when he reached an altitude of 30,500 feet.

The engine has 12 cylinders arranged in three blocks of four cylinders, the angle between each block being 60°. The cylinder bore is 5½" and the stroke 5⅛".

The Cylinders are made from steel forgings and are machined all over. The four cylinders in each block are secured to the crankcase by studs and nuts and to an aluminum head casting which contains the inlet and exhaust passages and the valves and valve mechanism. The cylinders are fitted with steel water jackets and two ignition plugs. There are two inlet and two exhaust valves in each cylinder. The valves are each fitted with two coil springs and a special friction locked tappet head and are operated direct by two camshafts which are carried in gunmetal bearings mounted on the head casting of each block. The camshafts are driven through bevel gearing by vertical shafts from the crankshaft at the rear end of the engine.

The Crankcase is an aluminum casting and is carried in the fuselage by six arms, three on either side. The front end encloses the propeller drive reduction gear and carries the airscrew shaft cover, airscrew shaft and bearing. The casting for the camshaft water and oil pumps and magneto drives is bolted to the rear end of the crankcase. The roller and plain bearings of the crankshaft are carried on the cross walls of the casting and are fitted with steel caps and studs. A large breather is mounted on the reduction gear casing.



Brake H.P. curve of the Napier "Lion" aero engine

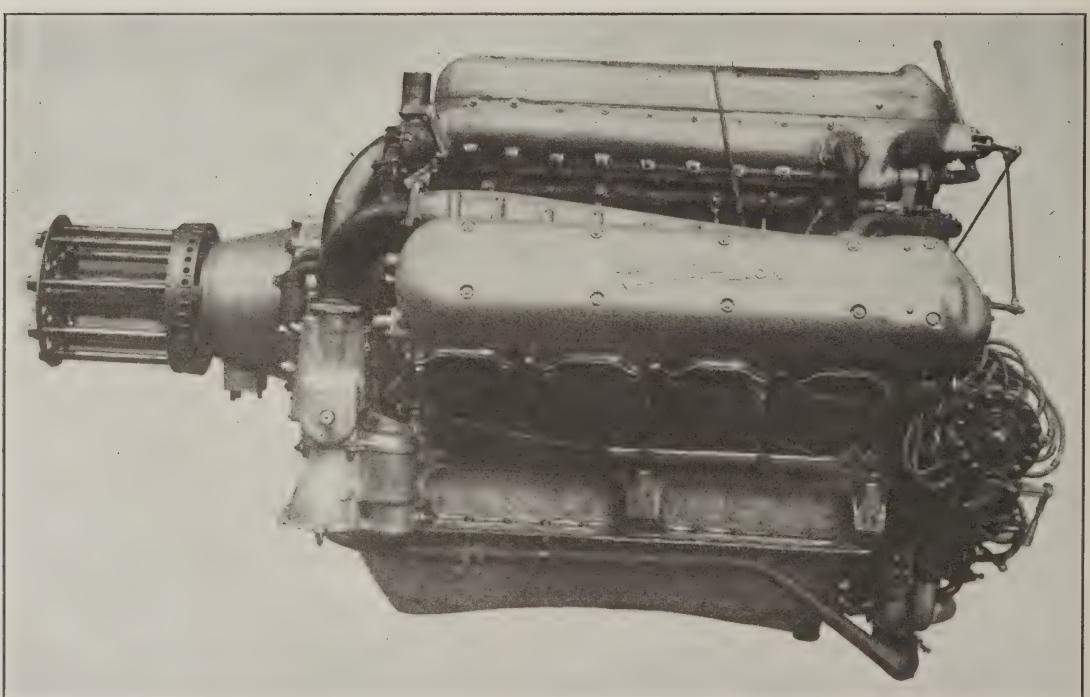
The Oil Sump of pressed aluminum, to which a stiffening plate is riveted, is bolted to the bottom flange of the crankcase. The sides and ends slope inwards and the bottom downwards from the middle towards the ends. Two steel suction pipes are fitted inside the sump, one leading to either end and connected to the suction oil pumps. The steel oil pipe carrying oil to the front end of the crankshaft also passes through inside the pump.

The Crankshaft is very rigid and is machined from a solid steel forging. It has four throws all in one plane. The crankpin and journals which are of large diameter are bored out and fitted with end plates held in position by bolts passing through the holes in the shaft. Holes are drilled in the webs connecting the pins and journals to the ends of the shaft. The shaft is carried in five substantial roller bearings and one plain bearing at the front end. The crankshaft reduction gear is fitted at the front end of the shaft and is carried on a taper and two keys and held in position by a nut.

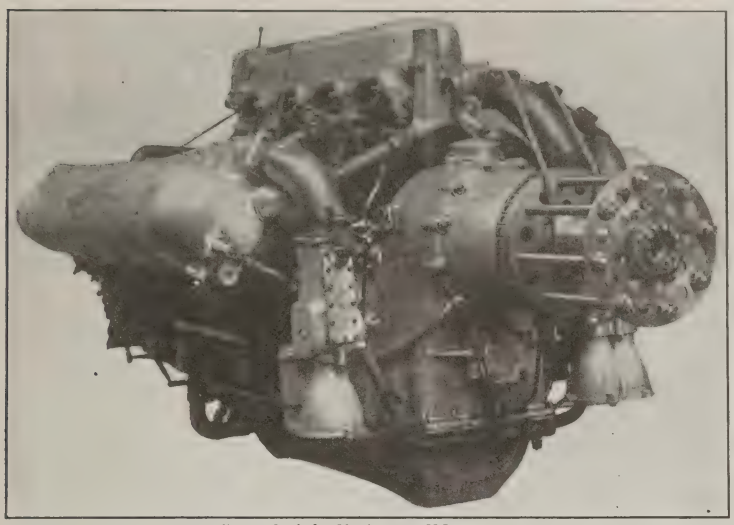
The Airscrew Shaft, which rotates in a clockwise direction, is carried on two roller bearings and is fitted with a large double thrust ball bearing which permits of the engine being used on either pusher or tractor machines. The reduction gear wheel of spur tooth type, is bolted and spigotted on to a flange solid with the shaft. The airscrew shaft and gear can be withdrawn from the crankcase complete with the cover. The reduction between the crank and airscrew shaft is 1.52 to 1. The propeller boss is made to Air Board Standard No. 4.

The Pistons are of aluminum alloy with large diameter hollow gudgeon pins fitted into steel bushes cast integral with the piston. There are two gas and two scraper rings.

The Connecting Rods are machined from high grade steel stampings. The big end of the master rod—which is



The Napier "Lion" 450 H.P. Aero Engine. This power plant was used by Capt. Lang in establishing the world's altitude record of 30,500 feet



Propeller end of the Napier 450 H.P. aero engine

coupled to the pistons on the vertical block of cylinders—is lined with white metal. There are four lugs on the master rod, two on either side, for the two short auxiliary rods. The gudgeon pin ends of all the rods and the anchor pin ends of the auxiliary rods are bushed. Pipes for carrying oil to the gudgeon pins are fitted. All the working surfaces are pressure lubricated.

Auxiliary Drives. The magnetos, water and oil pumps are driven through bevels mounted on a short auxiliary shaft carried on the rear end cover. The front end of the shaft engages in slots on the crankshaft and is driven at crankshaft speed.

The Water Pump is mounted vertically under the rear end cover and runs at engine speed. The pump delivers water through three outlets to the rear end of the jacket on each cylinder block. A white metal packed stuffing box and greaser is fitted.

Oil Pumps. There are two suction and one pressure spur gear type oil pumps fitted at the rear end of the cover casting. The suction pumps are connected to the ends of the oil sump. The pressure pump delivers oil from the supply tank to both ends of the crankshaft. All the pumps run at half engine speed and are driven through bevels and spiral gears from the auxiliary shaft. The capacity of either suction pump is greater than that of the pressure pump. An oil filler is fitted between the pressure pump and the supply tank.

Magnetos and Ignition. The two special 12-cylinder dual ignition magnetos (B. T. H. AV12, L & S) are mounted on transverse platforms on the rear end cover and are secured by set screws. The magnetos rotate anti-clockwise and are driven at two-thirds engine speed through bevels from the auxiliary shaft. They are fitted with special rotors to facilitate starting up by hand; the advance and retard levers are interconnected through links and bell crank levers mounted on the rear end cover. The ignition cables are carried in tubes mounted on the crankcase.

A Tachometer Drive is mounted on the casting carrying the drive shaft for the vertical cylinders, rotates at one-quarter engine speed and is fitted with a standard Air Board end connection.

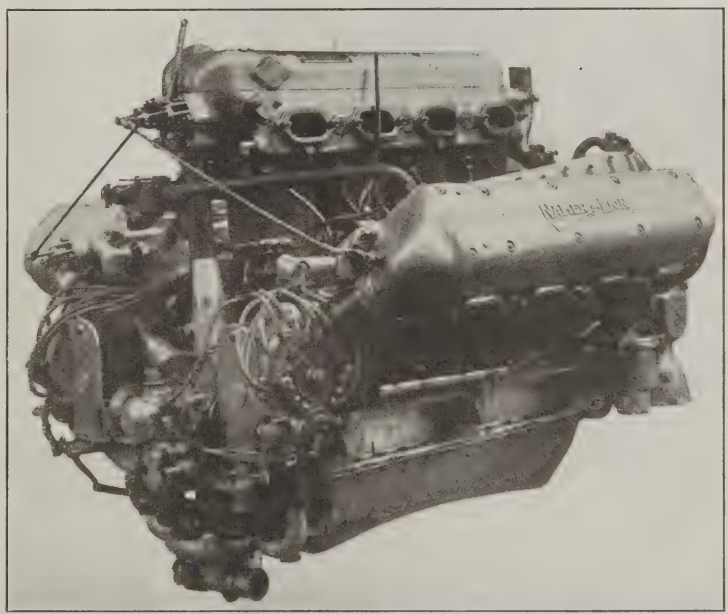
Carbureters. One double (N. D.) and one single (N. S.) carbureter is fitted on the engine. The double carbureter is mounted on the L. H. side and supplies the L. H. and vertical cylinder blocks. The single carbureter is mounted on and supplies the R. H. block. They are connected through water jacketted steel pipes to the induction manifold on the cylinder head castings. The carbureter bodies are of aluminum in two halves and are water jacketted. Both carbureters are fitted with altitude control cocks which are interconnected through levers to the throttle levers at the pilot's cockpit. The carbureter control shafts are carried in brackets on the crankcase. The carbureters are stayed to the crankcase to prevent vibration. Under running conditions the pipes and cock fitted at the rear ends of the induction manifolds act as an equalizing system for the three cylinder blocks.

Lubrication. All the connecting rod big ends, gudgeon pins and crankshaft plain bearing are pressure lubricated. Branch pipes from the pressure pump convey oil under pressure to the camshafts and bearings. The oil escaping from the ends of the bearings lubricates the valve tappets and is drained away at the ends of the head casting into the sump and returned by the suction pumps to the supply tank. The reduction gears are lubricated by oil squirted on to the teeth through a pipe connected to the crankshaft oil system. An adjustable leak pressure relief valve and a pressure gauge connection are fitted in the pressure system.

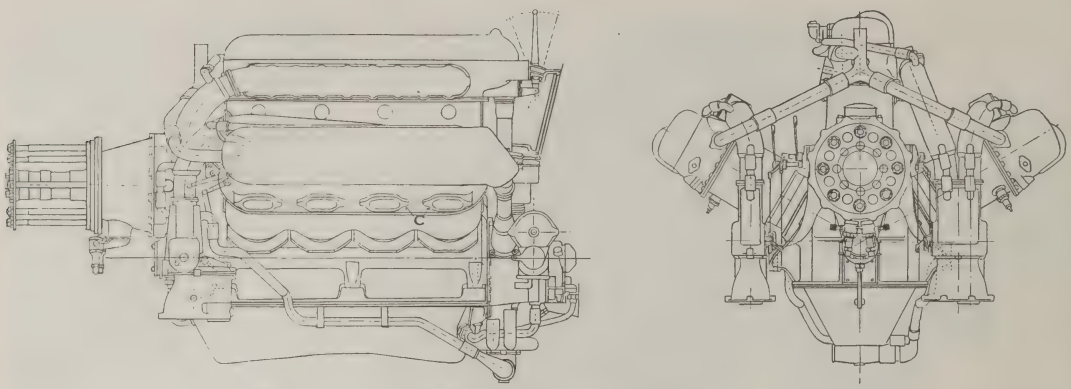
Gas Starter. The engine is started by pumping an explosive air petrol gas mixture into the cylinders; the mixture is then ignited by means of a hand starting magneto operating through the special rotors on the engine magnetos. The gas starter comprises a hand operated air pump, petrol vaporizer, a distributing or equalizing cock with pipes, and a system of levers mounted on the cylinder head castings for opening the valves by hand.

The engine, complete with propeller boss, carbureters, induction pipes, etc., weighs 850 lbs. approx:

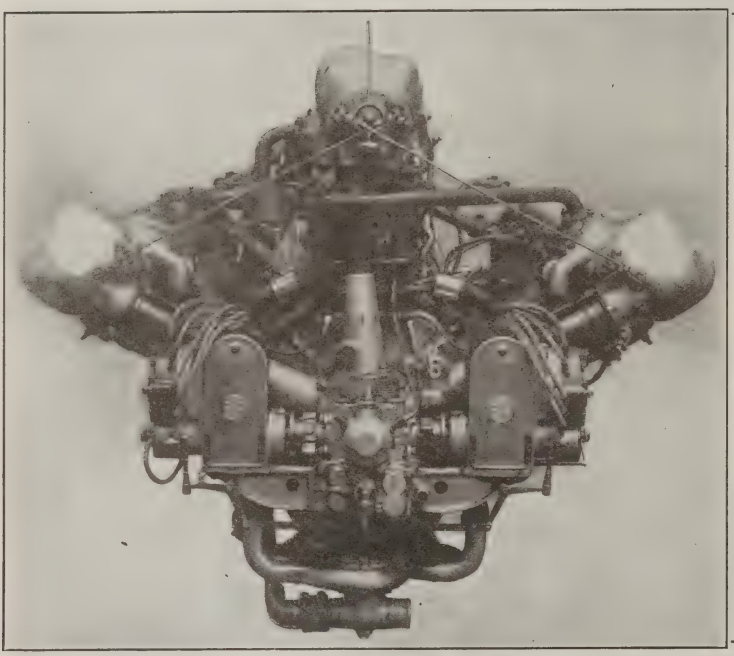
Horsepower 450 at 1,925 r.p.m.



Anti-propeller end of the Napier 450 H.P. aero engine, showing special arrangement of the cylinders



Side view and end diagram of the Napier "Lion" 450 H.P. aero engine



Anti-propeller end view of the Napier "Lion" 450 H.P. aero engine, showing the two special 12-cylinder B. T. H. Magnetos

Cited for Distinguished Service

First Lieut. John R. Castleman, Air Service pilot, 99th Aero Squadron. For extraordinary heroism in action near Romagne, France, October 5, 1918. In spite of being attacked by seven enemy planes, type Fokker, and later by five, type Pfalz, Lieut. Castleman successfully accomplished a photographic mission 6 kilometers behind the German lines, without protection, and also destroyed two of the enemy planes. Home address, F. I. Castleman, brother, 128 Rochelle Avenue, Wissahickon, Philadelphia, Pa.

First Lieut. John Y. Stokes, Jr., Air Service, 20th Aero Squadron. For extraordinary heroism in action near Etain, France, September 16, 1918. After their own formation had been broken up, Lieut. Stokes and his pilot voluntarily continued on their bombing mission with planes from another squadron. Although their plane was thrown out of control by antiaircraft fire, they proceeded to their objective and dropped their bombs. Their motor then died completely, and they were attacked by an enemy combat plane, but they fought off the attacking machine and reached the allied lines, where their plane crashed in a forest. Home address, John Y. Stokes, father, West Market, Reedsville, N. C.

Second Lieut. Edw. M. Morris, pilot (Air Service). For extraordinary heroism in action near Landres-et-St. Georges, France, October 30, 1918. Unable to complete a photographic mission, owing to motor trouble, Lieut. Morris, with his observer, made a reconnaissance behind the German lines. They dispersed a battalion of enemy troops, and although twice attacked by enemy patrols, drove them off and each case brought down one enemy plane. They remained in the air until their motor failed completely. Home address, Mrs. Rose Morris, 109 West One Hundred and Twenty-ninth Street, New York, N. Y.

First Lieut. Flynn L. A. Andrew, observer (Air Service). For extraordinary heroism in action near Landres-et-St. Georges, France, October 30, 1918. Unable to complete a photographic mission, owing to motor trouble, Lieut. Andrew, with his pilot, made a reconnaissance behind the German lines. They dispersed a battalion of enemy troops, and although twice attacked by enemy patrols, drove them off and in each case brought down one enemy plane. They remained in the air until their motor failed completely. Home address, Mr. Wm. H. Andrew, 1441 Pennsylvania Avenue, Denver, Colo.

Capt. Clearton H. Reynolds, pilot (Air Service). For extraordinary heroism in action near Romagne, France, October 9, 1918. Although weather conditions made flying exceedingly dangerous, Capt. Reynolds, with his observer, started on a mission to determine the position of the front-line troops of the division to which his squadron was attached. Flying at an altitude of 20 meters, they encountered and defeated three enemy patrols, gathered and deliverd to division headquarters very valuable information. Home address, Mrs. Lena B. Reynolds, mother, 33 North Seventeenth Street, East Orange, N. J.

First Lieut. Britton Polley, observer (Air Service). For extraordinary heroism in action near Romagne, France, October 9, 1918. Lieut. Polley was assigned to a mission to find line troops of the division to which his squadron was attached. Weather conditions made flying almost impossible, a second plane, assigned to the mission returning on that account. Flying at an altitude of 25 meters over enemy lines, he encountered and defeated three enmy patrols, gathring and delivring to his division headquarters, most valuable information. Home address, J. W. E. Polley, father, 440 East One Hundred and Sixty-sixth Street, New York, N. Y.

Second Lieut. Frank Luke, Jr., deceased, Air Service, 27th Aero Squadron. For the following act of extraordinary heroism in action near Etain, France, September 18, 1918, Lieut. Luke is awarded a bar to be worn with the distinguished-service cross awarded him November 8, 1918. Immediately after destroying two enemy observation balloons, Lieut. Luke was attacked by a large formation of German planes, Fokker type. He turned to attack two, which were directly behind him, and shot them down. Sighting an enemy biplane, although his gasoline was nearly gone, he attacked and destroyed this machine also. Next of kin, Frank Luke, 2200 West Monroe Street, Phoenix, Ariz.

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service

PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

Post Office Department Asks for Bids to Modify D. H. 4's

The Post Office Department has advertised for bids for the reconstruction and modification of the DeHaviland aeroplanes turned over to the Postal Service by the War Department. Sealed proposals for this work will be opened on February 26 at the Department in Washington.

The bids requested call for changing and modifying 12 DeHaviland 4 aeroplanes, and as many more up to 60, in lots of 12, as the Postmaster-General may direct. The changes to be made may be determined by inspecting a sample plane at the mail aviation field at Belmont Park, Queens, Long Island, New York, which may be surveyed and compared with the D. H. 4 battle planes, a specimen of which may also be found at the aviation field.

The changes comprehend the following, and such other changes as may be shown in said remodeled D. H. 4 plane at Belmont Park aviation field:

1. Pilot cockpit to be moved to rear.
2. Longerons on fuselage to be reinforced with 1/32" steel channels from front engine plate to rear of pilot's cockpit.
3. Longeron splices to be reinforced with steel plates.
4. Upper engine section wire to be increased in size and fittings reinforced with metal straps running diagonally from upper to lower longerons.
5. 1/32" steel reinforcing strip to be replaced on sides of fuselage from lower reinforcing strip to center sections fore and aft wires.
6. Bulkheads to be reinforced with cross bracing.
7. Mail compartment to be finished with 3/16" three-ply veneer and suitable covers and straps.
8. Turtleback to be better streamlined from rear of pilot's cockpit to stabilizer.
9. New cowling to be provided from engine to rear stabilizer.
10. All outer struts to be pinned with bolts.
11. To be fitted with stronger landing gear and same placed forward of old position, as per sample plane.
12. Bracing wires to be installed on elevators and rudders.
13. Stabilizer under brace to be tightened with bolts instead of pins.
14. Fitting at front lower longeron to be strengthened to take load of upper drift wire off wood by making fitting to go around longeron.
15. Rudder to be so arranged as to give plenty leg room.
16. Two pressure gasoline tanks and gravity tank totaling 180 gallons to be installed.
17. Instrument board to be placed as in sample D. H. 4 now at Belmont Park.

Delivery: The time for delivery of work should not be longer than four weeks from date of award for six of the machines, the second lot of six to be delivered within two weeks thereafter.

The Department will deliver the ships to and from factory.

Air Mail for Honduras

New Orleans.—Aeroplane mail service between Honduras, Nicaragua, Salvador and the United States is soon to be established, according to Joaquin Bonilla, Honduras counsel to Manchester, England, who has arrived in New Orleans from Honduras.

Mr. Bonilla said details are now being worked out and it was expected the service would be in operation within the next few months with Tegucigalpa as the main base. Mr. Bonilla is a son of Manuel Bonilla, former President of Honduras.

American Aces Tell Exploits In Washington

Washington, D. C.—Three American aces, Captain "Eddie" Rickenbacker with twenty-six planes credited to him, Lieut. J. O. Donaldson, credited with nine victories, and Captain Douglas Campbell, with seven victories, were the guests of the National Press Club on the night of February 13. Each of the aviators made addresses recounting some of their experiences in France. The story of Lieut. Donaldson, who is a resident of Washington, was the first account of his adventures given in public. Donaldson was captured by the enemy, but succeeded in eluding his captors and making his way with a companion to a German aerodrome. An effort was made to reach the allied lines by aeroplane, and after three hours of "tuning up" in the darkness of a hangar a German officer interrupted them. However, the two aviators made their way to the woods, where they were captured and placed in solitary confinement. A second attempt, this time successful, was made several weeks later, Donaldson being accompanied by four other officers.

Victor Chapman Extolled In Music

New York, N. Y.—The Society of the Friends of Music gave a concert at Aeolian Hall on February 15 in memory of Victor Chapman, one of the first American aviators to give his life for the cause of democracy. The composition rendered was written for the occasion by Charles Martin Loeffler.

Dirigible Endurance Record Broken

Cape May, N. J.—Remaining aloft for 33 hours and 6 minutes under the most unfavorable weather conditions, the naval dirigible C-3 last week established what is claimed to be a world's endurance record for the non-rigid type of balloon.

The C-3, with Ensign Clarence W. Tyndall of New York in command, left its hangar at the naval air station here last Wednesday at 4.35 P. M. Bad weather set in a few hours later and during the cruise up and down the coast rain, high winds, snow and extremely low temperatures were encountered. Early Friday the dirigible developed motor trouble, and at 1.41 o'clock that morning a safe landing was made on the flying field at Cape May.

The C-3 is of the blimp type developed during the war by the British Royal Flying Corps, and is the largest dirigible balloon in the navy's service. Ensign Tyndall was accompanied by two pilots, a radio operator and two mechanicians.

In its first endurance cruise about three weeks ago the C-3 remained aloft for twenty-seven hours and covered a distance of more than 1,000 miles.

Four French Air Mail Lines in Operation

Paris.—The fourth civilian postal air line in France will be in operation soon between Paris and Nice with landings at Lyons and Marseilles, according to the New York *Globe*. The most recently established service, that between Paris and Lille, is more than four times faster than the present train service, taking one hour and forty minutes instead of eight hours, while the two hours and a quarter mail service between Paris and Brussels is proving a great time saver, railway trains sometimes requiring twenty hours for the trip.

The Paris-St. Nazaire line, which has been in operation since August 17 on an average of eighteen days out of every thirty, is expected, as is the case of other services, to run about 80 per cent. of the time with better weather conditions in March and 90 per cent. or better in April and the succeeding summer months.

Mrs. Roosevelt Pays Tribute to Quentin

Paris.—Mrs. Theodore Roosevelt, accompanied by her son, Lieutenant Colonel Theodore Roosevelt, Jr., visited the grave of Lieutenant Quentin Roosevelt, near Fere-en-Tardenois, and laid flowers on the simple monument which marks her son's last resting place. The grave is being carefully tended by the inhabitants of the locality.

Cited for Bravery

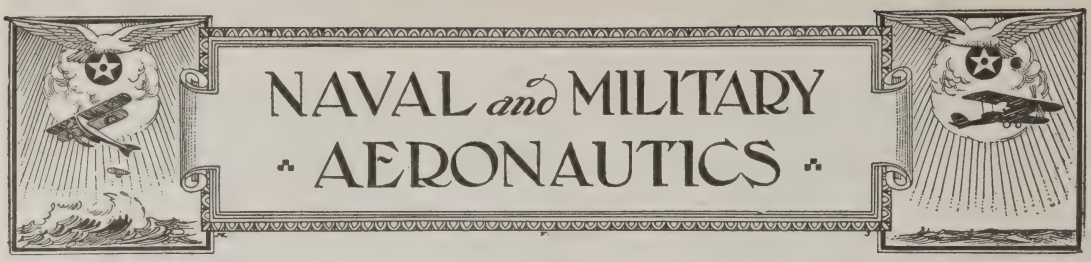
Alfred B. Patterson, Jr., First Lieutenant, Pilot, Air Service, 93d Aero Squadron. For extraordinary heroism in action in the region of Moiry, France, September 29, 1918. While on a patrol with two other machines, he attacked an enemy formation of seven planes (Fokker type) that were protecting a biplace plane. They destroyed the biplace and four of the Fokkers, forcing the remaining three to retire. A bronze oak leaf, for extraordinary heroism in action in the region of Moiry, France, October 23, 1918. He led a formation for the purpose of protecting our bombing planes, the accompanying planes being obliged to return, due to engine trouble. Despite this fact, *Lieut. Patterson* proceeded on the mission alone. He sighted an enemy patrol of nine machines (Fokker type) and attacked them, driving one down.

Wilbur C. Suiter, First Lieutenant, Air Service, Pilot, 135th Aero Squadron. For extraordinary heroism in action near Vilcey-sur-Trey, France, Septembr 12, 1918. He, with *Second Lieut. Guy E. Morse,* Observer, fearlessly volunteered for the perilous mission of locating the enemy's advance unit in the rear of the Hindenburg line. Disregarding the hail of machine-gun fire and bursting anti-aircraft shell, they invaded the enemy territory at a low altitude and accomplished their mission, securing for our staff information of the greatest importance. These two gallant officers at once returned to the lines and undertook another reconnaissance mission, from which they failed to return.

Guy E. Morse, Second Lieutenant, Observer, 135th Aero Squadron. For extraordinary heroism in action near Vilcey-sur-Trey, France, September 12, 1918. He, with *First Lieut. Wilbur C. Suiter,* Pilot, fearlessly volunteered for the perilous mission of locating the enemy's advance unit in the rear of the Hindenburg line. Disregarding the hail of machine-gun fire and bursting anti-aircraft shell, they invaded the enemy's territory at low altitude and accomplished their mission successfully.

First Lieut. Frank Ordiscoll Hunter, Air Service, 130th Aero Pursuit Squadron. For the following act of extraordinary heroism in action near Verneville, France, September 17, 1918: Leading a patrol of three planes, *Lieutenant Hunter* attacked eight enemy machines. He then returned to the flight and succeeded in destroying another and driving off the others. Home address, John H. Hunter, father, 216 East Gaston Street, Savannah, Ga.

First Lieut. Ralph P. Bagby, Field Artillery, observer, 88th Aero Squadron. For extraordinary heroism in action near Tailley, France, November 2, 1918. *Lieutenant Bagby* and First Lieut. Louis G. Bernheimer, pilot, on their own initiative went on a reconnaissance mission, flying 50 kilometers behind the German lines, securing valuable information as to the condition of the bridges across the Meuse River and enemy activity in the back areas and also harassing enemy troops. Home address, R. J. Bagby, father, New Haven, Mo.



Key to Abbreviations

ABC—Report to Army Balloon School, Arcadia, Cal.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
ARV—Report to Aviation Supply Depot, Richmond, Va.
BFT—Report to Barron Field, Fort Worth, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonia, Texas.
CRI—Report to Chanute Field, Rantoul, Ill.
CWT—Report to Call Field, Wichita Falls, Tex.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EOT—Report to Ellington Field, Olcott, Texas.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GLC—Report to Gerstner Field, Lake Charles, La.
HHM—Report to Hazelhurst Field, Mineola, L. I., N. Y.
KST—Report to Kelly Field, San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses.)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
MAC—Report to March Field, Allesandro, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIA—Report to U. S. Naval Air Station, Miami, Fla.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PWM—Report to Payne Field, West Point, Miss.
RSD—Report to Rockwell Field, San Diego, Cal.
RWT—Report to Rich Field, Waco, Tex.
TFT—Report to Taliaferro Field, Fort Worth, Tex. (When specified in the order, the number of the field is given in parentheses.)
TMA—Report to Taylor Field, Montgomery, Ala.
UTA—Report to School of Military Aeronautics, University of Texas, Austin Tex.
WDM—Wire Director of Military Aeronautics upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Notes

Note 1—Report to places mentioned in the order named.

Note 2—Report to Washington, D. C., to Walter Reed General Hospital, Takoma Park, D. C.

Note 3—Report to Panama Canal Zone, Ancon, Panama, for duty.

Note 4—Report to Chicago, Ill., to district manager aircraft finance, Consumers Building, and wire DAP.

Note 5—Report to Pensacola, Fla., to naval air station.

Note 6—Report to Akron, Ohio, to Army Balloon and Airship Detachment for duty.

Note 7—Report to Honolulu, Hawaii, to commanding general Hawaiian Department.

Note 8—Report to 360 Madison Avenue, New York City, to district manager aircraft finance.

Note 9—Report to Chief of Technical Section, Division of Military Aeronautics, Dayton, Ohio.

SPECIAL Orders No. 37-40 Inclusive—

A

Ayling, John G.....MIA
Austin, Charles B.....Note 3.

B

Blessley, Roland C.....Note 3
Birdsall, Raymond P.....DMA
Buchanan, Lester C. Gill.....LDT
Burt, Byron T., Jr.....Note 6
Brooks, John B.....Note 7
Burns, Leroy W.....RSD

C

Collins, Russell E.....Note 6
Cameron, Don R.....Note 6
Clare, Wilfred M.....Note 6
Cunnea, Louis J.....PMT
Connolly, Cecil H.....RSD
Case, Leland I.....KST
Carusi, Joseph S.....KST

D

Duggen, James R.....Note 3
Desmond, James P.....KST
Day, John L.....PMT

E

Edwards, William N.....Note 4

F

Finley, Robert H.....Note 5
Faulk, Theodore E.....Note 5

G

Gowans, Louis L.....RSD
Gaghagen, Howard H.....Note 2
Gibbs, William R.....PMT
Grimm, Alfred.....DMA
Grimes, Gerald E.....KST
Gahris, Leroy E.....HHN

H

Haddon, Julian B.....KST
Holton, Russell G.....DAP
Hightower, Alfred James.....Note 8
Hill, Willard D.....FRF
Holden, Harlan W.....GLC

J

Johnson, Walter S.....DAP

K

Kingsland, George D.....Note 5
Kennedy, Frank M.....Note 5
King, Benjamin.....DAP
Knight, William.....Note 9
Knight, Herbert C.....LDT

L

Lyon, Edward Crane.....CAF
Leeburn, Leo J.....LDT

M

Murtha, John T.....Note 2
Mills, Pittman W.....KST
Maranville, Clarence H.....MIA
Maenner, Theodore H.....Note 6
Mulliken, Harrall.....DMA
Moore, Percy S.....CAF
Miller, Henry J.....DMA

Mc

McMorrow, William F.....PMT
McDarment, Corley P.....PMT
McDonough, Harry L.....KST
McCabe, John H.....Note 3

P

Phillips, Eldon P.....Note 6

R

Ratliffe, George T.....KSTS
Smith, Fred H.....KST
Strong, Albertus.....FOB
Seymour, Joseph.....CGC
Smith, Stanley.....RSD
Stealy, Clair Laurus.....MAC
Strother, Samuel P.....AGC
Stack, Herbert J.....DMA
Souza, William B.....Note 3
Smith, Albert D.....DMA

T

Tonkin, Thomas C.....Note 3

W

Williams, John G.....Note 3
White, Willard Justin.....CAF

Major Smith Ends Transcontinental Flight

San Diego, Cal., February 14.—Completing one of the record flights in aviation history, Major Albert Smith ended his flight across the country and back on February 14. Major Smith began his flight from San Diego to New York on December 4. Although a great many days have elapsed since the start of the flight, most of the time was spent along the Atlantic coast in flights from Long Island to Washington, and long stops prior to the start of the return journey.

On the last day of the flight Major Smith had breakfast at Fort Bliss, Texas, luncheon at Yuma, Arizona, and dinner at San Diego.

French Air Mission Coming

Paris.—A French aviation mission will start for the United States on March 8 to demonstrate the degree of efficiency French aeroplanes have attained. The mission will take with it five of the fastest machines which have been turned out. One of the planes is fitted with a closed cabin for the use of the Americans who have been invited to accompany the mission, which will have five of the noted French aces as pilots for the machines.

Authority and Function of the Director of Air Service

To enable the Director of Air Service to exercise the necessary supervision, control and direction over the Bureau of Aircraft Production and the Division of Military Aeronautics, with which he is charged by direction of the Secretary of War, the following was announced by the Chief of Staff:

The Director of Air Service will carry out the duties of the Chief of the Air Service, as prescribed in Article LXXXI, Army Regulations, 1913. He will exercise, under the direction of the Chief of Staff, full and complete supervision, control, and direction over the Bureau of Aircraft Production and the Division of Military Aeronautics, in all that pertains to administration, supply, instruction, training, and discipline.

General Orders, No. 80, War Department, 1918, have been amended by striking out the words "the Directors of Military Aeronautics,—of Aircraft Production," and substituting the words "The Director of Air Service."

Fourragers

The Director of Military Aeronautics has just been advised by cable from General Pershing, that the 103d, Aero Squadron, formerly the Lafayette Escadrille, is one of the two organizations of the A. E. F. entitled to wear Fourragers awarded by the French government. This organization was awarded the Fourragers in the colors of the Croix de Guerre, having received two citations of the French Orders of the Army. The names of the individuals qualified to wear this decoration will be published shortly.

Military Aeronautics Strength

Figures prepared by the General Staff show that 60 per cent of Total Personnel of the Division of Military Aeronautics was Overseas on February 6th.

Distribution of personnel in United States and overseas at various dates is shown in the following diagram:

Date	*Number*		*Per Cent*	
	In U. S.	Overseas	U. S.	Overseas
Nov. 11.....	79,321	78,786	50	50
Nov. 18.....	80,689	78,973	51	49
Nov. 25.....	84,785	78,361	52	48
Dec. 2.....	84,844	78,061	52	48
Dec. 9.....	889,661	70,040	56	44
Dec. 21.....	81,607	61,245	57	43
Dec. 26.....	77,140	59,917	56	44
Jan. 6.....	67,833	59,584	53	47
Jan. 16.....	51,321	58,854	47	53
Jan. 23.....	46,467	58,133	44	56
Jan. 30.....	41,314	57,527	42	58
Feb. 6.....	37,537	56,299	40	60

Reduction of Personnel

The War Department recently announced that the Air Service Personnel, in Washington, had decreased as follows:

Division	Civilian Personnel Nov. 11	Net reduction Nov. 11- Feb. 7	Per cent decrease Nov. 11- Feb. 7
Aircraft Production..	1,861	579	31

Military Aeronautics. 1,100	313	28
The Total Figures for whole War Department are..... 25,892	6,536	25

Cancelled Aircraft Contracts

The War Department has announced Aircraft Contract Cancellations to the value of contracts cancelled and suspended $469,000,000.

The following is a summary of cancellations and suspensions of contracts to Feb. 7th:

	Value	Per cent of total
Engines and spare parts....	$250,107,551	53
Planes and spare parts.....	163,231,790	35
Chemicals	13,181,285*	3
Balloons and balloon supplies	9,877,356*	2
Instruments and accessories	9,864,238*	2
Fabrics, lumber and metals.	5,954,726*	1
Miscellaneous	16,631,047	4
Total	$468,847,993*	

* Reductions due to revision in cancellations of contracts.

Suspensions of Plane and Engine Contracts

The value of planes and engines delivered during the week ended February 7 was nearly $2,000,000, leaving a balance on order valued at over $10,000.00.

Planes	Balance on order Nov. 11	Suspended Nov. 11 to Feb. 7	PER CENT Suspended	Delivered	Remaining
Service	$124,818,750	$113,968,750	91	8	
Adv. Training.....	12,203,600	9,677,700	79	18	3
Elem. Training	5,400,000	4,187,358	77	23	
Total	$142,422,350	$127,833,808	90	9	
Engines					
Service	$227,010,000	$193,452,000	85	14	
Adv. Training.....	31,377,500	14,926,295	48	27	25
Elem. Training.....	2,864,200	0		93	7
Total	$261,251,700	$208,378,295	80	17	3

331 Liberty Motors Remaining on Order

During the week ended February 7th a total of 189 Liberty motors were delivered, leaving 331 still on order. To date 20,147 have been produced.

The status of contracts on February 7th is shown below:

	Balance on order Nov. 11	Suspended Nov. 11 to Feb. 7	Delivered Nov. 11 to Feb. 7	PER CENT Suspended	Delivered	Remaining
Nordyke-Marmon Co.....	4,548	4,000	548	88	12	
Lincoln Motor Corp.....	13,228	10,500	2,728	79	21	
Packard Motor Car Co.....	7,373	5,600	1,473	76	20	4
General Motors Corp.....	3,430	2,472	927	72	27	1
Ford Motor Co.....	1,947	1,050	897	54	46	
Total	30,526	23,622	6,573	77	22	1

42 De Haviland 4 Planes Remaining on Order

Deliveries of De Haviland 4 planes during the week ended February 7 were 5, leaving 42 still on order. A total of 4,600 exclusive of 204 shipped without engines, have been produced.

The status of contracts on February 7 is shown below:

	Balance on order Nov. 11	Suspended Nov. 11 to Feb. 7	Delivered Nov. 11 to Feb. 7	PER CENT Suspended	Delivered	Remaining
Standard Airc. Corp.	421	360	61	86	14	
Fisher Body Corp.	3,031	2,400	631	79	21	
Dayton Wright Air. Co.....	2,623	1,900	681	72	26	2
Total	6,075	4,660	1,373	77	22	1

7th Aero Squadron

Reporting from France Field, Cristobal, Canal Zone, on January 25, 1919, the Information Officer writes as follows:

"This week a flight was made to San Blas, R. P., in an HSIL flying boat, a distance of 180 miles being covered in aboui 140 minutes. On the trip to San Blas the boat carried four passengers (including pilots) and about 200 pounds of extra equipment. Two of the passengers were Air Service men who are on hunting pass, and in addition will make a hurried survey of conditions in the San Blas territory. The San Blas tribe of Indians is an old race, with many historical traditions. They have never been conquered, and the Panamanian Government is making some effort to educate them and to strengthen their allegiance to the Republic. A peculiarly shy and child-like people, these Indians have many habits of dress and adornment which are interesting. All their women wear nose rings of imitation gold almost from infancy, cover their heads and faces with cheap cotton shawls of elaborate design, wrap their legs tightly with a fabric strip and paint a stripe of varying color on their noses. The chief men are distinguished by circular earrings, also of imitation gold.

New Gas Station

The Panamanian Governor of the Province offered to allow the use of a portion of the Capital Island, Porvenir, for aviation purposes, and to build a gas station there. Co-operating with Navy aviation officers, the commanding officer of France Field plans to visit Porvenir within the next week in a Navy submarine chaser and one of France Field's boats, the U. S. A. David Putnam, and complete arrangements for the establishment of this gasoline station. This base will assist the operation of sea planes from France Field along the entire Atlantic coast of Panama, a distance of approximately 700 miles. The value of establishing gasoline stations of this kind is apparent when it is learned from Navy sources that six Curtiss NC1 flying boats are capable of landing 200 soldiers and equipment at any point along a 700-mile coast line in about three hours' time.

The 64th Balloon Company

Lieut. Col. H. B. S. Burwell, J. M. A., Commanding Officer of Rockwell Field, has commended the Commanding Officer, Arcadia Balloon School, on his co-operation in the Rockwell Field "Flying Circus," as follows:

"It is desired to extend to you my sincere thanks and appreciation for the wonderful way in which you co-operated with us in making the Rockwell Field 'Flying Circus' a success. The presence of the balloon company was one of the principal features of the circus, and the work done by the officers and enlisted men of that command is appreciated by myself and every member of this command.

"In spite of the very unfavorable weather conditions you were able to carry out your end of the program to the complete satisfaction of everyone present. It was a great pleasure to have you here as our guests, and our one regret is that we were not able to show how fully we appreciated the great trouble that you went to in bringing down the balloon company and equipment.

"The circus was a financial success and netted a substantial sum which will be used for the benefit of the enlisted men. Should you decide to stage a similar show at Arcadia you can rest assured that we will do everything in our power to co-operate with you in the way of furnishing aeroplanes and pilots and any other equipment at our command."

Lieut. Col. Mygatt conveyed the message to the 64th Balloon Company with the following indorsement:

"The work of the 64th Balloon Company, during the Flying Circus at Rockwell Field, is greatly appreciated by the Commanding Officer at that station. He states that the presence of the Balloon Company was one of the principal features of the circus, and the work done by the officers and enlisted men of this company was appreciated by himself and every member of his command. The handling of the balloon was excellent and the parachute jumps were perfect. The discipline and appearance of the company, in spite of the inclement weather and excessive work because of it, was all that could be desired. The Commanding Officer takes this opportunity to thank the officers and men of the 64th Balloon Company, and the officers attached to it, for their excellent work. A thorough performance of duty such as this reflects great credit upon the Balloon Service."

Firing Commands by Radio Telephone

A Field Artillery Brigade in action, with its Artillery Commander 2000 feet up in the air observing and giving firing commands direct, is the latest situation in aerial adjustment brought about by the use of the radio telephone.

Obviously, it cuts the time in field artillery response. Under the old system of airplane observation, it took from an hour to an hour and a half to adjust the fire of one gun, the time being taken in giving commands to the battery. By using the radio telephone and giving the firing commands direct,—as can be done by the aviator if he is a trained artilleryman,—the time for making all shifts and range changes can be more than quartered; and in this same less-than-one-fourth of the time, more than one gun can be brought into the action, and even the fire of a whole platoon.

These are actual results from recent experiments with the radio telephone between an airplane from Rockwell Field, San Diego, Cal., and a battery of field artillery training at Camp Kearney.

The aeroplanes used in these experiments have been the Curtiss JN4-H equipped with SCR 68 sets. An SCR 59 set has been used on the ground with SCR 53 antenna unit. (Radio phone.) The practice work is being carried on at regular intervals.

Brigadier General Hand, commanding the 16th Field Artillery Brigade, in giving his report of two days of cooperation between airplane and battery in the earlier days of this practice, has shown incidentally of what stuff aviators are made. Following is an extract from the General's report:

"Yesterday and today we have had firing by aerial adjustment from airplane using the telephone. The ground aerials were set up right at the battery, the executive officer wearing the telephone headdress. All the conduct of fire was by an aviator.

"The aviator who did the adjustment received the first lesson in adjusting fire by me 15 minutes before he went up, and that is all he knew about artillery fire. He was very bright, however, and on his first problem gave the proper commands for shifting his gun into its target and all the proper range changes throughout precision adjustment, including improvement fire. The first problem was 22 rounds, and lasted 19 minutes from the time he left the ground until the last shot. I had him actually give the firing commands, and he sent us no sensings whatsoever. In other words, he was battery commander. The second problem he secured his adjusted range and fired six rounds in improvement fire, making a total of 16, in 14 minutes. Included in this 14 minutes, he had given the commands to bring in the second gun. This morning, he went up, adjusted two guns of a platoon separately, brought in the whole platoon in fire for effect, making his corrections properly, and total time from his leaving the ground to last shot—21 minutes; total rounds fired—47.

"We all were greatly pleased with the results, and to my mind it means a revolution in aerial adjustment. If the aviator is a trained artilleryman, he can handle this fire with the ease, speed, and facility which one could do under the very easiest of terrestrial observation conditions. There was none of the long, tiresome delay such as I have been used to under our old system, as, you know, it took us about an hour or hour and a half, if we were lucky, to adjust one gun by airplane. The ship flew at about 2000 feet. I don't see why it wouldn't be possible to even pick up a fleeting target and adjust shrapnel fire with all the guns. Of course the height of burst might give him trouble, but take it on the proper proportion of air and graze, the trained field artillerymen should be able to handle it, and possibly one could get a very good idea after practice by rating the relation of the pattern to the burst, and be able to tell something about the height.

"However, to sum up my whole observation so far, I believe from now on where the phone can be used, and we have trained observers, they should give the firing commands direct instead of sending sensing down, and waiting for the ground people to transpose them to the battery. The ship we used had only one-way communication, but in a few days they expect to have apparatus so that we can also talk from the ground. That will make everything simple.

"I forgot to tell you that we purposely gave him a good error in deflection each time he was up, and we had no difficulty in making the proper shift. The accuracy of firing speaks for itself. In one problem he had three target hits during improvement and another one two. . . ."

FOREIGN NEWS

Ready to Fly to America

London, Feb. 16.—The 670-foot airship is ready at Glasgow awaiting favorable weather for a trans-Atlantic flight to America, the *Daily Chronicle* states.

The trip is expected to take eight days without stop (round trip). The airship will carry thirty tons. Strikes prevented an earlier demonstration, it is averred.

The machine is driven by six powerful engines under dual control. It is expected to be capable of forty hours' flight at a speed a little under 100 miles per hour.

Army Arranges Aeroplane Courier Service In Europe

Berlin, Feb. 18 (by the Associated Press).—American officers are endeavoring to arrange for an aeroplane courier service to connect various military missions at different points in the Central Empires and in new states with the American base in France. Present communications are difficult and unsatisfactory, particularly with Prague and Warsaw.

Germans Have Built Super-Plane

Berlin, Sunday (by the Associated Press).—If the war had lasted a few months longer Germany was prepared to surprise the world with an enormous aeroplane. The new giant of the air, which was planned by Harold Wolff, an engineer, will have its first trial at Doberitz within a few days.

The new machine is nearly 165 feet from wing tip to wing tip and stands more than 23 feet high. It has six motors with a total of 1,800 H.P., and is driven by four propellers, two of which are forward and two aft. Each of the propellers has four blades. The two motors, it is said, can stop simultaneously without affecting any of the propellers or having any result except to reduce the speed of the aeroplane.

Apart from its dimensions and power the new aeroplane is not only equipped with devices enabling the pilots to know at all times their altitude and angle of elevation, but also with devices to tell the absolute as well as relative direction, which it is believed will make flying possible on the darkest night and in the thickest fog. This device is an improved radio direction finder.

French Aviation Mission Coming to the United States

Paris, Feb. 16.—On March 8 a French aviation mission will leave for the United States with the object of demonstrating the degree of efficiency French aeroplanes have attained. The mission will take with it five of the fastest machines that have been turned out, of various makes.

The itinerary of the mission covers New York, San Francisco, Los Angeles and New Orleans, with a return to New York, the various stage sbeing covered by air. The mission will take with it a collection of paintings and photographs illustrating air episodes of the war. These pictures will be put on exhibition.

Huge Handley Page Machine Makes Long Flight

A Handley-Page aeroplane, fitted with four 350 H.P. Rolls-Royce engines, flew from Belfast to Sheffield on January 18. The total weight on board was 12 tons, including a crew of seven and a half a ton of baggage. The time taken by the flight was 2 hours and 35 minutes.

Flies Across Mediterranean

Lieut. Roget and Captain Cole, in a military biplane, propelled by a 300 H.P. motor, succeeded in flying across the Mediterranean from Marseilles to Algiers on January 26. They started from Istres in Bouches-du-Rhone at 2 A. M. and landed at Algiers five hours later. After a rest of about an hour they set off on the 500-mile journey back to France, but were forced to land at 7 P. M. at Rosas in Catalonia, having lost their way in the mistral and flown for about 1,000 miles over the Mediterranean, which they crossed twice.

Germans Have Surrendered 1,700 Aeroplanes to British

London.—In behalf of the Government it was announced in the House of Commons that the Germans had turned over 1,700 aeroplanes to the British Army.

No Zeppelins In Jutland Battle

A Zeppelin officer, discussing the Jutland battle with a member of the Allied Naval Commission in German waters, said it was not true that they had any Zeppelins on reconnaissance on the day of the battle. Had that been the case, the German fleet would certainly have avoided battle, the German officer said.

Italians Developed New Observation Balloon

Rome.—The chief of the Aerostatic Section of the Italian Army, Major Avoria and Signor Prassove, Director of the Italian Army Aircraft Works, produced, just prior to the signing of the armistice, a new type of observation balloon, which proved much more satisfactory than the Parseval-Sigsfeld or Tribolal Caquot balloon. The new type is essentially a spherical aerostatic fitted with what are equivalent to stabilizing fins and acting as a kite. It may be employed in winds of over 55 miles an hour, while the Parseval type could not be used safely in winds exceeding 12 miles an hour. The new type requires less gas and owing to its smaller dimensions, is easily transported and housed, and safer from hostile fire. A further advantage in the employment of mooring cables of smaller section follows from its smaller head resistance, while should the mooring cable snap, the balloon may be navigated as a free balloon.

Dismantled German Ships As Aerial Landing Places

London.—Commenting on the suggestion that Germany's battleships be destroyed rather than distributed among Allied powers, a British publication suggests their utilization as aerial landing stations in trans-Atlantic air lanes. Mid-Atlantic stopping places of this kind would certainly be an excellent field of utility for obsolete warcraft.

Airwomen Banned By England

London.—An order has been issued oy the Air Council forbidding women in the Woman's Royal Air Force from learning to fly, owing to the shortage of aircraft supplies. The restriction is said to be of temporary character only.

British Aeronautic Industry Has Tremendous Capacity

London.—The Advisory Committee of the Ministry of Reconstruction appointed to consider the establishment of new industries has estimated that existing aircraft factories in England are capable of producing 40,000 aeroplanes and 30,000 motors a year, in addition to sufficient spare parts to supply replacements for an air force of that size.

Australia Has Commercial Aeronautic Plans

Auckland, New Zealand.—The Minister of Posts and Telegraphs in New Zealand is supporting a movement for the establishment of aerial transport and aerial mail lines between various parts of New Zealand, extending from Auckland to Dunedin, a distance of 700 miles, and between New Zealand and Australia

Mr. L. A. Walsh, the managing director of Walsh Brothers and Dexter, Ltd., aeronautical constructors and engineers, who was in charge of the training of military aviators during the war; has been one of the moving spirits in the development of these plans. Under his direction several types of single and twin-motored flying boats have been constructed, employing Hall-Scott motors for propulsion.

A large number of military fliers will be available for operating commercial aircraft.

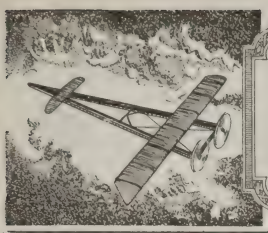
British Develop New Airship

London, Feb. 14.—The *Daily Mail* publishes the first particulars of one of the latest types of British rigid airships, the building of which has been done secretly. These vessels, known as the "33" class, are virtually equal in size to the most successful type of Zeppelin, and the preliminary tests have shown that they will equal, if not exceed, Zeppelin performances.

Their length is said to be 670 feet and the diameter seventy-nine feet. Weight in flying trim will be more than 600 tons, including a carrying capacity of between twenty-seven and thirty tons. For war purposes she was to have carried four 580-pound and eight 250-pound bombs, also machine and other guns fore, aft and on top.

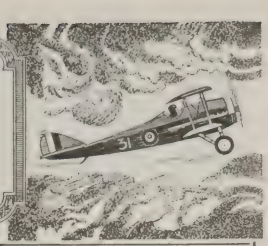


The Farman "Aerobus" being used in the Paris-London service. Two Salsmon engines are used. Note the wing end ailerons



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



CLUBS

PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska

DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.

CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.
CAPITOL MODEL AERO CLUB
1726 M Street, N. W., Washington, D. C.
CORRESPONDENCE MODEL AERO CLUB
320 N. Main Street, Rockford, Ills.
AERO CLUB OF LANE TECHNICAL HIGH SCHOOL
Sedgwick & Division Streets, Chicago, Ill.

Model Aeroplane Building as a Step to Aeronautical Engineering

OWING to the enormous inquiries in reference to the light type aeroplane received while the articles on the Ford Motored Aeroplane were being described the author has decided to give specifications and general details for building a motorcycle engine driven machine.

Some people have an idea that a motorcycle engine is not powerful enough to propel a machine through the air, but this idea is incorrect, because years ago A. V. Roe, of England, proved that he could fly with but 3 horsepower, this was not a mere hop in the air and then back to earth again, but a real honest straightway flight.

Again our Mr. Sellars flew a quadruplane having only an 8 horsepower motorcycle engine for his power plant and he is officially credited with successful flights of a mile or more. These were only experimental flights and no doubt longer ones could be accomplished if the designer so desired.

These machines were not as efficient as the machines of to-day because the aeroplane builders of those days did not have the dope to go by and very little was known about lift coefficients, etc., and it is marvelous to think that these pioneers accomplished as much as they did with the meager figures and data they had on hand.

Emil Laird, a bright young man of the Illinois Model Aero Club, startled the aviation world a few years ago by building a little biplane of about 20 feet spread and powered with a special cylinder air-cooled motor of light weight which was made of cylinders of a well-known automobile motor. This motor of Laird's was rated at about 12 h.p., but it was powerful enough to carry him all around the United States giving exhibitions at the fairs.

Later Laird built a machine powered with an Excelsior motorcycle engine and it was a good flyer. The only fault that the designer could find with it was that the engine heated up badly and the flights were shortened thereby. The heating up of the engine may have been caused by one of a few reasons, namely: overload caused by the propeller being too high pitch or too large diameter, engine not timed properly for the speed of engine or engine running wild due to propeller being too light pitch or diameter. A motor bears up unless we have the particular motor near us and we make a careful investigation of the case.

Recently a photograph of a motorcycle engine driven monoplane was shown in AERIAL AGE and the designer claimed a speed of over 50 m.p.h. with a stock motorcycle engine.

We can get encouragement by looking back to the days when the Wrights flew a machine with a great spread of wing and drove it through the air with twin propellers turning in opposite directions by a bicycle chain transmission driven by a 12 h.p. motor, and you will be amazed when you hear that the lifting efficiency of the wings was only 70%.

Later Nieuport developed a monoplane which has since became famous for its great speed for low horse power and which flew at the rate of 68 miles per hour with an 18 h.p. two cylinder opposed motor.

The foregoing well-known machines are mentioned merely to give the reader encouragement and to give him something as a guide, and by which he can check performances.

Drawings will be given showing the power plant which is a three cylinder "V" motor made up from three stock motorcycle cylinders and which should develop about 25 h.p., also drawings showing general construction and assembly of the machine will be given.

Fittings will not be described, as the fittings that were designed for the Ford Motored Aeroplane can be used for this machine. (In answer to numerous inquiries and for those who wish to know where they can purchase metal fittings and machine work, I refer you to The Jennings Machine Works, Uniontown, Pennsylvania, who have made a specialty of making fittings for the machine described in the preecding articles for a nominal sum.) The general construction will be much the same only over all dimensions and wing curve will be different.

Model Aeroplane Contest

We have received many entries for the contests from all over the country, and most of the entrants ask for an answer to their letters or post cards as the case may be.

It is impossible to answer all of these communications, and in the future we will enter the applicant's name and he will be eligible to complete. In fact any builder or flyer of model aeroplane is eligible, and it makes no difference what type or make of machine the model is patterned after so long as the entrant has built it himself.

This information is for some readers who think that the models must be built according to drawings which appeared in the "Elementary Aeronautics" columns.

Model Curtiss J N 4

The Model Curtiss JN4 shown in the accompanying illustration was built by Harold Morehouse of Detroit, a member of the Illinois Model Aero Club and now employed by the Dayton Wright Company as draughtsman. The model is correct in every detail, the controls working and connected dual as on the big machines. The covering is tracing cloth such as found in draughting rooms, the sizing being washed out of it. It is fastened in the regular way and doped. It is interesting to compare these photos with those of a large machine and note the resemblance to its large prototype.



Model of a Curtiss Aeroplane which shows careful construction. Controls can be operated as in the big machines



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Intelligent Female (to balloon officer of observation sausage): "I wonder you don't have a ladder or a fire escape or something of that sort instead of just having that rope to climb up and down."

Aerodrome Proverbs

It's the last bump that breaks the chassis strut.
A switch off in time saves nine days in the repair shop.

"Owed" to a Night Bomber

Hear! Meccano, ere you crank,
This foolish looking flying tank!
Let me on your mind impress
With the utmost earnestness,
Grasp this order without fail,
Don't get tangled in my tail.
Knight o' the sparkplug, hear my vow,
There will be one hellva' row,
Take it even now from me,
It'll be the end of you an' me.
If you'd escape my rage
Guardez vous mon empennage.

From *The Olympian.*



Tailspin Mac takes a ride under gosport system
(From "Rich Field Flyer")

I ought to get a good job during the election.
Why?
I've spent the last four years ladling out "dope."

Talking about American flying bobbies. "Yes, your wushup, I was on duty in Section XII when I saw the prisoner. He was driving his plane at a furious pace and flying on the wrong side of a cloud. Held up my hand to stop him, but he took no notice, and after nearly colliding with a nursemaid on her aerial pram, he crashed right into the doorway of the 'Aviators' Rest,' causing the same to rock and nearly break from her guys."

From *Aircraft* (London)

It was a wet day, and the 'bus was skidding all the way up Ludgate Hill.

"What's the matter, conductor," asked the nervous old gent in the corner.

"Driver's just been demobilized from the R. A. F., sir, and when he saw that aeroplane overhead, sir, he got the wind-up and tried to do the Immelman turn."

America has decided to have Flying Policemen. For the love of anything, don't drop the "F" from the adjective, Mr. Printer, or the Force will think we've done it on purpose.—*Aircraft.*

Air-Raided Padua

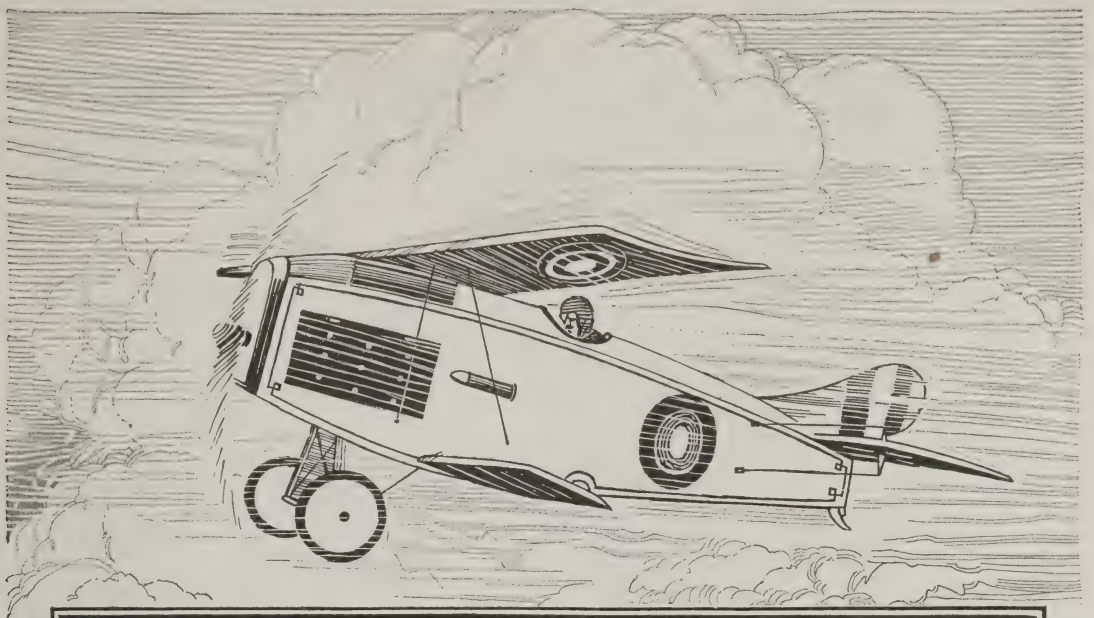
A heritage of Ilium's glory vast,
O "happy Padua," to thee belongs!
For here Antenor came, his trials past,
Whose ancient fame the Mantuan bard prolongs;
Here Dante dwelt and here he saw the throngs
Of shades within Inferno's gloomy bound;
And here once Petrarch sang his sad, sweet songs
Of "ceaseless sorrow" that loved Laura crowned
And make his tomb at Arqua, still a shrine renowned.

Thy storied name is crowned with memories bright,
And at its bidding come from History's page
Majestic shades of Rome's young, growing might,
By Livy told, and read from age to age.
Thou art the goal of many a pilgrimage—
Of Art and Learning thou art still a shrine
That guards for all the world rich heritage.
Loved still art thou by all the Muses nine—
'Neath blue Italian skies fair rise thy domes divine!

And not alone to thine own clime and race,
"Fair Padua, nursery of arts," hast thou
Been inspiration; thou hast won a place
On page of him to whom all poets bow
As King; Bianca and fair Portia now
Lend thee a grace that every reader thrills
And with their beauty's spell they thee endow.
But stay; What is that sound that o'er thee shrills?
What shadow dread flits from the Euganean hills?

Now o'er thy cupolas and towers high
There hover birds of prey on ruin bent;
A vandal foe to Padua draws nigh,
His winged couriers to thee are sent
And on thy shrines drop from the firmament
Dread bolts that far and wide destruction spread.
Shall storied Padua be in ruin blent?
A foe has come who spares nor quick nor dead—
'Gainst Art and shrines divine Thor's flaming bolts are sped!

—H. T. Sudduth, in the *New York Times.*



The Christmas "Bullet"— Valsparred, of course!

The Christmas "Bullet," is a business-like looking machine, designed by Dr. William Whitney Christmas. It is the first "strutless" biplane. The wings are flexible and during flight they bow, giving them the appearance of a bird's wings.

Equipped with a Liberty Six, which is rated 185 h.p., a speed of 197 miles per hour was made by this plane at Government Experimental Field No. 1 (near Central Park, L. I.) on December 3rd and 7th, before Col. Harmon and his staff.

Naturally, Valspar was used on the varnished portions of this plane. No other varnish made is elastic enough to stand the terrific vibration of this machine, whiz-z-z-ing through the air at 197 miles an hour.

Valspar resists *all* of the destructive effects of high speed and hard usage in airplane service and retains its protective qualities long after ordinary varnish requires renewal.

In constant use in the air service of the Allies during the war, Valspar was the one varnish that satisfied *all* of the exacting requirements.

Our Airplane Department will gladly afford information and assistance in solving your varnish problems. To Purchasing Agents and Superintendents of Production: We will send our book on airplane finishing free on request.

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(Continued from page 1241)

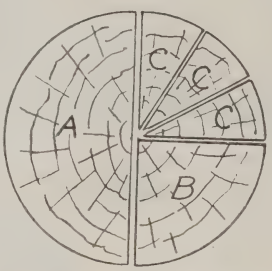
three methods which have been outlined it is generally green and wet with steam, and must be thoroughly dried before being either stored or made into plywood. The drying process is a very simple one. It consists merely in drawing air, which has been dried and heated by passage over steam pipes, through the room or rooms in which the veneer is stacked. A temperature of 100 to 110 degrees Fahrenheit is maintained. When the air has become nearly saturated with moisture from the veneer it is sucked out by fans that keep up a continuous circulation. A drying period of from 12 to 13 hours is sufficient, as a rule, for veneer which does not exceed 1/16 inch in thickness, and for greater thicknesses a proportionately longer time is necessary.

Stacking Veneer.—It is most important that the sheets of veneer be so stacked as to insure a ready access of air. The methods employed depend largely on the size and shape of the stock. The comparatively long and narrow sheets from the veneer saws or the slicer are placed in "tooth racks" which consist of pickets about 30 inches long placed in pairs, their lower ends fitted into mortises cut in a piece of scantling so that the clear space between them is ¼ inch. The veneer is supported every 2 or 3 feet by these pickets. Unless the sheets are fairly thick two are placed back to back in these racks and if they are not more than 12 to 15 inches wide they may be stacked edge on edge, two or more deep. The air has always full access.

What is known as the "protected end" method is employed when the sheets are wide and short; that is, not more than 3 feet long. Light boards with vertical grooves cut in them every 3 or 4 inches replace the pickets. The distance between these parallel boards or holders is varied according to the length of the veneer sheets, which are slipped into the grooves. In this way the ends of the sheets are protected, or prevented from cracking and warping while drying.

For rotary cut veneer—which for the most part is short and very wide—a third method called the "hanging process" is used. Lengths of from 6 inches to 3 or 4 feet, or even more, and widths of any dimension can be handled. Pairs of parallel wires, spaced 15 inches apart, are strung across the room about 5 feet above the floor. Each pair of wires supports a number of light wood cross members that project a little below the wires, and near their lower edge are driven nails which project an inch on each side of the stick. The sheets of veneer are hung from a cross-stick by these nails, which are struck through the piece close to its upper edge. When the width of the sheet is greater than the distance of the wires from the floor it is folded, and the other edge of the sheet is supported by the nails on the opposite side of the cross-stick. Very wide sheets and lengths greater than 20 inches are ordinarily suspended from two or more sets of wires.

After the veneer has been dried it is taken either directly to the cutting and gluing rooms to be made into plywood or to the storeroom for future use. Here it is kept in low piles containing all the veneer cut from one log, and marked with the log number. Since it may have absorbed some moisture while in the storeroom, veneer, before it can be used, must first be put through a re-drying press. Such a press consists of a series of heavy, hollow iron plates, sliding up and down in an open steel frame, heated by live steam and forced together both by their own weight and by the pressure of steam acting on a piston. Only 5 or 10 minutes is necessary to complete the re-drying of veneer of the usual thickness. Lack of care in this operation may cause a glossing of the surface of the veneer that is apt to render gluing difficult.



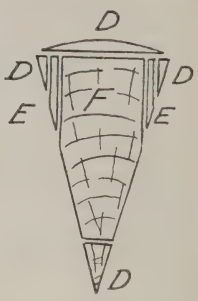


Fig. 5



Fig. 6—Front view of slicer



Fig. 7—Veneer saw and flitches

The Manufacture of Plywood

The first step in the manufacture of plywood is to cut the sheets of veneer to gross lengths and widths which are such that an ample allowance is made for later trimming to the exact dimensions specified in the order to be filled. Uniformity and speed are secured by the use of double header saws, both cross-cut and rip. With sawn or sliced veneer the sheets are usually so narrow that two or more must be spliced together.

Jointing and Splicing.—To secure square, straight edges the sheets are put through a jointer. A sufficient number to make a thickness of 3 inches are placed on the bed of this machine and are carried over a knife, gripped between a series of rolls and a roughened, endless chain. But one man is needed for the operation of a jointer. The veneer now passes to the splicer, where enough sheets are joined to give the required width. The operator takes up two pieces of veneer, places them on the smooth bed of the splicer and, pressing the edges together, starts the sheets under a roller which forces them still closer. At the same time a strip of gummed paper an inch wide is moistened and drawn through the roll with the veneer. This serves to fasten the pieces together. It is applied only to the outside surface of the outer plies of veneer, because if it were used on the inner surfaces of the plies the panel would not be waterproof. No glue whatever is applied to the joint, which is perfectly flexible. In a panel the inner layers of veneer, for which, as a rule, the softer, cheaper woods are used, do not need splicing, as they are rotary cut and hence can be of any width. Two men are necessary to run a splicer.

Gluing Up Panels.—The operation next in

(Continued on page 1285)

CONFIDENCE

To enjoy flying it is essential to have absolute confidence in the "ship" you are in, either as pilot or passenger.

Why you must have confidence in the



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(*Continued from page* 1255)

the the Italian Royal Air Force have been awarded the Italian War Cross:

Major:

Florello H. La Guardia

First Lieutenants:

James L. Bahl (deceased)
Raymond P. Baldwin
Arthur M. Beach
Allen W. Bevin
Gilbert P. Bogert
Arthur F. Clement
William C. Cochran
De Witt Coleman. Jr (deceased)
Kenneth G. Collins
Alexander M. Craig
Herbert C. Dobbs, Jr.
Edmund A. Donnan
Norton Downs, Jr.
Arthur D. Farquhar
Harry S. Finkenstaedt
Willis Fitch
Donald G. Frost
William O. Frost
Gosta N. Johnson
James P. Hanley, Jr.
George C. Hering
Wallace Hoggson
LeRoy D. Kiley
Herman F. Kreuger
Paton MacGilvary
Oble Mitchell
William H. Pottchoff
Aubrey G. Russell
William Shelton
Norman Sweetser
Emory E. Watchorn
Frederick F. Weyerhaeuser
Warren Wheeler
Alfred S. R. Wilson
Warren S. Wilson

Second Lieutenants:

Spencer L. Hart
James Kenedy
Norman Terry

Italian Citations

The following American Officers, First Lieutenants, attached to the Italian Air Service have been mentioned in citations:

James P. Hanley, Jr.
George C. Hering
William B. Shelton
Norman Sweetser
Emory E. Watchorn
Frederick K. Weyerhaeuser

Where Divisions Are Located Overseas

Washington, January 23rd.—The War Department made public a list giving the latest location of all divisions in France, as follows:

1—Montabaur, Major Gen. E. F. McGlachlin.
2—Heddesdorf, Major Gen. John A. Lejeune.
3—Andernach, Major Gen. Robert L. Howze.
4—Bertrich, Major Gen. Mark L. Hersey.
5—Esch sur Aizette, Major Gen. Hanson E. Ely.
6—Aigny-le-Duc, Major Gen. Walter H. Gordon.
7—Euvezin, Major Gen. Edmund Whittemeyer.
26—Montigny-le-Roi, Major Gen. Harry C. Hale.
27—(On priority,) Montfort, Major Gen. John F. O'Ryan.
28—Hudicourt, Major Gen. William H. Hay.
29—Bourbonne les Baines, Major Gen. Charles G. Morton.
30—(On priority,) Balloon, Major Gen. Edward H. Lewis.
31—Skeletonized, part on priority, part sailed.
32—Rengsdorf, Major Gen. Wm. Lassiter.
33—Diekirch, Major Gen. George Bell, Jr.
34—Skeletonized, part on priority, part sailed.
35—Commercy, Major Gen. Thomas B. Dugan.
36—Cheny, Major Gen. W. R. Smith.
37—(On priority,) Wormhoudt, (to Le Mans,) Major Gen. Charles B. Fansworth.
38—Skeletonized, part on priority.
42—Ahrweiler, Major Gen. Clement A. F. Flagler.
77—Chateau Villian, Major Gen. Robert Alexander.
78—Semur, Major Gen. James H. McRae.
79—Souilly, Major Gen. Joseph E. Kuhn.
80—Ancy-le-Franc, Major Gen. Samuel D. Sturgis.
81—Mussy sur Seine, Major Gen. Charles J. Bailey.
82—Prauthoy, Major Gen. George B. Duncan.
84—(To be skeletonized at Le Mans, Nov. 28.)
86—(Skeletonized—part for replacement, part to return to United States.)
87—St. Nazaire, Brig. Gen. William F. Martin.
88—Laigny, Major Gen. William Weigel.
89—Kylburg, Brig. Gen. Frank L. Winn
90—Berncastel, Brig. Gen. Joseph P. O'Neill.
91—(Designated for Lafaret—Bernard—to early return, Le Mans,) Major Gen. M. H. Johnston.
92—Le Mans, Brig. Gen. James B. Erwin.

Depot Divisions

41—St. Aignan, Brig. Gen. Eli Cole, U. S. M. C.
83—Le Mans, Major Gen. E. T. Glenn.
85—Toul, Major Gen. Chase W. Kennedy.
39—(Skeletonized for replacement and return to the United States.)
40—Revigny, Major Gen. F. S. Strong.
8—Pons.

Advanced Ratings for Overseas Officers for Distinguished Service

Advanced flying ratings have been recommended to 20 officers of the Air Service who have distinguished themselves in action overseas. Among the officers so recognized are Lieut. Col. Wm. Thaw, Major David McK. Peterson, Capt. Edward V. Rickenbacker, Capt. Reed G. Landis, Capt. Douglas Campbell, Capt. Edward G. Tobin, and Lieut. L. O. Donaldson, all credited with having shot down five or more planes.

These ratings are the first awards issued by a Board formed under the direction of Major General Wm. L. Kenly, Director of Military Aeronautics, to pass upon the qualifications and merits of flying officers who have distinguished themselves in action, with a view to awarding them such ratings as their achievements and abilities may warrant. This Board is composed of Col. Townsend F. Dodd, Lieut. Col. B. F. Castle, Major Horace M. Hickam, and First Lieut. Sidney T. Thomas, of the Army Air Service.

The ratings awarded are those of the Junior Military Aviator, carrying an increase of 50% base pay for flying duty, and the Military Aviator carrying 75% increased pay. Before the war the rating of Junior Military Aviator was given after certain flying tests were passed and that of Military Aviator only after three years' experience as a Junior Military Aviator. During the war the rating of Reserve Military Aviator was created, and a law was passed which authorizes the promotion and appointment of officers to advanced ratings for distinguished service in action without examination. The operations in the United States are now vested in the above mentioned board.

There follows a list of 20 officers just recommended by the board for these ratings, six of whom are reported deceased. The ratings are indicated by the letters J.M.A., Junior Military Aviator, and M.A., Military Aviator, the second being the senior rating.

Lieut. Col. Wm. Thaw, M.A., Pittsburg, Pa.; Maj. David McK. Peterson, M.A., Honesdale, Pa.; Capts. Edward V. Rickenbacker, J.M.A., to M.A., Columbus, O.; Reed G. Landis, M.A., Chicago, Ill.; Douglas Campbell, M.A. Mt. Hamilton, Calif.; Edgar G. Tobin; J.M.A., San Antonio, Texas; First Lieuts. Louis G. Bernheimer, J.M.A., New York, N. Y.; Wm. P. Erwin, J.M.A., to M.A., Chicago, Ill.; Robert F. Raymond, J.M.A., Newton Center, Mass.; Donald B. Warner (Bomber), to J.M.A., Swampscott, Mass.; James A. Keating, J.M.A., to M.A., Chicago, Ill.; Second Lieuts. Earl W. Porter (Observer), J.M.A., Chicago. Ill.; John O. Donaldson, M.A., Washington, D. C., and Charles W.

(*Continued on page* 1285)

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THE Liberty Starter is a four cylinder racial two cycle air motor and compressor with a bore of 2¼" and stroke of 2¼". As a starter it has 9 to 1 gear reduction on final drive to motor. It pumps direct drive at engine speed.

The valve construction is a semi-rotary of the Corliss type, having universal joint action to rocker shaft. The driving member between the rocker shaft and the valve not only performs the function of a universal joint, but is so constructed that the air pressure in valve chamber presses it against the end of rocker shaft bearing sealing the chamber airtight. It also permits the valve to be floated and held against the seat by the air pressure. This entirely eliminates the use of troublesome soft packing where valve actions are used.

The crank shaft is carried on roller bearings. All parts are idle except when brought into action as a pump or a starter.

The Liberty Starter has been approved and is being used by the United States Navy. The Japanese government recently placed an order for a large number.

The usual attachment on such as the Liberty, Hall-Scott, Renault and Bugatti motors is by bolting direct the flange of starter to the flange on motor. A suitable flexible coupling is provided for the drive to the crank shaft. Where flanges are not provided, such as the Curtiss V.X., etc., arms are provided for supporting the starter on engine runners.

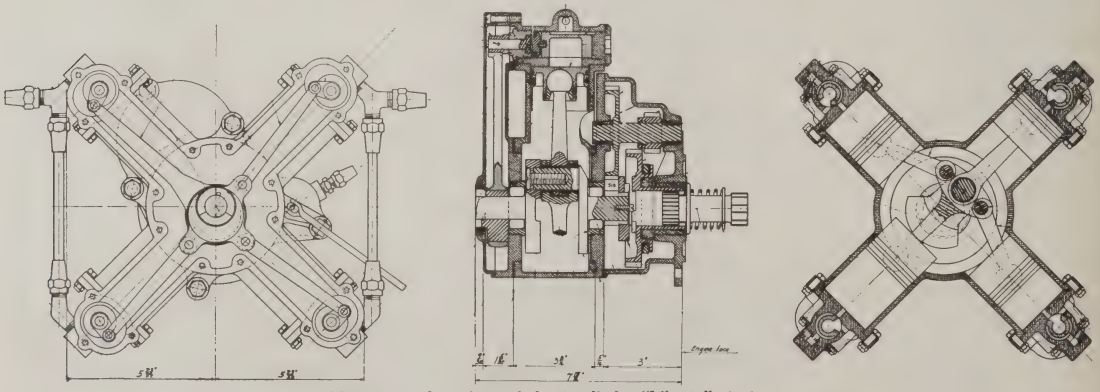
Although it weighs but 30 pounds completely the Liberty Starter is capable of starting the largest engines in service, such as the Liberty, Hall-Scott, Renault, Bugatti, etc. Its compactness lends itself to the requirements of installation on aeroplanes where but little space is available for "accessories" of any kind; though the "Liberty" can hardly be termed an accessory for it has really become a necessity.

Its length is only 8". It cranks the engine at 150 R.P.M. or more, and it replenishes its own energy in half a minute. The tank, weighs 12¼ lbs., bringing the total weight of the outfit to 49 lbs.

After the engine is started, the Liberty starter automatically disengages and remains disengaged until it is needed again either as a starter or compressor.

When the air pressure in the tank becomes low, the compressor is put in operation by pressing a button on the control valve while the engine is running at low speed. When engaged, the engine must be run at from 1200 to 1400 R.P.M., and when the pressure has been brought up to 230 lbs., the mechanism automatically becomes disengaged.

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(*Continued from page* 1251)

Speed	2¼ times engine
Make	Splitdorf-Dixie
Breaker gap	0.020 in.
Spark plugs	Splitdorf (Le Rhone Special)
Gap	0.020 to 0.024 in.
Oil pump	One plunger, oscillating cylinder

Director of engine rotation. Normal (counter clockwise from propeller end.)

Fuel consumption, 8 to 10 gal. per hr. or 0.6 to 11.5 lb. per b. h. p. hr.

Fuel recommended, 60° to 72° Baumé (0.740 to 0.690 sp. gray.)

Oil consumption..1 1/3 gal. per hr. or 0.12 lb. per b. h. p. hr.

Oils used....Castor oil, or heavy mineral oil of high viscosity

Engine weight, complete with accessories.....260 lb.

ANOTHER RECORD

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(2) The Hispano-Suiza Aviation Motor, telling the complete story with twenty-six illustrations.

(3) Description of Naval Aircraft Factory with many photographs.

(4) The complete report of Hughes Aircraft Investigation.

(5) The complete aircraft reports by Secretary Baker, General Kenly, Secretary Daniels, Mr. J. D. Ryan and Postmaster-General Burleson.

(6) Aero Club of America plans for Captain Bartlett's flight to the North Pole to explore 1,000,000 miles of unexplored territory, to collect data on air currents as well as make soundings in the Polar Basin.

(7) The extensive plans of the Aero Club to foster aerial transportation, sport, etc., with list of seventeen trophies and prizes to be competed for during the coming year.

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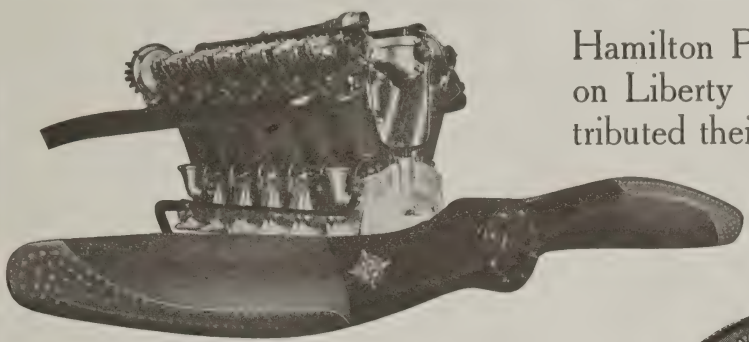
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Drew, J.M.A., Philadelphia, Penna.

The following deceased officers have also been recommended: First Lieuts. Fred W. Norton, J.M.A., Columbus, Ohio.; Edward Orr, J.M.A., Chicago, Ill.; Merton L. Campbell, M.A., Wakeman, Ohio, and Lloyd A. Hamilton, M.A., Burlington, Vt. Second Lieuts. Frank B. Bellows, J.M.A., Wilmette, Ill., and Roger Hitchcock, J.M.A., Los Angeles, Calif.

Cited for Distinguished Service

The commander-in-chief, in the name of the President, has awarded the distinguished service cross to the following named officers and soldiers for the acts of extraordinary heroism described after their names:

First Lieut. William P. Frank, observer (Air Service), 20th Aero Squadron, first day bombardment group. For extraordinary heroism in action near Buzancy, France, October 23, 1918. While flying in the rear of a formation, returning from a bombing raid, Lieut. Frank's machine was attacked by three hostile planes, Fokker type. Lieut. Frank was wounded and rendered unconscious early in the encounter, but upon recovering he shot down a Fokker which was attacking the leader of the formation and drove off two others which were pressing him from the side. Home address, Paul A. Frank, brother, 2349 Michigan Avenue, Chicago, Ill.

First Lieut. Andre P. Gundelach ,deceased (Air Service), pilot, 96th Aero Squadron. For extraordinary heroism in action near Buxieres, France, September 12, 1918. Lieut. Gundelach, with Second Lieut. Pennington H. Way, observer, volunteered for a hazardous mission to bomb concentrations of enemy troops. They successfully bombed their objective, but while returning were attacked by eight enemy planes. Their plane was brought down in flames and both officers killed. Next of kin, Maj. C. D. Meyer, Q. M. C., 5802 Kenmore Avenue, Chicago, Ill.

Second Lieut. Pennington H. Way, deceased (Air Service), observer, 96th Aero Squadron. For extraordinary heroism in action near Buxieres, France, September 12, 1918. Lieut. Way with First Lieut. Gundelach, pilot, volunteered for a hazardous mission to bomb concentrations of enemy troops. They successfully bombed their objective, but while returning were attacked by eight enemy planes. Their plane was brought down in flames and both officers killed. Next of kin, Mrs. Pennington H. Way, wife, St. Davids, Pa.

First Lieut. Richard D. Shelby, Air Service, 139th Aero Squadron. For extraordinary heroism in action near Verdun, France, October 10, 1918. Lieut. Shelby encountered six enemy planes at a very low altitude strafing our trenches. He immediately attacked and dispersed the enemy planes and by skilful maneuvring brought one of the planes down just behind his own lines. Home address, W. A. Shelby, father, Rosedale, Miss.

First Lieut. Karl J. Schoen, deceased (Air Service), 139th Aero Squadron. For extraordinary heroism in action near Aincreville, France, October 1, 1918. While leading a patrol of three machines Lieut. Schoen sighted nine enemy planes, Fokker type, and immediately attacked them. Although greatly outnumbered, he destroyed one of the planes and put the others to flight. He was killed in action October 29 and has been officially credited with destroying seven enemy aircraft. Next of kin, Maruine Estelle Schoen, wife, 5001 College Avenue, Indianapolis, Ind.

(*Continued from page* 1272)

order after the splicing is that of gluing up the veneer to form a "panel" or "plywood." The "finish" or outside "plies" of panel that have just come from the splicer are not put through the gluer. Only the inner layers or "cross-bands" pass through this machine, which applies the glue to both surfaces of the wood. As a "cross-band" comes from the gluer it is laid upon a sheet of finish veneer. When the panel is only three ply another layer of finish is next placed upon the "core" or cross-band, with its grain at right angles to the grain of the core, and parallel to that of the first finish ply. If, however, the panel is to be of five-ply construction, a relatively thick core or "center," usually of chestnut, gum or poplar, and often of comparatively poor quality, is laid upon the first cross-band, on top of this comes another cross-band, and lastly the outside finish ply. Veneer used for cross-banding is generally the cheaper, rotary cut gum or poplar. Since it can be obtained in any width, splicing is unnecessary. Panels, of course, may consist of any number of plies. Symmetry requires that the number be odd. Always, the grain of adjacent plies is at right angles.

Pressing the Panels.—The glued panels are now placed in piles upon a "caull," a thick, rigid board of laminated construction. Between each layer of plywood is inserted a thin waxed board. When the piles are 3½ or 4 feet high another caull is put on the top and the whole then placed in a hydraulic press. But instead of resting directly on the bed of the press the lower caull rests upon several shallow I-beams placed crosswise of the bed. The same number of I-beams are similarly put on top of the upper caull. The I-beams project beyond the sides of the pile and heavy turn-buckle clamps are attached to corresponding ends above and below. The purpose of these clamps is not to aid in applying the load, but as the pile compresses or packs down slightly, due air and surplus glue being squeezed out, the slack in the clamps is taken up, and therefore, when the stack is removed from the press, it is still under great pressure caused by tension in the clamps.

The pressure while the stack is in the press depends upon the character of the panels; that is, their size and thickness, and the species of wood of which they are made. For lighter work 100 pounds per square inch is satisfactory, but for the largest, heaviest type, a pressure of 300 pounds per square inch is needed. Excessive compression causes the glue to squeeze out between the joints and results in a "starved" joint. The operation of pressing takes only about five minutes.

After removal from the press, the stack of panels, tightly clamped together, is carried to a drying room. Here it remains as a rule for 24 hours in a temperature of 70 to 90 degrees Fahrenheit. When this time has elapsed the clamps are loosened, the upper caull removed, and the panels piled up in the same room, separated by small sticks so that they are entirely exposed to the dry air kept circulating through the room. Forty-eight hours is allowed for this second drying, after which the panels are ready for cutting to size and sanding.

Cutting and Sanding.—This operation is done with rip and cross-cut saws which trim the panels to the specified dimensions. They are now ready for the final process, that of smoothing the surfaces in a sanding machine. The panels are drawn in by steel rolls and passed over sand-paper of grades ranging from No. 1½ to No. 0. Ordinarily this is sufficient, although sometimes a panel has to be put through the sander a second time. For very fine work a "finish sanding" on a belt re-sander with No. 00 paper is required. Whenever plywood is designed to carry important stresses care must be taken, especially if the face plies are thin, not to remove too much material in the sanding process in order, for instance, to reach a specified total thickness.

Minor defects that occasionally appear in finishing work, caused, perhaps, by slight imperfections in the wood or careless workmanship, are repaired by an expert, who generally cuts out the part containing the flaw and inlays new wood.

(The writer wishes to express his appreciation to the Messrs. Kline of the Louisville Veneer Mills, Louisville, Ky., for their kind assistance in securing the material for this article.)

(*Continued from page* 1261)

15,000 feet and an increase of two and a half percent in the horizontal speed was obtained by removing the nose radiator, streamlining the nose and fitting on side radiators.

Wind tunnel tests on a large model have indicated that for a given amount of heat dissipated, the total head resistance of the fuselage is from ten to fifty percent greater when fitted with a nose radiator than when a free air radiator is used, the larger difference having occurred when the same type of cooling section was used in both cases, and the smallest difference having occurred when a high resistance radiator was in the nose.

There remains still one point in favor of the nose radiator: When it is shuttered the head resistance of the machine decreases, whereas the shuttering of a free air radiator increases the resistance of the machine. But this point may be practically dispensed with at once. An aeroplane, which in constructed in such a way that a nose radiator can be installed on it, is usually of such a design as will permit the use of retractable radiators—side radiators which can be drawn into the fuselage, or a radiator underneath the fuselage which can be drawn up into it.

The Wing Radiator

There is at the present an increasing tendency towards the installation of the radiator in the wing; but it does not seem advisable to adopt this location as being exceptionally good without a rather extensive study of its effects. A great number of influences are brought to bear upon the machine which are difficult of solution and should probably be determined from comparative tests in flight.

In connection with the ordinary radiator installation head resistance weight, durability, cooling properties and the ability of pass water are the main considerations; and these are all easily determined in the wind—tunnel and in flight. But the wind radiator brings in its own head resistance (perhaps more aptly called "drag" in this case) weight, durability, loss of lift, increased wing loading, increased angle of incidence, the consequent increase in resistance of the wings, cooling properties and the ability to pass water—and the problem of determining whether it is a good installation becomes more complicated.

From comparative tests in flight on a honeycomb wing radiator, shown in Fig. 15, it is safe to say that this particular type is very bad when installed in the wing.

In this case the horizontal speed of the seaplane was reduced by four and a half percent at one thousand feet, and the rate of climb was reduced by sixteen percent in the first three thousand feet of climb, as compared with the performance of the same machine when equipped with ordinary radiators.

On the basis of these tests the following discussion is given as being the probabilities concerning the wing radiator, as compared with the usual type.

The weight of the radiator wil probably be fifteen percent greater. Assuming a speed of ninety miles per hour, this increase in size suggests that the cooling power of the radiator will be that of a free air radiator at seventy-two miles per hour, and indicates that the resistance to the air in passing through the radiator is 6.3 pounds per square foot. As the tubes in the radiator in question were placed at thirty degrees to the vertical this resistance may be resolved into a vertical compoment of 5.45 pounds per square foot and a horizontal component of 3.15 pounds per square foot. Then, assuming a normal wing loading of 8 pounds per square foot there will be a loss of lift of [(8—5.45) lb. /sq. ft. =] 2.55 pounds per square foot of the surface occupied by the radiator. Now taking the weight of the radiator itself at its normal value of 19.2 pounds per square foot and adding on the loss of lift, we have the effective weight as

$$(19.2 + 2.55) \text{ lb. /sq. ft.} = 21.75 \text{ lb. /sq. ft.}$$

and assuming a lift-drift ratio of six, the power to carry the radiator is

$$(3.15 \times 6 + 21.75) \times .04 \text{ h.p. /sq. ft.} = 1.63 \text{ h.p. /sq. ft.}$$

and taking the heat dissipation per 100°F. mean difference at its normal value of 72 miles per hour we have

$$\text{Figure of merit} = \frac{40.6}{1.63} = 24.9$$

which is extremely high, as the figure of merit of a free air radiator at ninety miles per hour is in the neighborhood of thirteen.

Up to this point the efficiency of the radiator itself as calculated is high; and the higher efficiency has been obtained by procuring a low air speed, as in the case of the nose radiator, and by converting part of the resistance into a vertical component. But it seems probable that a very heavy drag which cannot be calculated is brought into play in changing the direction of the air flow before it enters the radiator and after it leaves it. If the very poor performance of the machine in question is actually due to such a drag, it might be said off-hand that the use of a plate radiator in which the plates ran parallel to the length of the machine would do away with most this injurious effect by allowing the air to flow through the radiator with a very small change in direction.

It is not believed that the air would flow through in such a way, however, because the high pressure underneath the wing acting in connection with the low pressure above the wing should tend to change the direction of the air and force it upward through the radiator. And, furthermore, if the use of a plate radiator would allow the air to flow through with a small charge in direction, a very small amount of air would get through, as the cross-sectional area of the air stream which flowed into the radiator would approximate the projected area (projected along the line of flight) of the wing radiator, and this would be very small. Furthermore, under such conditions the air would flow along the lengths of the plates and would become very ineffective toward the rear becase of its being heated up.

At present any consideration of the wing radiator must of necessity be largely conjectural; and it must remain for further and extensive tests to determine whether it can be made efficient or not. It may be possible to make a longitudinal plate radiator with such a small plate spacing that the loss of lift will be very small; but it is believed that the effect illustrated in Fig. 4 will nulify the cooling properties of the radiator before the desired small spacing is reached. And it is believed that the injurious effect of this type which has been ascribed to a drag entailed in changing the direction of the air which passes through the radiator cannot be disposed of.

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AERIAL AGE WEEKLY

Vol. 8, No. 26 MARCH 10, 1919 10 CENTS A COPY

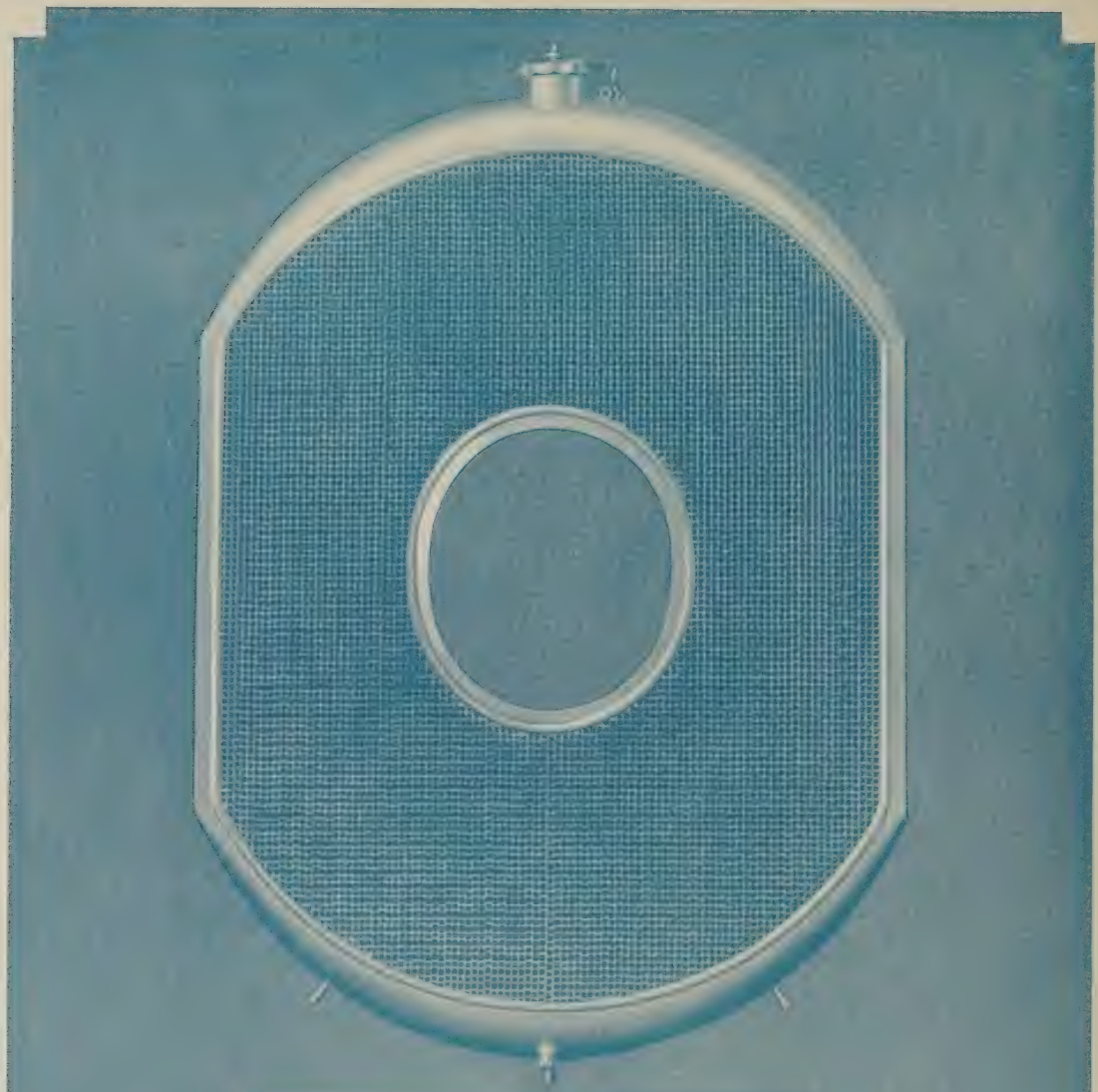


Modern Aerial Acrobatics

Aero Show to be Followed by Aeroplane and Dirigible Races and Convention at Atlantic City

Exposition Exhibits Completely Described

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AERIAL AGE WEEKLY

VOL. VIII MARCH 10, 1919 NO. 26

TABLES OF CONTENTS

PAGE

The Aero Show to be Followed by Aeroplane and Dirigible Races and One-Month Aeronautical Convention 1325

Airmen Memorial Fund Created by Aero Club of America..... 1326

The Aeronautic Exposition..... 1327

Aeroplane Exhibits 1328

Miscellaneous Exhibits 1338

The News of the Week..... 1344

The Aircraft Trade Review..... 1346

U. S. Aerial Mail..... 1347

The Thomas-Morse Model 8-90 Aero Engine 1348

Line Reaming Crankshaft Bearings of Liberty Motors..... 1349

Naval and Military Aeronautics.. 1350

Foreign News 1352

Elementary Aeronautics and Model Notes..... 1353

Aeronitis 1354

Streamline v. Wire Cable..... 1358

PUBLISHED WEEKLY BY THE AERIAL AGE CO., INC.
Foster Bldg., Madison Ave. and
Fortieth Street, New York City.

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And for INFORMATION CONCERNING COMMERCIAL AERONAUTICS IN ANY PART OF THE WORLD

If **YOU** hold any of the above qualifications, but have not yet registered, you are invited to communicate with the Editor (Air Service Demobilization Department) AT ONCE.

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THE NATIONAL TECHNICAL, ENGINEERING AND TRADE AUTHORITY

PUBLISHED WEEKLY BY THE AERIAL AGE CO., Inc., Foster Building, Madison Avenue and Fortieth Street, New York City

WASHINGTON OFFICE: 619 *Union Trust Bldg.*

LONDON OFFICE: *Thanet House, 231 Strand, W. C.*

Entered as Second-Class Matter, March 25, 1915, at the Post Office at New York, N. Y., under the Act of March 3, 1879

Copyright THE AERIAL AGE CO., March 10, 1919

Subscription Price, $4.00 a year, Foreign, $6.00. Telephone, Murray Hill 7489

VOL. VIII NEW YORK, MARCH 10, 1919 NO. 26

THE AERO SHOW TO BE FOLLOWED BY AEROPLANE AND DIRIGIBLE RACES AND ONE MONTH AERONAUTICAL CONVENTION

THE Show is a huge success and the organizers deserve great credit. The setting, the exhibits and the attendance —everything is up to expectations.

Thousands of people have attended the Show each day and packed the aisles so that people who came with the intention of ordering planes had to postpone doing so.

The numerous exhibits are described elsewhere in this number.

This Show and the aeroplane and dirigible races and the one month Aeronautic Convention and other events to be held at Atlantic City beginning with May 1st will interest hundreds of thousands of people in aeronautics. The Atlantic City plan will permit actual demonstrations of aircraft to prospective buyers. This plan will greatly facilitate the work of selling aircraft to prospective buyers, who after seeing the aircraft exhibited on the Steel Pier and seeing them in flight during the races, can proceed to the beach or the aerodrome and get a ride on the craft he or she has selected and will be able to place the order there and then for the craft selected.

A great many of the people who are attending the New York Aero Shows will be at Atlantic City to see the demonstrations and races. Many who have just become interested and who probably would not go any further in aeronautics this year, will go to Atlantic City and order planes for use in the summer. Representatives of college groups will look over balloons for the balloon races to be held at St. Louis in the Fall.

Selecting Aircraft for Atlantic City Races

The announcement of the Atlantic City events created additional interest in the New York Show. Prospective entrants for the competitions are looking over the aircraft exhibited at the Show with a view of selecting "winners" for the Atlantic City races.

Tens of Thousands of People to Attend Convention to Discuss New Phases of Aeronautics in Which They Are Interested

The convention aims for the first time in the history of aeronautics to permit thorough discussion of each of the important phases of aeronautics so that people interested in each phase may acquire all the information available on the subject.

The program is most thorough and complete. Tens of thousands of people of different lines of human endeavor related to aeronautics are invited to attend. For instance, on the fifth day, when the "Large Dirigible and Its Value for Transportation" is discussed, there are invited the representatives of railroads, express, steamship and other transportation organizations invited to attend.

For the illustrated addresses on "Aerial Forest Patrol," the Forestry Department of every State are invited. For the discussion of the "Work of Aerial Police Squadrons, and Why Every City Should Have One," the police commissioners of all cities are invited.

For the illustrated address on, and consideration of "Aerial Mail Plans," the Chairman of Post Office and Post Roads Committees of House of Representatives and Senate, and Postmaster General Burleson and 26,000 United States postmasters, and Chambers of Commerce of 13,000 cities are invited to attend.

Likewise for the illustrated addresses on the "Need of Municipal Aerodromes, and the Part To Be Played By Aircraft In City Planning," the Chambers of Commerce and City Planning Commissions of 13,000 cities are invited to attend.

For the presentation of the flags by each State of the United States to the Aero Squadrons representing the States, all the States and cities are invited to send delegates and Army, Navy and Marine Corps to send representatives.

For the demonstrations and illustrated addresses on the "Value of Aircraft for Advertising by Day and by Night," all national advertisers and advertising agents are invited to attend. For the discussion of "Pan-American Aerial Transport," the commissions of the 20 Latin-American Republics are invited to attend.

For the discussion of "Aerial Navigation Instruments for Flying Over Land and Water," aviators, navigators, scientific instrument makers and aeronautic experts are invited to attend.

For the addresses on "Aerial Photography," all the photographers, professional and amateur, and makers of photographic apparatus are invited to attend.

For the addresses on "Aerial Exploration and the Use of Aircraft for Coast and Geodetic Survey," all people interested in exploration and surveying are invited to attend.

For the addresses on "Need of Broader Attitude Regarding Insurance for Aircraft and Aviators," all the insurance companies and agents are invited to attend.

For the addresses on "Aerial Jurisprudence—Aerial Laws and Regulation of Air Traffic," all lawyers, traffic commissioners and police authorities of different countries are invited to attend.

For the Aeronautic Art Day, when an address on "Aerial Painting and Sculpture of Different Countries" will be delivered and exhibition of aerial paintings by Lieut. Farre, Lieut. Ruttan and others, all the prominent artists, managers of art galleries and art patrons are invited to attend.

The engineers are invited to attend aeronautic week, when basic problems of aeronautic engineering are to be considered.

For the discussions of "Meterology—How the Weather Forecasts Can Be Extended and Made More Efficient by the Use of Aircraft in Exploring the Upper Air," also "How the Weather Forecasts Help Aerial Navigation" and "Telegraphic and Climatic Factors in Relation to Aeronautics," people interested in the subject are invited to attend.

For the discussion of "International Medical Standards for Aviators in War and Peace," when reports from different countries will be presented by the highest authorities on the subject, 50,000 medical men are invited to attend.

Every Day Plenty of Aeronautic Activities—Every Saturday Contests

Every day will have plenty of aeronautic activities, as follows:

(1) *Exhibits of aeroplanes, motors and accessories on the Steel Pier.*

(2) *Demonstrations and tests of seaplanes, land aeroplanes, motors, dirigibles, kite balloons, to prospective purchasers.*

(3) *Aerial passenger carrying by seaplanes and dirigibles, and kite balloon ascensions.*

(4) *Moving pictures and addresses by leading authorities on most important phases of aeronautics.*

The contests to be held every Saturday are most interesting. They are:

(1) Seaplane contests (general).
(2) Curtiss Marine Flying Trophy and prizes.
(3) Intercollegiate seaplane contests.
(4) Land aeroplane contests.
(5) Dirigible contests.
(6) Kite balloon speed in ascending and descending, and maneuvering contests.
(7) Parachute competition.
(8) Aviette (bicycles and motorcycles with wings) contests.

The Atlantic City convention is to be a potential factor in starting American aeronautic activities on a permanent basis.

AIRMEN MEMORIAL FUND CREATED BY AERO CLUB OF AMERICA

THE Aero Club of America has adopted the plan to put up a memorial "To the Airmen Who Cannot Come Back" in the famous graveyard at Toul, where Major Lufbery, Hobey Baker, Blair Thaw and other famous Americans are buried, which was proposed to the Aero Club of America at the club's annual banquet by Captain Eddie Rickenbacker, the American Ace of Aces.

Captain Rickenbacker has been selected as chairman of the Memorial Committee and the fund has been started with the following contributions:

Aero Club of America	$500.00
Aerial League of America	500.00
Alan R. Hawley	100.00
Henry A. Wise Wood	100.00
Henry Woodhouse	100.00
Charles Jerome Edwards	100.00
J. Parke Channing	50.00
C. R. Corning	50.00
John Hays Hammond, Jr.	50.00
Augustus Post	50.00
G. Douglas Wardrop	50.00
Evan J. David	50.00
Capt. Herbert S. Mapes	50.00
K. M. Turner	50.00
Lieut. M. Gilbert Whitman	25.00
Lieut. Granville A. Pollock	25.00

It is requested that subscriptions to this fund be addressed to Captain Eddie Rickenbacker, Chairman, Airmen's Memorial Fund, Aero Club of America, 297 Madison Avenue, New York City. Checks should be made payable to the Airmen's Memorial Fund.

Captain Rickenbacker's appeal for a memorial to his dead comrades was most touching. He said:

"I recall a little graveyard just outside of Toul, which is probably the most famous graveyard as far as Americans are concerned. Such men as Lufbery, Hobey Baker, Lieut. Blair Thaw and probably one dozen others are quietly resting there. And for that reason I think in some way we should look into the future and plan for a memorial to these men, as they were the real heroes after all, the men who were the inspiration to us boys who were more fortunate, and who had the good fortune to come back and receive the admiration and the ovation of the multitudes of people of the dear old United States of America.

"I remember I had not arrived in Columbus but a few moments, when going up the main street of the town I saw a temporary memorial 'To the Boys of Columbus,' with their names inscribed on it. Something which will be made permanent to live for centuries thereafter will be erected there. And I thought this evening would be a good time to bring up and suggest such a memorial for this little graveyard just outside of Toul, which we all know so well; and something to perpetuate the memory of the boys left behind. I hope one and all of you will try to think now and then of these boys, and not overlook the fact that we here are not entitled to all of this applause—there are others!

"If I had my way about it, the parents of the boys left in France the mothers, would have the decorations which I have today. In years to come we can say with a clear conscience that those who gave their all for the cause which brought us fame are the men whose memories shall stand out, and the future generations of America's air fleet, America's eagles, will look back with that realization in mind.

"I do not want you to feel that I am trying to bring back something that you want to forget. I do not believe any one of you is trying to forget all of the horrors of this war, yet it is a part of the make-up of the American public to want to forget too soon. Consequently, I suggest again that the Aero Club of America and each and every one of you present will do your share and bit in contributing to this memorial to 'The Men Who Shall Not Come Back.'"

The matter of putting up a suitable memorial to dead airmen in the United States has been given consideration by the Club since the beginning of the war. It was realized at the time that instead of having a monument for each aviator it would be better to wait and have one memorial for all the aviators who lost their life in the fight for humanity and civilization. Therefore a resolution was adopted to that effect and a committee with Admiral Peary as chairman was appointed to outline the plans for such a memorial.

Two suggestions made by the committee, which have been approved and are being carried out are:

(1) To ask every State and every city to present and dedicate a flag to each aero squadron and balloon company whose members were in preponderance from that State or city. The flag is to bear the insignia of the State or of the city as well as the insignia of the squadron itself. This plan has received the enthusiastic approval of the aviators to whom it has been submitted for an expression of opinion.

(2) To place the names of all the airmen who lost their lives during the war on a permanent Honor Roll, to occupy a prominent place in the club house of the Aero Club of America. This plan has also been approved and is being carried into effect.

Transatlantic Flight

Every effort is being made by the Navy Department to get the giant seaplane at the Rockaway training station ready for the proposed transatlantic flight. There is keen rivalry among the navy, the army and the British dirigible for the honor of being the first to cross the ocean. All three machines are theoretically abundantly able to make the flight and, as each is of a different type, the test will offer a chance to compare their different merits.

The naval craft has already carried many passengers, has attained a speed of eighty-five miles an hour and can climb 2,000 feet in ten minutes, thereby proving its abilities. It is intended to have two pilots, who will be seated side by side, and a crew of five men in an enclosed cabin. It has been estimated that the trip between Newfoundland and Ireland can be made in fifteen hours.

The army aeroplane, which is yet to be built, will be of the Glenn-Martin type and will have no pontoons—which would be unfortunate in case it fell into the water. To compensate, its speed will be considerably greater, but it will have to take a longer route—by way of the Azores, landing either in France or England.

Very little has leaked out about the plans for the voyage of the British dirigible, but an expert has already arrived in Newfoundland to pick out a suitable landing place. The British machine is under the disadvantage of possible head winds, as the revolution of the globe throws the lighter aerial envelope from west to east faster than the solid earth.

One great question is that of directing the course of the machines. On such a rapidly moving surface compasses would be unreliable and the sun's position would not offer a sure index of locality. The suggestion is made in the European edition of the *Herald* that the flights take place at night, when the North Star would be a safe guide. It instances the plight of two French aviators who, after crossing the Mediterranean from Marseilles to Algeria, were unable on their return to find the Balearic Islands, where they intended to make a landing, and reached Spain instead.

The Aeronautic Exposition



THE Aeronautic Exposition, being held in Madison Square Gorden and the 69th Regiment Armory, under the auspices of the Manufacturers Aircraft Association, was opened to the public on March 1. The attendance on the opening night created a record, and has been very well sustained during the past week.

The exhibits bear wonderful testimony to the energy and aggressiveness of the American, aeronautic industry, and one calculated to inspire confidence in the possibilities of aerial transportation and sport, as is evidenced in the descriptions of the exhibits in this issue of AERIAL AGE.



The Committee in charge of the Exposition on arrangements. Top row: Fay L. Faurote, Frank H. Russell, S. S. Bradley, Inglis M. Uppercu. Bottom row: G. M. Williams, B. A. Guy, Harry Bowers Mingle, Albert H. Flint

AEROPLANE EXHIBITS

AEROMARINE PLANE AND MOTOR COMPANY

(Garden, South Section, Main Floor)

Aeromarine Model 50 Flying Boat is similar to the Model 40 except that in the latter machine the cabin is closed in by a transparent hood and it is driven by an Aeromarine 130 H.P. Type L engine. The Model 50 is a sport machine designed for pleasure flying.

The upper plane has a span of 48′ 4″, lower plane, 37′ 4″, and a chord of 6′ 3″, stagger of 12″. The gap between the planes is 78″. Fully loaded the machine weighs about 2,500 pounds. Unloaded the weight is about 2,000 pounds.

BOEING AEROPLANE COMPANY

(Armory, Southeast Section)

The Type C-1-F Navy Training Hydro Aeroplane was flown from Hampton Roads, Va., to Rockaway, N. Y., for exhibition at the Aero Show. This machine is equipped with a Curtiss OXX-5 100 H.P. motor. It is an experimental type built for the Navy and has single float instead of the double floats usually employed on Boeing seaplanes.

The top plane is carried on inverted V central struts with no center panel. There is no horizontal stabilizer and the tail flaps are of the balanced type.

The general specifications of the C-1-F are as follows:

Span, both planes	43′ 0″
Chord	5′ 9″
Gap	6′ 0″
Stagger	29¼″
Overall length	24′ 0″
Dihedral	1°
Decalage	2½°
Speed range	36-65 M.P.H.

BURGESS COMPANY

(Armory, Southeast Section)

The Burgess Company is exhibiting a car designed for one of the "C" class twin-motored Navy dirigibles. The car is of streamline form, 40 feet long, 5 feet in maximum diameter, with steel tube outriggers carrying an engine at either side. Overall width of outriggers, 15 feet. Complete weight of car, 4,000 pounds.

Seven passengers may be carried, but the usual crew consists of four. At the front, the coxswain is placed; his duty is to steer the machine from right to left. In the next compartment is the pilot, who operates the valves and controls the vertical movement of the ship, and aft of the pilot the mechanicians controlling the engines. At the rear cockpit is the wireless operator.

The engines are made by the Union Gas Engine Company and are 150 H.P. each. Fuel capacity, 240 gallons; oil, 16 gallons. Four bombs, totaling 1,080 pounds, are carried at the side.

The dirigible for which the car was designed is 192 feet long, 43 feet wide, and 46 feet high; it has a capacity of 180,000 cubic feet. Its high speed is 59 M.P.H., at which speed it has an endurance of 10 hours. Cruising speed, 42 M.P.H.; cruising radius, 12½ hours. Climb, 1,000 feet per minute.

THE CANTILEVER AERO CO.

(Garden, South Section)

The "Christmas Bullet" has caused a great deal of comment in aeronautical circles because of its freedom from struts and wires. It is the first heavier-than-air machine built on the Cantilever truss principle, and is the result of years of painstaking investigations and experiments made by the inventor, Dr. William Whitney Christmas.

The wings of the Christmas Bullet are flexible and resemble true bird form. Because of this yielding principle the machine is absolutely immune from all strain and resistance as are "stiff-wing," parallel-strut machines.

The "Christmas Bullet" has a horsepower of 185 and has flown 197 miles per hour—a world's record.

General specifications of this machine are as follows:

Span, upper plane	28′ 0″
Span, lower plane	12′ 0″
Chord, upper plane	5′ 0″
Chord, lower plane	2′ 6″
Area, upper plane	140 sq. ft.
Area, lower plane	30 sq. ft.
Length overall	21′ 0″
Weight, machine empty	1,820 lbs.
Weight, fully loaded	2,100 lbs.
Minimum speed	50-60 M.P.H.
Maximum speed	185 M.P.H.
Cruising radius	550 miles
Dihedral	minus 17°

A Liberty "6" engine is used, giving 185 H.P. at 1,400 R.P.M.; the machine attains 170 miles at three-quarter throttle.

CAPRONI COMPANY

(Armory, East Section, Center)

The Caproni Company is exhibiting a giant triplane which has been famous since 1915, when it made its first appearance. This triplane has a spread of 130 feet. It is equipped with three 400 H.P. engines, two of them in tractor position at the nose of the fuselage, and one a pusher at the rear of the central nacelle. This machine has climbed to an altitude of 14,000 feet with a ton of useful load and with only two of the engines running. The triplane was used as a bomber and carries a bomb compartment below the lower plane.

CURTISS AEROPLANE & MOTOR CORP.

(Garden, Center)

Curtiss J N 4 D

The J N 4 D Tractor shown by the Curtiss Company is shown with half the cover removed to illustrate the internal construction. All parts of the machine are finely finished and metal parts



Top (left) Curtiss M.F. Flying Boat, (right) Curtiss H.A. Hydroaeroplane. Bottom (left) Curtiss Model K Biplane, (right) Curtiss Flying Boat with Handley Page in the rear

nickel plated. A full description of the J N 4 D was published in the AERIAL AGE WEEKLY.

General specifications are as follows:

Span, upper plane	43′ 7″
Span, lower plane	33′ 11″
Wing chord, both planes	5′ 0″
Gap between planes	5′ 0″
Stagger	16″
Length overall	27′ 4″
Height overall	9′ 10″
Total controlling surfaces	352 sq. ft.
Net weight empty	1,430 lbs.
Gross weight, machine loaded	1,920 lbs.
Useful load	430 lbs.

Motor is model OX 5, 90 H.P. Speed range of 75-45 M.P.H. Climb in 10 minutes 2,000 feet.

The Curtiss M F Flying Boat

The Curtiss M F Flying Boat, a Sportsman's model, is the smallest of the Curtiss boats, a development of the popular "F" boat, carrying two persons side by side.

General specifications are as follows:

Span, upper plane	49′ 9″
Overall length	28′ 10″
Overall height	11′ 9″
Weight, empty	1,796 lbs.
Useful load	636 lbs.
Maximum speed	69 M.P.H.
Minimum speed	45 M.P.H.
Climb in 27 minutes	5,000 ft.
Maximum range	325 miles
Engine, Curtiss OXX	100 H.P.

The Curtiss H-A Hydro

The Curtiss H-A Hydro is a two-place single float seaplane. The upper wing has a dihedral of 3° and the lower plane a cathedral of 1°. Both planes have an incidence of 2°, and a sweepback of 4½°. In official tests by the Navy Department this machine has made a speed of 131.9 miles per hour with a full load. Its climbing speed is 8,500 feet in ten minutes.

The float is 20 feet long, 3 ft. 6 in. wide and 2 ft. 6 in. deep. It has three planing steps.

The horizontal stabilizer is adjustable during flight, within the limits of minus and plus 1°. The machine carries four machine guns; two fixed Marlins and two flexible Lewis.

The engine is a Liberty 12 giving 330 H.P. It is directly connected to a two-bladed propeller 9 ft. 2 in. in diameter, with a 7 ft. 7 in. pitch, or a three-bladed propeller 8 ft. 6 in. in diameter and 7 ft. 6 in. in pitch, depending upon whether speed or quick climb is required.

The general specifications are as follows:

Upper plane	30 ft. 0 in.
Lower plane	30 ft. 0 in.
Cord	72 in.
Maximum gap	70 5/36 in.
Minimum gap	55½ in.
Overall height	10 ft. 7 in.
Overall length	30 ft. 9 in.
Area, upper plane	184.8 sq. ft.
Area, lower plane	170.8 sq. ft.
Total supporting area	390 sq. ft.
Area of each aileron	8.6 sq. ft.
Total aileron area	34.4 sq. ft.
Horizontal stabilizer	25 sq. ft.
Vertical stabilizer	18.9 sq. ft.
Rudder	16.75 sq. ft.

Weights

Weight per sq. ft.	9.35 lbs.
Weight per H.P.	11.5 lbs.
Net weight, machine empty	1,012 lbs.
Weight, full load	2,638 lbs.

Performance

Speed range	62 to 131.9 m.p.h.
Climb	1,000 ft. per minute

DAYTON-WRIGHT AIRPLANE CO.

(Garden, Center)

De Havilland 4

The De Haviland 4 aeroplane exhibited by the Dayton Wright Airplane Company was the first De Haviland 4 battleplane to be built in America, having been completed October 29, 1917, at Dayton, Ohio. This machine has been in continuous service since that time and has been used in 2,500 flying tests of various kinds.

With this machine a distance of about 111,000 miles has been covered in a time of about 1,078 hours. Twenty-eight cross-country trips have been made in it, including Dayton to Washington, Dayton to New York, Dayton to Chicago, Dayton to Cleveland, etc., and in all its career no mishap has ever come to the machine.

The battleplane is exhibited with all its military equipment, including two Marlin machine guns fixed on the front cowling and fired through the propeller at a rate of 750 rounds at 1650 R.P.M. of the engine, and two movable Lewis machine guns at the rear cockpit which fire 650 rounds per minute. The wireless carried has a range of 11 miles to another aeroplane and a receiving radius of 47 miles by a ground station. A camera located to the rear of the observer is worked by means of wind vane. Photographs are taken at the rate of 24 per minute and magazine carries 6 dozen plates.

A full complement of 12 bombs are carried under the lower wings and flare lights for night landing are suspended from the wing tips. Red and green guide lights are carried on the lower plane and a white light is located on the fuselage deck, aft of the gunner.

The engine is, of course, one of the first Libertys to be built, and the fact that it is still in such good running condition speaks well for American manufacturing methods.

Dayton-Wright D 4-K

Two of these D 4-K De Havilland machines are being refitted to be used for carrying Government officers on important missions where speed is essential, and the machine is provided with conveniences which make it extremely comfortable, having all the luxurious equipment of the finest automobile. Such appointments as an enclosed weatherproof top, lunch compartments, robe rail, revolving seat and other accessories are provided.

The speed of the D 4-K is about 115 miles an hour near the ground; low speed, 53 miles per hour. The climb is about 10,000 feet in 10 minutes, and the economical radius is four hours.

Dimensions are similar to the D H-4.

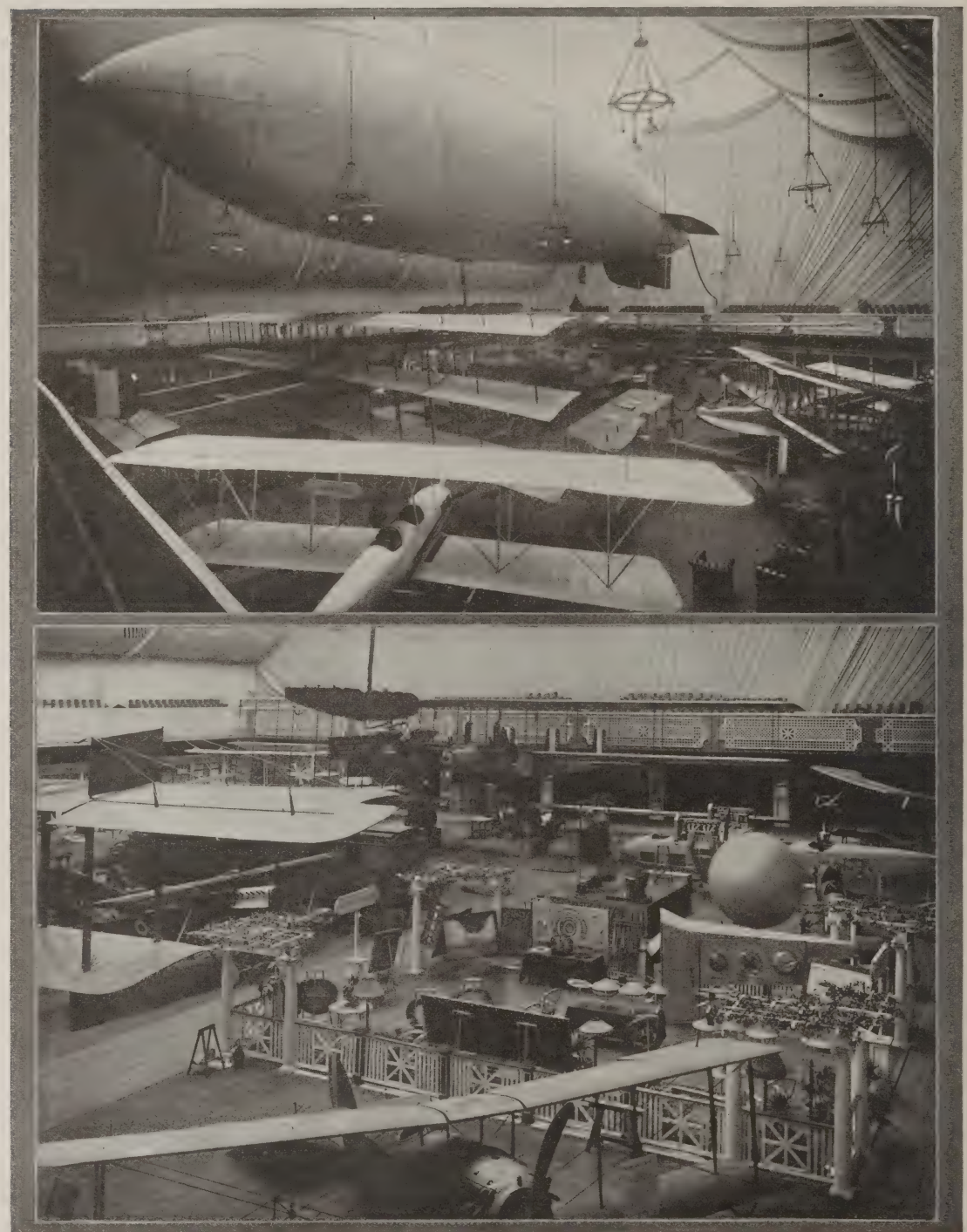
The T-4 Messenger

The "Messenger" was designed as a war machine, but after being modified in small details it makes an ideal machine for commercial and sporting purposes. As a war machine its use was to have been in carrying messages from the front lines to headquarters, and in general liaison work.

The machine is exceptionally light, and easy to



Top (left) Curtiss H.A. Seaplane, (right) Thomas-Morse M-B-3 Fighter. Bottom (left) Caproni Triplane, (right) Navy Model F-5-L Flying Boat



Two views in the 69th Regiment Armory, showing the excellent layout of the exhibits. The Naval dirigible presents an imposing appearance, and fills most of the air space. The immense size of the Caproni triplane is accentuated by the numerous ordinary sized machines placed around



Two views of the exhibits in Madison Square Garden. The machines are well set out to show the variety of types, and are accessible for close examination. The Glenn L. Martin Bomber and the Handley Page Biplane present imposing spectacles at the front and rear of the Garden respectively

fly, making it possible to make landings in places that have been heretofore unaccessible. Very rigid flying tests have been made by Mr. Rinehart at Dayton.

The fuselage has absolutely no metal fittings nor tie rods of any sort, strips of veneer being used exclusively for the bracing.

As an example of its strength, the fuselage was supported at either end while 12 men stood at the center.

The machine comes within the means of the average sportsman, for its cost is said to be not much over $2,000.

General Specifications

Span, upper plane	19′ 3″
Span, lower plane	19′ 3″
Chord, both planes	3′ 3 9/16″
Area, upper plane	50 sq. ft.
Area, lower plane	56 sq. ft.
Gap	3′ 8½″
Stagger	0″
Length	17′ 6″
Height	6′ 1″
Angle of incidence	6°
Dihedral of lower plane	3°
Stabilizer incidence	½″
Weight unloaded	476 lbs.
Weight loaded	636 lbs.
Horizontal maximum speed	85 M.P.H.
Landing speed	37 M.P.H.
Climb in 10 minutes	3,000 ft.
Engine, air-cooled De Palma	37 H.P.

The engine is a 4-cylinder air-cooled "V" type manufactured by the De Palma Engine Company of Detroit. Its weight is 3.7 lbs. per H.P. The engine consumes 4 gallons of gasoline per hour and tank has a capacity of 12 gallons. Oil is carried in the crankcase.

GALLAUDET AIRCRAFT CORP.

(Garden, Southwest Corner)

Gallaudet E-L 2 Monoplane

Striking originality in design is shown in the twin-pusher monoplane exhibition by the Gallaudet Aircraft Corporation. Mr. Gallaudet's 1919 Sport Model has a high factor of safety and is easily maintained.

Two stock "Indian" motorcycle engines are located in the nose of the fuselage, connected to a common transverse shaft and resting on the top of the plane, and driving twin pusher propellers on longitudinal shafts driven by bevel gears.

Engines are "oversize" models, giving 20 H.P. each at 2400 R.P.M. Weight, 89 lbs. each. Propellers are 3 bladed (2 bladed propeller on exhibition), 4′ 8″ in diameter and 7′ 0″ in pitch. Propellers run at one-half engine speed, 1200 R.P.M.

The plane has a span of 33′ 0″ and a chord of 4′ 6″. Wing tip ailerons are 7′ 0″ long and 1′ 0″ wide. Wing section, modified R.A.F. No. 15. Dihedral, 178°.

The body is of monocque construction, 3-ply spruce being used. Two seats are provided, side by side, with single stick control.

Tail areas: Fin, 2 sq. ft.; rudder, 4; stabilizer, 12; elevators, 8.

Overall length of machine, 18′ 7″. Special patented true streamline wires brace the wings. For adjustment and dissembling a rod from one cabane to the other permits slackening of the cables and removal of planes without loss of adjustment. Turnbuckles are therefore unnecessary.

Eight gallons of fuel are carried; sufficient for 2 hours.

With full load, a speed of 40-80 M.P.H. is attained. At present the machine weighs 750 lbs., but new features will permit a reduction in weight to 600 lbs.

Gallaudet D-4 Bomber

The Gallaudet D-4 Light Bomber was described in AERIAL AGE WEEKLY in the issue of January 6. This machine is powered with a Liberty motor driving a pusher propeller attached to a ring surrounding the fuselage. The D-4 actually made an official record of 110 knots (126.7 miles) an hour over a measured course. Other performance figures obtained by actual flight tests are as follows:

High speed	126 M.P.H.
Slow speed	42.6 M.P.H.
Slowest getaway	46 M.P.H.
Climb in 2 minutes	2,100 ft.

AERIAL AGE WEEKLY

(Elevated Platform—Garden and 69th Armory)

AERIAL AGE holds many distinctions, among them (1) that of having been the first publication in the United States to urge the creation of the Council of National Defense and having continued the campaign of national education which resulted fifteen months later in the creation of the Council and, subsequently, the creation of the Aircraft Production Board.

(2) That of having been the first publication to donate advertising space for the Mobilization of Industries, for Recruiting and for the Liberty Loans.

(3) That of publishing twice as much technical material and trade and news items as any other aeronautic publication.

(4) That of publishing weekly the complete official reports of the Army and Navy Air Services together with articles by the recognized authorities on Military and Navay aeronautics, thereby insuring to the reader a more complete representation of Army and Navy aeronautics than is afforded by any other publication in the United States.

(5) That of always publishing articles on technical developments written by authorities on the subject, refusing the purely theoretical essays of men who have not had actual experience in original research, in the factory or in the field, whose theories only lead to costly failures to those who adopt them.

(6) The distinction of having carried a larger amount of advertising in 1918 than any other publication.

There are many other distinctions, but the above explains how AERIAL AGE became the National Technical Engineering and Trade Authority.

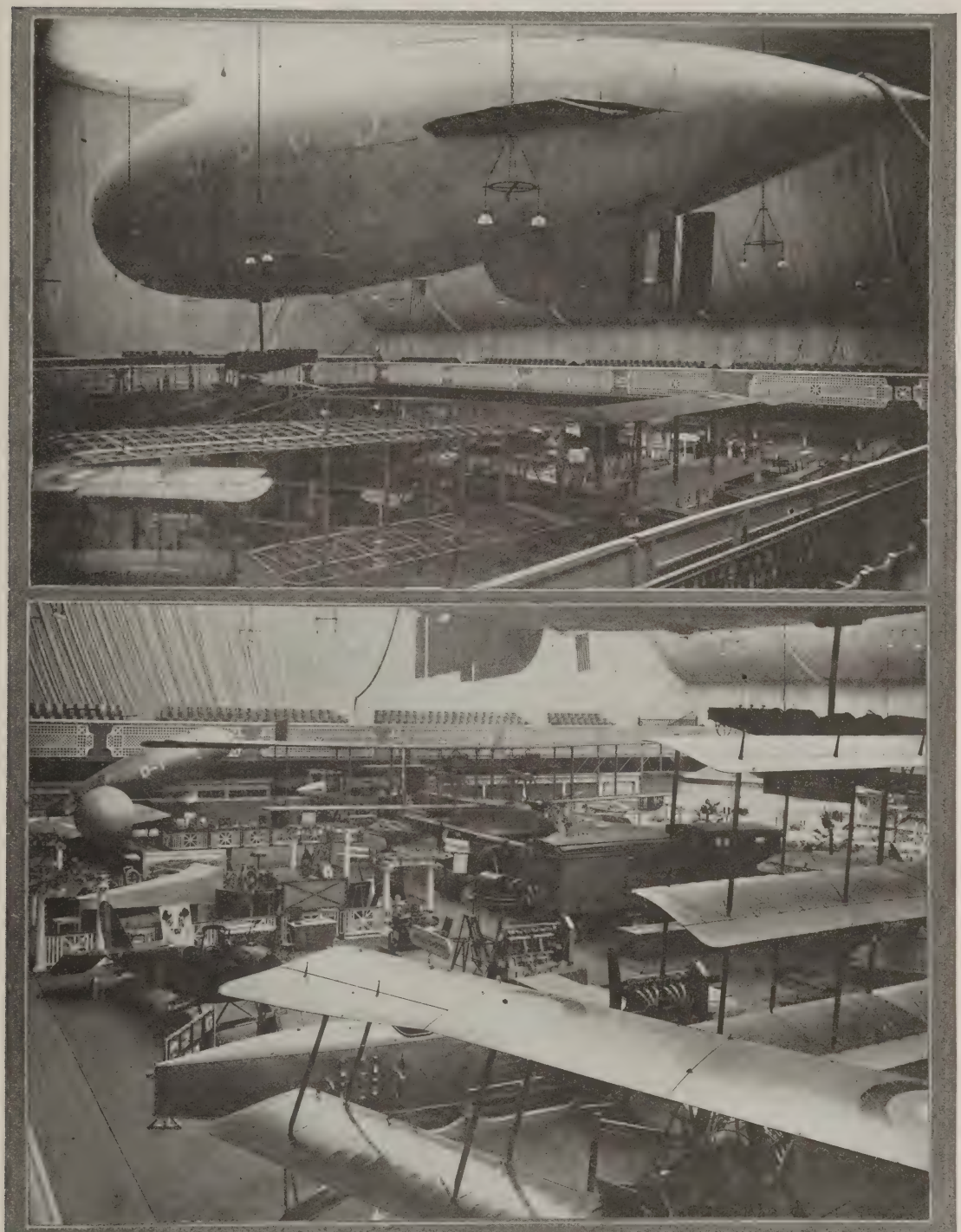
FLYING MAGAZINE

(Elevated Platform—Garden and 69th Armory)

Official publication Aero Club of America, Aerial League of America, Aero Club of Illinois, Aero Cub of Pennsylvania, Aero Club of New England, Aero Cub of Minneapolis, Pan-American Aeronautic Federation, National Special Aid Society, National Aerial Coast Patrol Commission, The Woman's Naval Service.



Top (left) Dayton-Wright D 4-K, (right) Curtiss Hydroplane. Bottom (left) Dayton T4 Messenger, (right) Ansaldo A1



Two views in the 69th Regiment Armory. The upper picture shows the large Naval flying boat, which attracts wide attention, and which being half stripped, half covered, amazes the spectators by showing them the enormous amount of detail in aircraft construction

THE L-W-F COMPANY

(Armory, Northeast Side)

The L-W-F Model V Tractor was described in AERIAL AGE WEEKLY of May 22, 1916. This machine, equipped with 125 H.P. Thomas engine, is convertible from a land machine to a hydro. The machine exhibited at the show has twin floats.

The L-W-F Company also exhibits one of the H S 1 L Coast Patrol Flying Boats with a 350 H.P. Liberty engine. The machine has a span of 62' and chord of 6' 3" and the total wing area is 653' including ailerons. Overall length is 38' 6" and overall height is 14' 7". The hull weighs 1,265 lbs. Gross weight 5,900 lbs. and weight empty 4,810 lbs. Fuel and oil 750 lbs. and crew 360 lbs.

Machine has a maximum speed of 91 M.P.H. and a low speed of 53 M.P.H. Climb in 10 minutes is 3,000 feet.

L-W-F Model G-2 Fighter

Model G-2 is a two place armored fighter carrying 7 machine guns and 4 bombs. Guns are arranged to be fired downward through an opening in the bottom of the fuselage.

The main specifications of the Model G-2 are as follows:

Dimensions

Span overall	41' 7½"
Chord, both planes	80"
Gap between planes	74"
Stagger	7⅛"
Length overall	29' 1¼"
Height overall	9' 4⅜"

Weights (pounds)

Weight, light (fighter)	2,675.5
Total, full load (fighter)	4,023.
Weight, light (bomber)	2,675.5
Total, full load (bomber)	4,879.5

Areas (sq. ft.)

Total, supporting surface and ailerons	515.54
Net area of main planes	465.46
Upper planes, with ailerons	268.78
Lower planes	246.76
Stabilizer	29.15
Elevators	27.70
Fin	5.21
Rudder	12.65

Performance (Fighter)

Speed at 10,000 ft.	130 M.P.H.
Speed at low altitude	138 M.P.H.
Low speed	50 M.P.H.
Climb to 10,000 ft.	9 min. 18 sec.
Endurance at full speed	4 hours

The engine is a Liberty, giving 435 H.P. at 1700 R.P.M. Propeller, 9' 7" diameter; 7.38 ft. pitch.

THE GLENN L. MARTIN CO.

(Garden, Center, West)

The Martin Bomber

The Martin Twin Engine Bomber in its official test at Wilbur Wright Field, Fairfield, Ohio, has excelled any other record for a similar bomber either here or abroad.

A speed of 118.5 M.P.H. was made on the first trial with full bombing load. The climbing time with full bombing load was 10,000 feet in 15 minutes and a service ceiling of 16,500 feet was attained. As a military machine the Martin Twin is built to fill requirements of a night bomber, day bomber, long distance photographer, or a gun machine. As a night bomber it is equipped with 3 Lewis guns, 1,500 pounds of bombs and 1,000 rounds of ammunition. A radio telephone set is carried on all four types. Fuel capacity sufficient for 6 hours. Full power at 1,500 feet.

As a day bomber 2 additional guns are carried and the bomb capacity cut to 1,000 pounds. The Martin Twin is easily adaptable to commercial uses which are now practical; they are mail and express carrying, transportation of passengers, and aerial map and survey work. As an example of its capacity, 12 passengers or a load of merchandise weighing a ton may be carried.

General dimensions are as follows:

Span, both planes	71' 5"
Chord, both planes	7' 10"
Gap	8' 6"
Overall length	46' 0"
Overall height	14' 7"

With a ton of useful load speed of 100 to 150 M.P.H. is made. Two 400 H.P. Liberty engines are used.

PACKARD MOTOR CAR CO.

The Packard Aeroplane

(Garden, North, Center)

The Packard two-place tractor was designed around and made a complete unit with the Model 1-A-744 Packard Aviation Engine. This machine will make about 100 M.P.H. with full load, on account of its light weight and clean-cut design, and yet its landing speed is as low as the average training aeroplane.

Fast cross-country trips are made possible in this ship, with the ability to land in relatively small fields. The general specifications are as follows:

Power Plant

Packard 8 cylinder 160 H.P. at 1,525 R.P.M. Weight, complete with hub, starter, battery and engine water, 585 lbs. Fuel consumption, .50 to .54 lbs. per H.P. hour at sea level.

Weights, Areas, etc.

Area, main planes	387 sq. ft.
Weight, machine empty	1,520 lbs.
Normal flying weight	2,167 lbs.
Weight, lbs. per H.P.	13.5 lbs.
Wing loading, per sq. ft.	5.6 lbs.
Permissible extra luggage	100 lbs.

Performance (estimated)

Altitude (feet)	Speed (M.P.H.)	Time of Climb (minutes)	Fuel range (hrs.)
0	102	0	2.5
5,000	100.5	7.5	3
10,000	98	18.1	3.5
15,000	90.5	34.5	4

Absolute ceiling, 19,500 feet.

STANDARD AERO CORPORATION

Handley Page Bomber

(Garden Rear Center; Armory, S-W Side)

The American built Handley Page shown at the Garden is similar to the British, except that Liberty "12" 400 H.P. engines are employed in the former and the Rolls-Royce or Sunbeam in the latter. Accommodations are made for one pilot and two or three gunners and an observer, who operates the bomb dropping device. Two guns are located at the top of the fuselage and a third is arranged to fire through an opening in the under side of the fuselage, and a pair of flexible Lewis machine guns is operated at the forward end of the fuselage. One gunner may have charge of all rear guns although usually two gunners man them.



Top (left) Glenn L. Martin Bomber, (right) Gallaudet E-L2 Monoplane. Bottom (left) Aeromarine Model 50 Flying Boat, (right) Dodge Mfg. Veneer De Havilland Aeroplane parts


O'yes Eddie he was there with the smile
Our old friend Orville Wright
Lieut Col Jesse D. Vincent
C. M. Keys
Our Good friend Mr Glenn H. Curtiss
Mr C. F. Willard
H. Ex. Talbott Jr
James Ex. Kepperley
Mr Fay L. Faucett
Mr Elmer A. Sperry
Major H. C. Mainon
Sketches made from life at AERO SHOW by Norman E. Jewett 1919

The general dimensions of this machine are as follows:

Span, upper plane	100′ 0″
Span, lower plane	70′ 0″
Chord, both planes	10′ 0″
Gap between planes	11′ 0″
Length overall	62′10″
Height overall at overhang cabane	22′ 0″
Height overall at center panel	17′ 6″
Width, wings folded	31′ 0″
Machine empty	1,566 lbs.
Machine loaded	14,300 lbs.

Each of the two engines give 400 H.P., at 1,625 R.P.M.

Speed at ground, 92 M.P.H.

The "E-4" Mail Aeroplane

(69th Regiment Armory)

The "E-4" Mail Plane, built by the Standard Aero Corporation, is particularly adaptable to the work of carrying mail because of the special features of its design. The machine exhibited has seen considerable service, having been brought directly to the show after completing one of its regular mail carrying trips.

The engine is a Wright-Martin Model I Hispano-Suiza, giving 150 H.P. at 1,500 R.P.M., and 170 H.P. at 1,700 R.P.M. The model I is an 8 cylinder V type with a bore of 120 mm. (4.724″) and a stroke of 130 mm. (5.118″).

General specifications of the "E-4" are as follows:

Span, upper plane	31′ 4¾″
Span, upper plane with overhang	39′ 9¾″
Span, lower plane	31′ 4¾″
Chord, both planes	6′ 0″
Gap between planes	5′ 6″
Stagger	5¼″
Length overall	26′ 2″
Height overall	10′ 10 3/16″
Machine empty	1,566 lbs.
Machine loaded	2,400 lbs.
Machine loaded with overhang	2,450 lbs.
Stalling speed	50 M.P.H.
Gliding angle	1 to 8
Dihedral	3° or 1¾°

The speed at ground is 100 M.P.H.

THE THOMAS-MORSE AIRCRAFT CORPORATION

(Garden, North Section, Center)

Four aeroplanes shown by the Thomas-Morse Company: the Type S-6, S-7, S4-C Scout and the M-B-3 Fighter.

The M-B-3 Fighter is equipped with a 300 H.P. Hispano-Suiza Engine. It is a single seater, and is said to be the fastest climbing aeroplane in the world.

The S4-C is an 80 H.P. Le Rhone Scout, used for advanced training. It has been used at most of the army training schools throughout the United States.

The S-6 is a Tandem 2 seater, very similar to the S4-C in general appearance. With an 80 H.P. Le Rhone, this machine has a speed range of 35-105 M.P.H. In 10 minutes, its climb is 7,800 feet.

The S-7 is a side by side tractor with an 80 H.P. Le Rhone engine. The side by side seating makes it especially desirable for pleasure flying. The cockpit contains numerous comforts and conveniences.

The principal dimensions and specifications of the S-7 are as follows:

Span, both planes	32′
Chord, both planes	5′ 6″
Incidence angle	1½°
Gap between planes	4′ 6¼″
Overall length	21′ 6″
Stagger	34% of Chord
Weight, loaded	1,480 lbs.
Weight per square foot	4.25 lbs.
Climb in 10 minutes	6,700 feet
Maximum speed	90 M.P.H.
Minimum speed	35 M.P.H.
Low flying speed	40 M.P.H.

THE UNITED AIRCRAFT ENGINEERING CORPORATION

(Armory, N-W Section)

This Company is showing a Canadian-Curtiss training plane, such as used by the Royal Flying Corps for instruction in Canada and England.

A number of Curtiss OX-5 100 H.P. engines are also on display, together with other equipment, which the Company has purchased from the Imperial Munitions Board of Canada.

UNITED STATES ARMY

Langley Experimental Flying Machine

(Garden, North-rear)

The model of the Langley aeroplane is a copy of the original Langley Flying Machine, which is now in the United States National Museum at Washington, D. C. This machine made the first successful flight by heavier-than-air machine driven by its own power. The machine was launched May 6, 1896, at Quantico, Va. It rose to a height of 70 to 100 feet and travelled half a mile at 20 to 25 M.P.H., with propellers revolving at 1,500 R.P.M.

The total weight of the machine is 26 pounds. It is driven by a single cylinder engine, using gasoline as fuel.

Foreign Aeroplanes

Among the foreign aeroplanes sent to the Aero Show by the War Department are the French Spad (*rear, Garden*), French Nieuport (*Front, S. W. cor. Garden*), British SEV and a German Albatross DII (*center, Armory*).

The Spad is a single seater scout with a Hispano-Suiza Engine.

The Nieuport Single Seater is equipped with a rotary Gnome Engine.

The SEV, which was put into limited production in the United States, has a Hispano-Suiza Engine.

The Albatross Scout was one of Germany's best fighters. It has a Mercedes Engine.

U. S. Army

In addition to exhibiting military aeroplanes the War Department is featuring the recent developments of radio telephony as a part of their exhibit. Under the supervision of Lieutenants Woolfolk, Shangraw and Adams, visitors are permitted to "listen-in" while aeroplanes above are being directed by voice command. It is thereby possible to hear the orders, just as the aviator in the plane hears them. An SCR-67 set is used for radio-telephone transmission and reception. Other sets on view are the SCR-57, an interphone for communication between aeroplane occupants; SCR-73, the 200 watt spark set, equipped with rotary gap, which was used for the direction of artillery fire with remarkable success; SCR-72, the two step amplifier, which increases a faint signal to one of extreme loudness; the SCR-81, a direction finding outfit, and numerous others.

On the balcony of the Garden, the Department of Military Aeronautics is exhibiting some remarkable photographic maps or "mosaics" which attracted general attention. There are also photographs showing the work of the military photographer, taking photographs, developing, printing, mounting in mosaics, and comparing them with other maps. A mosaic covering the territory between Fort Sill and Wichita on a scale of 10,000 to 1, having an area of over 35 square feet is an interesting example of the work done by the military photographer.

UNITED STATES NAVY DEPARTMENT

(Armory, West Center)

The F-5-L Flying Boat

The F-5-L, constructed by the Naval Aircraft Factory at Philadelphia, has a span of 107 feet, wing chord of 8 feet, and an overall length of 50 feet.

Two 400 H.P. Liberty Engines are used, connected to tractor propellers 10′ 6″ in diameter. 500 gallons of gasoline are carried, sufficient for a duration of 10 hours at full speed, near sea level, and a speed of 102 M.P.H. is maintained.

Fully loaded the machine weighs 14,000 lbs. This weight includes a crew of 5 men; 1 Davis and 4 Lewis machine guns; 4 230 lb. bombs; radio apparatus; telephone system with 6 stations; carrier pigeons; and 500 gallons of gasoline.

The machine is exhibited with one half covered and the other half exposed to show the interior construction.

In the making of this machine there are 6,000 distinct pieces of wood, 50,000 wood screws, 46,000 nails, braces and tacks, and 4,500 square feet of cotton fabric. The hull requires 600 square feet of veneer. The 250 pieces of steel tubing total 1,000 feet in length. 5000 feet of wire and cable, 500 turnbuckles, 1,500 each of bolts, nuts, and washers, and 1,000 metal fittings are necessary in the construction of this flying boat.

Navy M-2 Baby Seaplane

The M-2 Seaplane designed by the Navy Department and built by Grover Cleveland Loening, was to have been used for submarine patrol work. It is the smallest seaplane ever built, and its size has gained for it the name of "molecule." It is easily set up and, occupying so little space, can be stored aboard a submarine.

The machine is a tractor monoplane with twin floats. The plane has a span of 19′, a chord of 4′, and a total wing area of only 72 square feet. The wing section is a modified R.A.F. 15. Overall length of machine 13′.

The floats are 10 feet long and weigh 16 lbs. each. They are constructed of sheet aluminum with welded seams. The interior of the floats is coated with glue and outside is not painted but coated with oil. Experiments have proven this practice to be most efficient in preventing corrosion. Mr. Loening's experiments have proven that paint applied to aluminum causes a corrosive galvanic action. Floats have exceptional reserve buoyancy; with machine at rest on the water it is impossible to overturn machine by standing on the wings near the tips or by standing on the rear of the fuselage.

The engine is a 3 cylinder Lawrance 60 H.P. air cooled engine, driving a 6′ 6″ propeller with a 5′ pitch. 12 gallons of gasoline and 1 gallon of oil are carried, sufficient for 2 hours' flight. Fully loaded with pilot and fuel the complete machine weighs but 500 pounds. The maximum speed is about 100 M.P.H., and the low speed is 50 M.P.H.

Helium Filled Model Airship

The model dirigible exhibited by the Navy Department is inflated with Helium, which would have cost one million dollars a year ago, and which now can be produced for about $100. It is through the wonderful discovery of Helium that the dirigible balloon will make great development. Its cost is at present about 10 cents per cubic foot and later it will cost even less. The remarkable feature, however, is the fact that it is not inflammable, and therefore one of the greatest drawbacks of lighter-than-air craft is overcome.

Another item that is of interest is the fact that this model dirigible, 32′ long and 7′ in diameter, contains more Helium than has ever been placed in an envelope of any kind. In spite of the chemical process that makes it non-inflammable, Helium contains 85% of the lifting power of Hydrogen.

The army and navy controls the entire sources of supply of this gas. Stations in Kansas and near Fort Worth, Texas, will soon produce about 2 million feet of Helium per month.

Astra-Torres Dirigible

The dirigible car shown by the Navy Department is from a ship of the "Astra-Torres" type. The airship was built by the French in 1916 and turned over to the Americans in March, 1918, at Paimboeuf, France, the American Naval Station commanded by Commander L. H. Marfield, U.S.N. It was used until November, 1918, for coast patrol on the west coast of France.

The car is 45 feet long, 6 feet wide and 7 feet high. The envelope (which is not exhibited) is 221 feet long and 47 feet in diameter, having a capacity of 252,000 cubic feet. Speed, 45.5 miles per hour. With a crew of Americans, this ship has stayed aloft for 25 hours 40 minutes. At its cruising speed of 45.5 miles, the endurance is 10 hours.

The car accommodates a crew of 12. At the front, the pilot controls the side-to-side movements of the ship. Behind him is the bridge from which the altitude and trim are controlled by a pilot, and the engines controlled by the Commanding Officer. Upon the bridge are numerous instruments for navigation. Below and aft of the bridge is the chart room, about 6 feet square, also used as a dining room. Next is the blower motors and blowers for maintaining the pressure and trim of the envelope.

A passageway runs through the center of the car, and four fuel tanks and two water ballast tanks are located at either side. Aft of the tanks are the bomb racks, holding four 150 lb. bombs, and at the stern is the radio room. Two 150 H.P. Renault engines with two-bladed tractor propellers are used. They are placed on outriggers. Two Lewis machine guns are carried.

This ship is one of several large dirigibles purchased by the United States Navy and brought to this country for the purpose of development.

U. S. Navy

In addition to the seaplanes and dirigibles exhibited by the Navy, which are described under another heading, there can be seen at the Navy booths in the Armory almost every type of aerial ordnance used during the war, including the Davis non-recoil gun, two captured German Spandau machine guns, etc. A great many aeroplane motors of various types, manufactured for the Navy, are mounted on test stands, in the same manner as they can be found in Navy instruction schools.

Several types of radio equipment are in evidence, developed by the Bureau of Steam Engineering. On the dirigible car of the Astra-Torres type, described under another section, is a French radio set, which saw considerable service during the war.

Another feature of interest is the pigeon loft, containing thirty pigeons which were used to carry distress signals from pilots downed at sea. Some of these pigeons had war records consisting of more than six months' overseas service.

Numerous excellent photographs supplement the complete exhibit, showing all phases of the work of the naval aeronaut.

The Ansaldo Exhibits at the Aeroplane Show

IN the center of the 69th Regiment Armory the firm of Gio Ansaldo & Co., of Genoa, Italy, exhibits two sister machines, which represent the most original and advanced developments in Italian aviation, and are the more interesting because of their glorious achievements in the war. They are the S. V. A. and the Ausaldo I, the latter better known by its nickname of "Balilla," a popular Italian hero.

Designers of the S. V. A.

The first of these machines to appear was the S. V. A. It was designed by two officers of the Technical Branch, Italian Aviation Service, Colonels Savoia and Verdusio, whose initials give the first two letters to the name of the machine.

The builder was the great Ansaldo Company of Genoa, a concern having over 150 million dollars capital and which, during the war, turned all its activities to the manufacture of guns, ammunition, ships, all kinds of war materials and machinery—including the most modern one, the aeroplane. And Ausaldo's initial accounts for the third letter in the name.

Aim of the Designers

The S. V. A. was designed with the determination of embodying the latest and soundest prin-

(*Continued on page* 1364)


Mr H. B. Mingle of Handley Page Co.
B. A. Fiss show manager "He's The Guy"
Mr Glenn L. Martin
S. S. Bradley General manager
Our good friend Mr Heath of Baltimore
Mr C. M. Manley
"Wonderful Show" Mr Inglis M Uppercu
Major General Chas T. Menoher the new director of air service.
Mr W. Sterling Burgess
Lieut Ralph A. D. Preston
ADVERTISING CONTRACTS
Mr H. B. Childs advertising manager of "AERIAL AGE"
"You know me—Al Hearn one of the silliest boys at the Garden
Sketches made from Life at AERO SHOW by Norman G. Jennett 1919

MISCELLANEOUS EXHIBITS

AERO INSTRUMENT CORPORATION

(*Garden, Balcony, Right*)

The Aero Instrument Corporation of New York City are manufacturers of accurate aero altimeters, clocks and temperature-recording barometers and speedometers. The characteristic feature of this altimeter is its supreme accuracy, which is obtained by eliminating the chain drive, now almost universally used. This is replaced with three ingeniously designed cams so arranged as to cause the indicating needle to move the same distance per thousand feet at all altitudes, eliminating the cramped scale at the higher altitudes. This company manufactures altimeters reading as high as 35,000 feet, with extremely high accuracy.

The chief engineer of this company, who designed this altimeter, is Mr. Albert Bourrieu, formerly chief engineer of the Companie Francaise, famous makers of electric meters and precision instruments and chief of fabrication of the Electric Light Company of Paris. Mr. Bourrieu is well known as the inventor of the taximeter, universally used as the fare-recording device on taxicabs.

An extremely delicate indicating recording barometer and altimeter, which the Aero Instrument Company has brought out, gives the aviator's performance without possibility of error. The clockwork which operates the device is readily adjusted to turn the recording cylinder around in any length of time between one hour and twenty-four hours. The construction of the instrument does not permit the appearance of a magnetic field through its parts to affect the accuracy of the readings.

ACIERAL PRODUCTS CO.

(*Garden, Space* 123-124)

The Acieral Products Company is displaying its light weight pistons, which are 2½ times lighter than cast iron and have more than double its heat conductivity. The Acieral Casting composition is said to overcome the usual imperfection of sand holes, porosity, shrinkage cracks and permits of high polish finish.

AIRCRAFT ENGINEERING CORPORATION

(*Garden, Space* 506)

The Aircraft Engineering Corporation of New York's exhibit consist of models and photographs of the ACE plane, designed for the use of the aerial sportsmen, to sell at a price of $2,500. The enthusiasm with which this exhibit is greeted serves as a barometer of the desire of people for a small low-cost flying machine. Demonstrations are being given daily at the aerodrome at Central Park, Long Island, which emphasizes the safety and simplicity of the machine. The plane lands at a speed of only 30 miles per hour, and owing to its light weight and construction, comes to a stop within 50 feet of where it strikes the ground. Its fuel consumption is only four gallons per hour, while its flying speed is sixty miles an hour. Its simple and rigid construction makes it one of the pioneer machines for the civilian aeronautic enthusiast.

AJAX AUTO AND AERO SHEET METAL CO.

(*Garden, Space* 612-613)

The Ajax Auto and Aero Sheet Metal Co. of New York are exhibiting several models of their honeycomb radiators, which have been used on L. W. F., Aeromarine and Standard aeroplanes. The manufacturers state that the high cooling efficiency of their radiators is due to the fact that all four sides of the water tubes contribute to the cooling of the water within.

AMERICAN BALSA CO.

(*Armory, Space* 631-634)

The American Balsa Co. of New York City, by treating balsa, a wood imported from Costa Rica and Panama, with the Marr process, is able to produce a wood having a weight only one-fourth that of spruce yet possessing one-half of its strength. It is especially adapted for instrument boards, fuselage beams, flooring, seats and other parts not requiring great strength. The extreme bouyancy of balsa was utilized in the construction of life rafts for transports. A pair of balanced scales show that 12½ times the cubic quantity of balsa were required to counterbalance a unit block of iron.

AMERICAN BOSCH MAGNETO CO.

(*Garden, Space* 201-206)

The American Bosch Magneto Co. are exhibiting their complete line of magnetos ranging from 1-cylinder to 18-cylinder equipments, mounted on display stands with hand-operated cranks. Although this company's production was largely confined to magnetos for motor trucks and cars, tanks and other vehicles, they are prepared to manufacture magnetos for aircraft motors of all sizes.

AMERICAN PROPELLER & MFG. CO.

(*Garden, Space* 108-109)

The extensive facilities of the American Propeller Co., of Baltimore, Md., were fully utilized in the war program. This company manufactured all types of propellers, from the small air-fan used in driving generators for heating, lighting and radio, to single, two, three and four-blade air-screws for fighting and bombing planes. This company's exhibit consists of various types of propellers made for the government program.

A-C SPARK PLUGS

(*Garden, Space* 514)

When the armistice was signed, the Champion Ignition Company, makers of A-C plugs, were producing 40,000 plugs daily for aircraft alone. Besides this, this firm was making spark plugs for ordnance tanks and trucks. Every standardized Class "B" truck was originally equipped with A-C Titan plugs.

When America entered the war spark plug production was not sufficient for our program. Mica insulated plugs were being used abroad on French, British and Italian planes, but the individual skill required in the manufacture of such plugs made quantity production difficult. Plugs made of wrapped mica and with mica washers, moreover, are not easily duplicated. Only a small percentage of them pass inspection.

To fill the need, it was necessary to produce a porcelain plug, which would be adapted to quantity production. Working in conjunction with engineers of other companies, the Champion Ignition Company collaborated in the development and design of a porcelain spark plug which would withstand the high temperatures to which an aviation motor is subjected. The results obtained in tests of these plugs as compared with those of foreign make reflected most favorably on American design and manufacture.

The BRISTOL CO.

(*Garden, Space* 333)

The Bristol Co. is manufacturer of high grade gauges and measuring instruments. Their exhibit consists of several of their air speed indicators and water ballast gauges, which indicate the amount in inches of water remaining in the ballast tank, as used on dirigibles.

BUDD WHEEL CO.

(*Armory, Space* 607-609)

Wire wheels for aircraft of all sizes and types for large and small planes are being exhibited by the Budd Wheel Company. Strength, simplicity and rigidity of construction are outstanding features of the design of their products.

COLD LIGHT MFG. CO.

(*Garden, Space* 520)

The Cold Light Company of New York City, manufacturers of "Marvelite" luminous paints, are exhibiting various indicating devices to which their luminous paint had been applied, including compasses, clocks, tachometers and gauges. Charts, illustrating the process of manufacture from the mine to the finished product, vividly depict the great engineering skill required to produce a truly luminous paint. This material is a mixture of a very small amount of radium with a base which is rendered luminous by the action of the radium. Marvelite is truly a radioactive material and is not dependent on phosphorescence for its luminosity. It therefore remains luminous indefinitely and does not lose its brilliance after short radiation in darkness. Phosphorescent materials may appear brilliant for a short time in the dark, but they lose their luminosity when the light absorbed during daylight has been radiated.

COLLEGE OF THE CITY OF NEW YORK

(*Garden, Balcony, Center*)

The College of the City of New York is conducting several courses for aeronautic mechanics and engineers, full information regarding which is published elsewhere in this issue. The school has $85,000 worth of aeronautic equipment.

CONNECTICUT AIRCRAFT CO.

(*Garden, Space* 127-131)

The Connecticut Aircraft Company of New Haven, Conn., are displaying several detailed models of the various types of lighter-than-air ships which they have manufactured. They are also exhibiting a model of a huge passenger dirigible of 300,000 cubic foot gas capacity, to be propelled by two 400-horsepower motors, to carry twenty passengers. This company manufactured Type "R" kite balloons, U Type dirigibles and the "Solo" free balloon having a capacity of 18,000 cubic feet.

DAYTON ELECTRICAL ENGINEERING LABORATORIES

(*Garden, Space* 517-519)

A complete line of Delco Ignition Products, both of Delco design and those made to Government specifications are being exhibited at the Delco booth. The Delco Company has been manufacturing generator-battery-distributor ignition systems for the automobile industry in huge quantities, so that their design and manufacturing experience were of great value in securing adequate production for aviation purposes during the war. Every Liberty motor was equipped with ignition of this type, and the Delco Company contributed largely to national production. A complete Liberty "12" ignition system is on display as manufactured by this company to Government specifications.

Delco equipment for the Packard aviation engine of 8 and 12 cylinder type and for the Lorraine-Didietrich motor, as manufactured for the French Government, are to be seen at the Delco booth.

For those interested in testing equipment there is a complete ignition inspector's outfit, including apparatus to determine the angularity of spark occurrence.

DAYTON WIRE WHEEL CO.

(*Armory, Space* 614-615)

The Dayton Wire Wheel Company are among the foremost manufacturers of wire wheels for motor cars and aeroplanes, and they have produced wheels in large quantities for the aircraft industry for training and war planes. Their exhibit includes wheels for the lightest and heaviest aircraft of both single and twin type.

DETROIT ACCESSORIES CO.

(*Garden, Space* 501)

This company's contribution to the aircraft industry consists largely of motor pump parts of light weight and great strength. Their exhibit includes motor pumps complete and dissembled.

DODGE MANUFACTURING CO.

(*Garden Exhibition Hall*)

The Dodge Manufacturing Company's exhibit shows laminated plywood, which is used in fuselage construction, in small and large sheets, from the thin, light material used in fuselage construction to the large multiple-ply planks from which the stouter parts are made. Wing-ribs, struts, spars, engine bearers and all the essential parts of the aeroplane are shown, as made for actual machines.

The greater part of the structural framework and body covering of the DeHaviland-4 planes were made of plywood and a complete fuselage of this company's construction was on view. Trussed members of laminated plywood have replaced the metallic aluminum for the framework of rigid dirigibles, the use of the noninflammable hydrogen having eliminated the danger of fire.

The successful use of pylwood helped to solve the spruce problem, since any available wood may be used without long-distance transport, delays in seasoning, and difficulties from twisting and winding grain.

DOEHLER DIE CASTINGS CO.

(*Garden, Space* 207-208)

The Doehler Die Castings Co. of Brooklyn and Toledo are displaying numerous high-grade aluminum and alloy castings, which they have turned out in large quantities for the aircraft industry. Parts for Liberty and Curtiss motors, magneto housings, parts for Lewis guns, including the spiral guide for bullets in the magazine, camshaft and crankshaft bearings and scores of others are on view. This company has developed a process of babbitting on aluminum, thus permitting great strength of bearing surface without undue weight. This babbitt-lined aluminum bearing, known by the trade name of "Do-Lite," is used on Curtiss V-type 210-horsepower motors, the King-Bugatti motor, manufactured by the Duesenberg Motors Corporation, and the Liberty motors, as well as by several motor car manufacturers. This company makes all types of aluminum, brass, bronze and white metal for quantity production.

DUDLEY LEE TENNY CO.

(*Garden, Space* 334)

This company is exhibiting a reinforced steel propeller which has just been brought on the market. It is claimed by the manufacturers that this propeller can be produced in any strength and weight, that it will not flutter owing to the heavy leading edge and is unaffected by climatic conditions.


NORTH POLE.
Mr. Henry P. Wise
Captain Robert Bartlett.
Mr. G. Douglas Wardrop
Mr. Alan R. Hawley
Mr. Henry Woodhouse
Augustus Post
Mr. John H. Torrey
Sketches made from life at AERO SHOW by Norman E. Jennett 1919
Rear Admiral Bradley A. Fiske
W. T. Thomas
John H. Willys

DUESENBERG MOTORS CORPORATION

(*Armory, Space* 648-655)

The Duesenberg Model H motor, manufactured by this company and described in detail in the January 27 issue of AERIAL AGE WEEKLY, forms the chief center of interest at the booth of the Duesenberg Motors Corporation, of New Brunswick, N. J. This is a 16-cylinder motor, developing 850 horsepower. Another motor which this company manufactured for war purposes is the King-Bugatti motor, also described in detail in AERIAL AGE WEEKLY on February 10. Several other motors, including the Model A, 4-cylinder, 150-horsepower motors, are being exhibited by this company.

EASTMAN KODAK COMPANY

(*Garden, Space* 511)

The Eastman Kodak Company, of Rochester, N. Y., is displaying a complete line of aeronautic cameras, suitable for military and mapping purposes. An interesting feature of their exhibit is the "photographic gun," used to train aviators in aerial marksmanship, which is mounted on the standard gun ring. The aviator, instead of firing bullets, snaps photographs of his mark and upon development of the film a record is obtained of the number of bulls'-eyes obtained and the accuracy of aim. This device has resulted in the saving of considerable ammunition for training purposes.

The cameras include hand-held types and types requiring special mounting, for both roll films and plates. Simplicity of operation, convenience of loading and ease in aiming and handling is a feature of every camera manufactured by the Eastman Company. Their extensive experience and research in orthochromatic and panchromatic photography, in the manufacture of lenses and shutters, in all types of roll films and plates, combined with the information which was placed at the disposal of our air services by our allies, resulted in the development of aerial photography and apparatus to a very high plane.

The Model A-1 camera, having a capacity of twelve 4x5 plates or Eastman cut film, is a type which will undoubtedly find favor among aerial photographers. It is equipped with a 10-inch Hawk Eye lens having a fixed aperture of f4.5 and a shutter capable of adjustment through a speed range of 1/120 to 1/450 of a second. In common with all Eastman aerial cameras, a safety shutter as a protection to mist, fog and dirt is provided, which opens only when the exposure is made. The loading is extremely simple and a new magazine can be attached in an instant. The camera is sighted directly at the object and a slight pressure of the thumb lever release opens the safety shutter, exposes the lens and makes the exposure. One short quick turn of a lever advances the film and resets the shutter.

Two types of cameras for photographic mapping, one hand mounted and the other for fixed mounting on a special rack, make the production of photographic maps almost automatic. Flying at definite altitudes, so that the negatives are made to scale, it is possible to fit the prints or enlargements together with sufficient accuracy to produce photographic maps of considerable accuracy over wide areas. A photographic map of the city of Rochester made in two and a half hours shows how effectively, speedily and accurately photographic mapping can be done.

EDISON ELECTRIC APPLIANCE CO.

(*Armory, Left Side*)

The Edison Electric Appliance Co., makers of the famous Hot Point products, have filled large Government contracts for aviators' electrically heated clothing. An interesting part of their exhibit is an aviator's high altitude flying uniform with helmet, electrically heated gloves and pads. Such equipment is necessary for all high altitude flying, where low temperatures are encountered at all seasons of the year.

EDSTROM MACHINE CO.

(*Armory, Left Front*)

The Edstrom Machine Co. are displaying one of their wire-wrapping machines, which have been officially inspected by the Navy Department and the Department of Military Aeronautics. By means of this machine, operated by a crew of two men, a neat and strong wrap can be made in 45 seconds, which is of better workmanship than can be produced by the most skilled hand labor. In official tests the machine wrap stood 100 per cent. of the tensile strength of the wire on which it was made, amounting to more than 4,200 pounds. A test of this wrap, without soldering, resulted in nine out of ten wraps withstanding the full tensile strength of the wire, the tenth giving way at 71 per cent.

One aircraft manufacturer stated that this machine enabled two men to turn out as many wraps of a much better quality as could be obtained by manual wrapping of twelve to twenty men.

EMPIRE ART METAL CO.

(*Armory, Space* 603-606)

This company has developed a wing structure made entirely of metal, having the same weight as wood, with considerably increased strength. A factor of safety of nine is obtained. These wings have been used on Curtiss JN4B training planes with great success and a pair of these wings as manufactured on Government contract, together with rudders, and wings for use on C-1 planes with a carrying load of 39 pounds per square foot are on exhibition. In addition to increased strength the use of metal adapts itself to quantity production and assembly by only moderately skilled personnel.

ERICSSON MFG. CO.

(*Garden, Space* 301-302)

The Ericsson Mfg. Co., of Buffalo, N. Y., makers of the famous "Berling" magnetos, are showing their complete line of magnetos, including the D-83 for Curtiss OX-2 motors, the D-81 for Curtiss OX-5 motors and the J-12 type, which is being developed for the new Curtiss 12-cylinder motor, now still in the experimental stage.

GENERAL ORDNANCE CO.

(*Garden, Space* 509)

The General Ordnance Company are exhibiting their non-recoil heavy aircraft gun, which has had extensive use during the war. The gun overcomes recoil by firing two opposed charges simultaneously, with the result that the recoil of each charge, being equal and opposite, is counterbalanced.

B. F. GOODRICH CO.

(*Armory, Southwest Section*)

The principal exhibit by the Goodrich Company consists of one of the first dirigibles put into the United States Naval Service. This is a "Blimp" that was completed in August, 1917, and used for seventeen months in coast patrol work in the vicinity of New York City. The dirigible is 167 feet long, 33 feet in maximum diameter and contains 80,000 cubic feet of gas. This dirigible held the record for continuous flight.

A Curtiss OX motor is used. The car is arranged to carry a crew of three men. In cruising a speed of from 40 to 50 M.P.H. is maintained.

Other exhibits by the Goodrich Company are a model spherical balloon; relief throttle valves perfected by the Goodrich Company and principally the Gammeter valve; shock absorber cords; special parachute attachments; fabrics and cloths for aeronautical use, etc. Another feature of the exhibit will be a short motion picture showing how the balloons are manufactured.

THE GOODYEAR TIRE AND RUBBER COMPANY

(*Garden, Main Floor, Northwest*)

The Goodyear Tire and Rubber Co., of Akron, Ohio, is the most extensive aerostatic exhibit of the show. The outstanding feature of the booth is the dirigible pusher car, completely equipped, of a type which has many sisters in service. A 35,000 cubic foot type "R" military kite balloon is suspended and equipped complete. Attractive models of the twin engine Navy dirigible and a trans-continental passenger dirigible car are on display. These models are complete in every detail, including full set of instruments and controls, lockers and upholstery.

A balloon fabric complete testing laboratory was on exhibition.

Several well-arranged panels of small parts, including rope, cable, cable clamps, thimbles, junctions, manometers and bridal rings gave visitors an idea of the numerous high-grade parts that go into the construction of aerostatic craft. A panel of ropes, with various knots and ties, used by aerial "seamen," show that the art of the sailor of the sea applies to the sailor of the air as well.

A full-sized dirigible car equipped with dual control, indicating devices, including manometers, tachometers, air speed indicators, incidence and bank indicator, clock, driven by an 8-cylinder OX-2 Curtiss motor, of the type used on the FC training dirigible, having a cubic capacity of 85,000 feet, form an interesting part of the Goodyear exhibit. Models of "R" type kite balloon, military free balolons and of the U dirigible are also on display.

The Goodyear Company is represented by Mr. E. R. Preston, manager of the Government sales department, assisted by Mr. W. P. Seiberling, G. M. Kurtz, R. H. Upson and H. T. Kraft, whose names are familiar to all interested in aerostatics.

HARTZELL WALNUT PROPELLER COMPANY

(*Garden, Space* 414-415)

The Hartzell Walnut Propeller Co., manufacturers of "Liberty" propellers, are exhibiting the various types of propellers which they have manufactured. This company's design has been adopted for the Loening plane, and air screws of their manufacture have been purchased in quantity by the Army and Navy for various types of planes, including the 4-bladed propeller used on the HS-1 and H-16 Navy planes.

HENDERSON FORGE AND MACHINE COMPANY

(*Garden, South Balcony*)

The Henderson Forge and Machine Co., of Detroit, are showing the complete line of crankshafts. This company manufactured a large number of Liberty motor crankshafts, and in their exhibit showed them through all the stages of manufacture from the rough casting to the final finished product.

HESS-BRIGHT MFG. CO.

(*Garden, Space* 505)

The Hess-Bright Mfg. Co. are exhibiting their line of high-grade ball bearings on neatly arranged panels. Their product is well known for quality of workmanship and materials, and has been extensively used for aircraft motors.

HART AND HUTCHINSON

(*Garden, Space* 328-329)

This manufacturer is exhibiting lockers for employees, steel stationary cabinets and tool cabinets which are sold extensively to manufacturing concerns.

JAMESTOWN PROPELLER CO.

(*Garden, Space* 112-114)

All sizes of "Falcon" propellers, the product of the Jamestown Propeller Co., of Jamestown, N. Y., of two and four bladed type, with and without metal tips, are on view at the exhibit. This company made a large contribution to the propeller production for the aircraft program during the war.

ARTHUR JOHNSON MFG. CO.

(*Armory, Left Side*)

The Arthur Johnson Company, of New York City, have made a specialty of artistic aeronautic jewelry, and in their display included propeller tie pins, watch fobs, military aviator's wings, brooches and rings. This company is making the official souvenir of the show.

JONES-MOTROLA, INC.

(*Garden, Space* 215-216)

The Jones-Motrola Company, of New York City, are displaying their complete line of air speed indicators, tachometers, altitude indicators, clocks, oil, air pressure and motor thermometers, which were manufactured on Government contract.

LAWRANCE AERO ENGINE CORP.

(*Armory, Space* 626-627)

The Lawrance Model L-1, three-cylinder, Y-type, air-cooled engine, described in detail in the March 3 issue of AERIAL AGE WEEKLY, is attracting favorable attention at the Armory. The motor is rated at 60 horsepower at 1900 revolutions per minute, and has a bore of 4¼ inches and a stroke of 5¼ inches. Its weight is 130 pounds.

LIBERTY STARTERS CORPORATION

(*Garden, Space* 514-515)

The Liberty Starters Corporation of New York City, are exhibiting their electric starter, which has been supplied to the Navy. This starter is electrically operated by a motor built by this company. Its weight is only 29 pounds, yet it delivers 1500 foot pounds and turns over a Liberty motor from 60 to 70 revolutions per minute. The Liberty starter is so designed that a hand crank can be used on the motor if necessary; this being geared to the crankshaft at a ratio of 22 to 1, while the electric motor is geared to a ratio of 240 to 1. For military purposes, a synchronizer for a machine gun was incorporated in the design, but this can be replaced if desired by a generator for supplying power for ignition, lighting or radio.

LUNKENHEIMER CO.

(*Garden, Space* 516)

The Lunkenheimer Company, which has offices in New York, is exhibiting a panel of parts produced in quantity for the aircraft program, consisting of air and oil pressure gauges, pet cocks, gasoline line junctions and piping and other small auxiliary parts.

MACCOMBER WHYTE CO.

(*Garden, Space* 307-308)

The Maccomber Whyte Company, manufacturers of wire rope, has been making streamline wire on government order. This company sent their engineers to England to become familiar with the best practice there and brought back machinery for making cold rolled streamline wire. Their exhibit consists of samples of this product.


"Great Show"
Mr. Charles B. King
Brig. Gen. T. C. Lyster
Chas. B. Kirkham
Mr. Frank H. Russell
Major General William Kenly
Lieut. Harold H. Emmons
Evan J. David
Business Manager of Flying magazine
Mr. Charles F. Kettering
Mr. E. M. Williams
Alfred W. Lawson
Our friend Dr. Christmas
Lieut. Col. S. D. F. Chandler
Mr. McNaulty
Flying's advertising manager
Sketches made from life at AERO SHOW by Norman E. Taussig

MARLIN-ROCKWELL CORP.

(*Armory, Space* 618-623)

The Marlin-Rockwell Corporation, manufacturers of the Marlin aircraft gun, is displaying several models of their ordnance, which is familiar to Army aviators. The work of this company has won the encomium of high Government officials and their product has given excellent account of itself against enemy aircraft.

MATTHEWS BROTHERS MANUFACTURING CO.

(*Garden, Space* 510)

The Matthews Brothers Company, of Milwaukee, Wis., manufacturers of "Hamilton" propellers, are presenting an interesting and instructive exhibit of their line of propellers and seaplane hulls. The entire process of propeller manufacture, from the rough plank to the highly finished product, are displaying successively for the benefit of visitors. Finished propellers are shown cut longitudinally and latitudinally, so that the direction and thickness of the laminations and the varying thicknesses from the hub to the end of the propeller could be observed.

A feature of the Matthews exhibit is the hull of the type used on the N-9 Navy elementary training seaplane.

A. J. MEYER

(*Garden, Section* 226-227)

A. J. Meyer has been making turnbuckles for the aircraft industry for several years, and his familiar products are displayed on suitable racks for the benefit of visitors. This company engaged in intensive production during the war in order to fill the contracts which were awarded to them on time.

FRANK J. MOSSBERG

(*Garden, Space* 335-336)

The complete line of Frank J. Mossberg's wrenches and tools are being displayed in their booth at the Garden. These tools are extensively used by the automobile and aircraft industry in the assembly and repair of motors. They need no introduction to the industry, their products having found their way into every motor manufacturing plant.

MOTOR COMPRESSOR CO.

(*Garden, Space* 503)

The Motor Compressor Company, of Newark, N. J., are showing their pneumatic aeroplane motor starter, used by both the Army and Navy, and which is now being supplied to the Post Office Department for mail planes. The starter motor is a four-cylinder double opposed type and is sufficiently powerful to turn over any motor up to 550 horsepower. The pressure tank stores enough air for ten to fifteen starts. This company also manufactures pumping outfits for garages, which are being used at several aeroplane fields to supply pressure for aircraft tires.

NATIONAL ADVISORY COMMITTEE ON AERONAUTICS

(*Garden, Space* 508)

The National Advisory Committee has done extensive testing work of various aircraft accessories and parts, including spark plugs and instruments of all kinds, utilizing the facilities of laboratories throughout the country, including that of the Bureau of Standards of Leland Stanford University. An aerodynamic laboratory has just recently been completed for the use of the Committee at Langley Field. A series of tests on the aerodynamic qualities of hundreds of aerofoils and propellers resulted in the gathering of highly valuable data for the use of designers of aircraft. The exhibit of the Committee includes a great many instruments tested by them as well as charts and graphs explaining its work.

NATIONAL CASH REGISTER CO.

(*Garden, Space* 403-410)

The National Cash Register Company are exhibiting the various types of indicating instruments and wing parts which they made for the Government. This company received a contract for the manufacture of 10,000 tachometers of the famous French "Tel" type shortly after the launching of the American air program. The difficulties in securing quantity production on such a delicate instrument may be realized by the fact that 2,104 tools were made, requiring 55,325 hours of work, were needed to produce the 1,540,000 small parts to build the 10,000 tachometers.

The National Company produced 3,199,000 small screw machine parts for Liberty motors. They made all the metal fittings for the Standard J-1 training plane and made rudders, ailerons and stabilizers for DeHavilan4-4 planes.

In order to secure quantity production on the air speed indicators and tachometers, the engineers of this company evovled a new method of dip brazing to avoid the necessity of using torch dipping.

THE NORMA COMPANY OF AMERICA

(*Garden, Space* 209-210)

The Norma Company of America is displaying a complete line of "Norma" High-Precision Ball Bearings, as used in ignition apparatus, lighting generators, radio-electric apparatus, gyroscopic apparatus, and other high-speed equipment used in connection with the aviation industry.

PACKARD MOTOR CAR CO.

(*Garden, Main Floor, North*)

In designing this line of engines it has been the aim of the Packard Engineering Department to retain all the good features of the Packard and Liberty aircraft engines, and at the same time eliminate features having to do with installation difficulties. The result has been an appreciable saving in weight and an increased reliability in performance.

The Model 1-A-744 Engine. This model has 8 cylinders with a 4¾" bore and 5¼" stroke, set at a 60° angle. Complete with propeller hub, carburetor ignition distributor heads, switch, generator, starting motor and switch, the engine weighs 520 lbs. Starting battery, 40 lbs. additional. Engine water, 25 lbs.; radiator water, 27 lbs.; radiator, 73 lbs. Horsepower, 160 M.P.H, at 1525 R.P.M.

The Model 1-A-1116 is similar to the 8-cylinder type, but is provided with 12 cylinders instead. Weight, 710 lbs. Horsepower, 240 at 1525 R.P.M.

The design of the Model 1-A-2025 engine is similar to the 1-A-1116, but the dimensions are changed as required for 5¾" bore by 6½" stroke. Weight, complete, 1,000 lbs. In spite of the fact that this is one of the largest aircraft engines designed to date, its compact arrangement makes neat streamline installation possible. Horsepower, 440 at 1550 R.P.M.

PERRY-AUSTEN MFG. CO.

(*Armory, Space* 616-617)

The Perry-Austen Mfg. Co. are displaying their dope products, which have been extensively used as wing covering on all types of American aircraft. Of the thousands of gallons of Aus-Per-Ite nitrate and acetate dope which they have supplied to the Army and Navy, not one gallon has been found defective or below standard by Government inspectors.

This company has brought out a new product, a combination of dope and gray varnish which reduces the time required to produce the finished wing. As the varnish is mixed with the dope, cracking and peeling, due to unequal coefficient of expansion of dope and paint, is eliminated.

RADIUM DIAL CO.

(*Garden, Space* 309-310)

The Radium Dial Co. demonstrates the efficiency of their luminous paint by means of a dark room containing several instruments treated with their product. A complete instrument panel of a DH-4 plane, formed a part of their exhibit. A bomb sight, known as Mark I-A, developed by the Government to enable the aviator to drop bombs with the accuracy which marks the direction of artillery fire, and manufactured by the Edison Company, treated with luminous paint, was one of the devices that is attracting considerable attention among the visitors at the show.

JOHN A. ROEBLING CO.

(*Garden, Space* 311-313)

The John A. Roebling Co., of Trenton, N. J., is exhibiting a complete line of aircraft wire, stranded cord, thimbles and ferrules, as well as all types and kinds of wire products and insulated wire as it applies to the aircraft industry. The exhibit is arranged in a series of glass-covered cases, each of which contains complete data relative to the products contained in it.

A novel feature of the exhibit is a coil of wire possessing the highest tensile strength for any wire of its size and weight known in the world. It is ¼ inch in diameter, 6x19 strand steel balloon cable, having a copper conductor in the center for telephonic communication. This wire is furnished to the United States Government for balloon mooring.

SCHNEIDER BROTHERS INSTRUMENT COMPANY

(*Garden, Space* 213-214)

Schneider Brothers Instrument Company, who for the past forty years have been engaged in the manufacture of weather indicating instruments, is displaying their complete line of meteorological instruments both of portable and stationary type, which were used by the Army and Navy in forecasting and recording weather conditions for the use of the air services. Many of these devices were designed by the engineers of the company, whose long experience in design and construction of instruments for the Weather Department was of great assistance in the development of instruments of this type.

This company is exhibiting the famous "Schneider" altimeter, as supplied to the Navy, anemometers for indicating wind velocity, barometers, including the large type used to standardize the meters mounted on planes, and the metereograph, which indicates and records wind velocity, pressure, temperature and humidity.

SIMMS MAGNETO CO.

(*Garden, Space* 344-345)

The Simms Magneto Co., of East Orange, N. J., is showing a complete line of aeroplane and automobile magnetos. Several types of Simms' magnetos have been used for aircraft motors, the L-16 model being suitable for King-Bugatti motors, the L-8 for Hispano-Suiza motors and the CK-8 for the Packard Aviation Motor. This last-named model was used by Ralph de Palma in his record-breaking Packard car, which used the Packard Aviation Motor.

All Simms aviation magnetos are waterproof and the permanent magnets carefully tempered to give the utmost strength of magnetic field with the highest possible retentivity.

SOCIETY OF AUTOMOTIVE ENGINEERS

(*Armory, Space* 635-636)

The standardization work of the Society of Automotive Engineers as an important contribution to war production is graphically displayed by a series of glass-covered panels showing the standards established by this society for heat-treated steels, adjustable yoke rod ends, plane yoke rod ends, eye rod ends, rods and pins, bolts and nuts and threads. These standards have been published from time to time in AERIAL AGE WEEKLY and are the guide of the aeronautic engineer.

A. G. SPALDING BROS.

(*Armory, Space* 641-642)

The A. G. Spalding Company, of New York, Chicago, San Francisco and Los Angeles, have a complete line of aviators' and yachtsmen's clothing on view at the Exposition, including several types of helmets, goggles, wool hoods, masks, leather coats and trousers, leather vests, gloves, mittens and gauntlets, mackintosh waders for naval aviators and fleece-lined boots and shoes. The Spalding Company has developed a non-sinkable coat, guaranteed to keep a man afloat on the water fully sixty hours. Their complete line fills every need.

LAWRENCE SPERRY AIRCRAFT CO.

(*Armory, Southeast*)

A new type of indicating instrument of great value to the air pilot is being exhibited by the Lawrence Sperry Aircraft Company, of Farmingdale, Long Island. This device is a turning indicator, which instantly responds to any change in lateral direction of flight, yet is unaffected by side gusts and banking, unless accompanied by turning motion. This device is demonstrated by a model plane, fitted with the new instrument, which showed instant deflections when its lateral direction was changed.

The familiar Sperry banking indicator and the Sperry compasses are again in evidence.

The W. B. motor is making its first appearance at the show, and it will be described in detail in a future issue. It is a light-weight four-cylinder, V type, air-cooled, 129¾-pound motor, developing 38 horsepower. Reliability, simplicity and economy of operation are its chief characteristics at 1800 revolutions per minute. An engine of this type is installed in the Dayton-Wright "Messenger" aeroplane. The Sperry Company has also arranged to have a running test of the engines at a nearby garage where ten-hour endurance runs will be made. A detailed description of this motor will appear in a future issue of AERIAL AGE WEEKLY.

Sperry is also exhibiting a special parachute and launching device, and a constant speed air fan developed for the War Department to drive radio generators.

SPLITDORF ELECTRICAL INSTRUMENT COMPANY

(*Garden, Space* 521)

The Splitdorf Electrical Instrument Company is displaying their complete line of magnetos and ignition parts, including the two magneto unit for use on Liberty motors. This company manufactures complete ignition outfits for all sizes of aircraft and automobile motors, as well as distributors and electrical measuring instruments.

STANDARD PARTS CO.

(*Armory, Space* 610-611)

The tremendous achievements of this company in the production of aeronautic parts of all kinds in their various factories through the Middle West has earned for them a place in the parts manufacturing industry second to none. The company is represented at the exposition by various members of the sales and executive forces.

STERLING ENGINE CO.

(*Garden, Exhibition Hall*)

The Sterling Engine Co., of Buffalo, N. Y., are manufacturers of marine motors ranging from 10 to 300 horsepower with from 2 to 8 cylinders. This firm is exhibiting a comprehensive line of marine motors, including various types made for the American, French and British Government for use on seaplane tenders. The Sterling Company completed a contract for Sunbeam motors for the United States Government.

STEWART HARTSHORN CO.

(*Garden, Space* 317-318)

The Stewart-Hartshorn Co., manufacturers of streamline wire, are exhibiting their products on panels, showing the nine stock sizes which they have supplied in quantity. The Hartshorn strap end, which is their exclusive product, has been

submitted to most rigid tests and has shown a breaking strength in excess of 200,000 pounds per square inch for the wire for which it is designed. The wire itself has a breaking strength of 165,000 to 175,000 pounds, which shows that the strap end will hold even if the wire is strained to the breaking point. DH-4 planes manufactured by the Standard, Dayton-Wright and Fisher Body Corporation and the SE-5 seaplane manufactured by the Curtiss Company were exclusively equipped with Hartshorn streamline wire. This company also completed a contract for Liberty motor valve springs.

STONE PROPELLER CO.

(*Garden, Space* 138-139)

The Stone Propeller Co., of Dayton, Ohio, one of the pioneers of the propeller industry, are manufacturing the propeller used on La Pere fighters and have completed a large contract for propellers for use on the DH-4 plane and for planes using Hispano-Suiza, Rolls-Royce, Curtiss, Hall-Scott, Gnome and LeRhone motors. This company is displaying their complete line of propellers for the industry, ranging from a small 6 foot 6 inch size for use on Ford motored aeroplanes to some of the largest sizes in use.

STROMBERG MOTOR DEVICES CO.

(*Garden, Space* 504)

The Stromberg Motor Devices Company exhibit includes a series of models of carburetors suitable for aviation engines of all sizes and powers. The NAV-6 model is used on the 300-horsepower Hispano-Suiza motor; the NAD-6 on the 180-horsepower Hispano-Suiza, and the NAD-6 on the Thomas Morse 8-cylinder. This carburetor was used on the Loening plane in establishing the 3-passenger speed record and on the plane which recently established the American altitude record of 29,500 feet.

TIPS AERO ENGINE CO.

(*Garden, Space* 125-126)

The Tips Aero Engine Company is exhibiting for the first time their 18-cylinder, 480-horsepower rotary motor, which has a weight of only 850 pounds. This motor is of radical design of the utmost simplicity, using rotary valves, permitting of exceptional cooling and lubrication. This motor has just been completed by the engineers of this company and possesses many original and interesting features of design.

TITEFLEX METAL HOSE CORPORATION

(*Armory, Space* 624-625)

This company has brought out a special unpacked, absolutely tight all metal tubing that possesses inherent flexibility instead of depending on the movement and slipping of a joint to obtain bending. This material overcomes the limitations of the flexible metal tubing that has heretofore been available, in that absolute tightness is obtained, yet possesses a greater degree of flexibility without the lessening of the degree of either at the expense of the other. It has been impossible heretofore to obtain a material that would successfully handle very high pressures, and one that would give a satisfactory degree of durability, and although this new tubing is slightly more in first cost, it proves itself to be most economical by giving longer life in service.

The manufacturer's whole facilities were given over to the Government during the war to supply this product to the various departments, and in a number of instances it was found to be the only tubing that could satisfactorily meet the drastic requirements in the special installations that were made.

The Bureau of Aircraft Production used an assembly of this tubing with fittings as an all-metal gasoline feed line from the fuel supply tank to the carburetor on various planes, and the Bureau of Steam Engineering of the U. S. Navy equipped several types of seaplanes and dirigibles with this tubing for conveying gasoline, oil and air. It is a noteworthy fact that the Caproni in the service of the Italian Government were considering the use of this material in connection with their plane work at the time of the closing of the war.

Additional uses by the United States Government were as gasoline, oil, water and air lines on standardized trucks, caterpillar type of tractors, battle tanks, heavy mobile gun mounts, etc. The tubing lends itself to many interesting uses, an instance being that of the Eastman Kodak Co., which is employing it as a protecting housing around a revolving shaft on aeroplane cameras.

This company is identified with Westinghouse interests, Mr. H. H. Westinghouse being chairman of the Board of Directors, and its official personnel is composed of Mr. C. W. Fletcher, president and general manager; H. R. Smith, secretary and treasurer; W. H. Fulton, chief engineer, and C. E. Mackay, director of sales. The general office and works of the company are at Badger Avenue and Runyon Street, Newark, N. J., where the plant facilities of the organization are modern and of large capacity and with space in reserve for expansion.

TORRINGTON COMPANY

(*Garden, Space* 104-107)

The Standard Plant of the Torrington Co., of Torrington, Conn., was devoted to the manufacture of streamline wires, tie rods, clamps, lock nuts, washers, spokes and nipples for aeroplane wheels for the aircraft program. A complete exhibit of all sizes and types of such parts mounted on display racks forms the principal part of this company's exhibit.

The Langley, the first American-built Handley Page, is equipped with Torrington streamline wire. A full set of DH-4 wires and fittings, as manufactured by this company, was mounted on racks and forms an interesting part of the exhibit.

TRIPLEX SAFETY GLASS CORPORATION

(*Armory, Space* 637-638)

Safety goggles of all kinds for aviators are in evidence at the Triplex booth. These goggles have earned an excellent reputation among military aviators, for they have contributed substantially to the safety of flying. Although a blow can shatter them, the glass does not splinter, thus eliminating all danger to the aviator's eyes.

U. S. BALL BEARING CO.

(*Garden, Space* 120-122)

This company is displaying its complete line of ball-bearing products, large quantities of which have entered into the construction of motors for the military aircraft program.

VALENTINE & CO.

(*Garden, North Balcony*)

This company is exhibiting their full line of waterproof varnishes, which are extensively used on seaplanes and propellers. A feature of their exhibit is a propeller which was kept in motion in a glass tank of water, without there being any visible deleterious effect on the propeller varnish.

VAN SICKLEN CO.

(*Garden, Space* 502)

The Van Sicklen Company, manufacturers of tachometers and oxygen equipment, has an interesting exhibit of their various products. The Prouty oxygen system, developed by this firm for supplying the aviator with the necessary oxygen at high altitudes, is considered superior to the devices used by foreign governments. Not only is the oxygen supply regulated according to the altitude of the plane, but compensation is made for decreased tank pressure due to dropping of temperature. The supply tank holds 800 litres of oxygen at a pressure of 150 pounds. The instrument is equipped with an accurate pressure indicator, and a simple regulator for increasing the supply from one to two men, as needed.

The altimeter designed and built by this company has a specially designed diaphragm which eliminates the use of the chain drive for the indicating needle, this obviating the chief cause of inaccuracy for this type of instrument. Furthermore, the diaphragm expands uniformly according to the altitude, thus making an even scale possible without compensating gears.

WELLINGTON, SEARS AND CO.

(*Armory, Space* 628-630)

The Wellington, Sears & Co., of Centerville, R. I., which manufactured every type of aero-



Some of the attendants of the Curtiss Aeroplane & Motor Corporation exhibit, who prove real attractions



THE NEWS OF THE WEEK



Aeroplane for Oversea Flight Now Being Rushed at Navy's Factory

According to press dispatches, a type of naval aeroplane, which in point of size, power and carrying capacity greatly exceeds the N C-1, is now under construction at the Navy's League Island aircraft factory in Philadelphia, it became known recently when an aircraft designer, who has been at the factory, described its features in detail.

The designer, who would not consent to have his name made public, said that work on the plane was going on night and day in order to have it ready as soon as possible for the contemplated trans-Atlantic flight. Officials of the Navy's Air Service, he said, had great faith in the new flying boat, and believed it would accomplish a trip to Europe with little or no difficulty.

The design of the new super-aeroplane, which is known as Model T, is similar to the Navy's F-5, now being shown at the Aeronautical Exposition. It has an upper wing span of 250 feet, which is 124 feet more than the N C-1. The lower wing is 25 feet less. The length of the craft over all is 80 feet. The wings are 12 feet broad and 14 feet apart.

The motive power for the new naval aeroplane will be supplied by five Liberty motors of 400 horsepower each. Three will be tractors and two pushers.

Seventy-five passengers will be able to ride comfortably in the Model T, according to press dispatches, making ample allowance for tanks carrying sufficient gasoline and oil for a flight of 2,000 miles. The N C-1 has carried fifty-one passengers on one of its trips. If the new Model T lives up to the hopes of its builders, it will establish a new passenger-carrying record.

Construction on the machine has progressed so rapidly that its completion is expected in the very near future, according to the aircraft designer who told of its details. He was unable to express himself more definitely as to the date of its completion, he said, because of the many unforeseen difficulties which arise in building aeroplanes of a new type.

Lieutenant Flachaire Returns to United States

New York, N. Y.—Lieutenant Georges Flachaire, who spent several months in the United States last year and has many friends and admirers in this country, arrived in New York recently on the S. S. *Touraine*. Lieutenant Flachaire has been decorated with nearly every military medal that can be conferred on a French flying officer.

Congress Aids Ground Training in Colleges

Washington, D. C.—The joint resolution which the Senate recently passed was modified to insure that the loaning of air service equipment to colleges be confined to ground training. It authorizes the Secretary of War to loan aircraft engines and equipment to encourage the development of the science of flying, for the loans are to be made to "such educational institutions as provide advanced mechanical and technical instructions." The first application for the loan of such equipment has been made by the College of the City of New York.

Radio Telephones at Aero Show

New York, N. Y.—The Division of Military Aeronautics has authorized Lieutenant J. E. Adams, of Hazelhurst Field, Mineola, L. I., to conduct formation flights over Madison Square Garden during the Aeronautical Exposition. The flights are made daily between noon and two o'clock and directed by radio telephones at the Exposition. Telephone receivers for visitors are available, making it possible to hear the orders transmitted, in the same way as the aviator in the plane above hears them.

S. A. E. Aeronautic Meeting

New York, N. Y.—The Society of Automotive Engineers, held on March 7, during the Aeronautic Exposition, a meeting at which many important engineering questions involved in the commercial use of aircraft will be presented and discussed.

An afternoon session began at four o'clock at the headquarters of the S. A. E., 29 West 39th Street, this being followed by a supper there, at which an informal conference of the automotive engineers and their guests afforded an opportunity to take up in an intimate way just what is possible, new or in sight in the commercial as well as sporting use of aircraft.

At the afternoon session C. H. Day had as his subject "The Commercial Future of Aeroplanes from the Engineer's Standpoint." Archibald Black, of the United States Navy, summarized a comprehensive paper he had prepared for the S. A. E. on Aircraft Radiators.

At the evening session representatives of the Army and of the Navy, as well as of the industry, who are engineering authorities on aeronautics, addressed the members.

March 7 was designated officially as S. A. E. day by the management of the Aeronautical Exposition.

Civilian Flying Licenses to be Required

In the February 24 issue of AERIAL AGE we printed the Aero Club of America's recommendations to provide for the registration of aircraft and aviators by the Department of Commerce.

It is announced that President Wilson, in submitting to the House the recommendations of the National Advisory Committee for Aeronautics for legislation placing the licensing and regulation of aerial navigation in charge of the Department of Commerce, declared that he "fully approved the suggested legislation." Secretaries Baker, Daniels and Redfield also indorsed the proposal.

The legislation would give the Department of Commerce authority to issue licenses for civilian operation of aircraft and provides an appropriation of $25,000 for the necessary expenses. A letter from C. D. Walcott, Chairman of the Executive Committee, said the legisaltion should be passed at the present session. Mr. Walcott, pointing out the absence of any Federal authority for establishing rules and regulations governing civilian operation, said if the War Department sold its surplus machines many amateurs would attempt flying, which would result in many accidents. Operation of "unlicensed and irresponsible aircraft," he added, would cause probably complications through smuggling from Mexico and Canada.

Discharge Emblem Selected

Washington, D. C.—The War Department authorizes the following statement:

The "honorable discharge" emblem to be issued by the War Department will be a bronze lapel button somewhat similar to the G. A. R. button of like significance. It is the intention of the Government to distribute the button free of charge to all entitled to it. The buttons will be manufactured only by concerns chosen by the Government, which will furnish the dies for their manufacture and purchase the buttons, thus obviating any possible variance from the approved pattern in design, color or material.

Of appropriate and artistic design, the button is the result of a competition among American artists and sculptors, conducted by the Commission of Fine Arts of which Charles Moore is chairman, and the following are members: Herbert Adams, J. Alden Weir, Charles A. Platt, William Mitchell Kendall, John Russell Pope, James L. Greeneaf and Col. C. S. Ridley, secretary. Fifteen designs were submitted by the commission for final selection by the Chief of Staff.

Secretary Daniels Commends Naval Airmen

Secretary Daniels has commended the men of the office of the Inspector of Engineering Material, Brooklyn Aeronautic District; also the men of the Navy Aviation Mechanics School for carpenter's mates, Keyport, N. J., for the splendid manner in which they conducted themselves while on guard duty during the fire at Morgan, N. J., on the night of October 4, 1918.

Distribution of Aircraft Personnel in U. S. and Overseas

The Statistics Branch, General Staff, War Department, issues the following table, showing the distribution of the military aeronautics personnel in the United States and overseas at various dates:

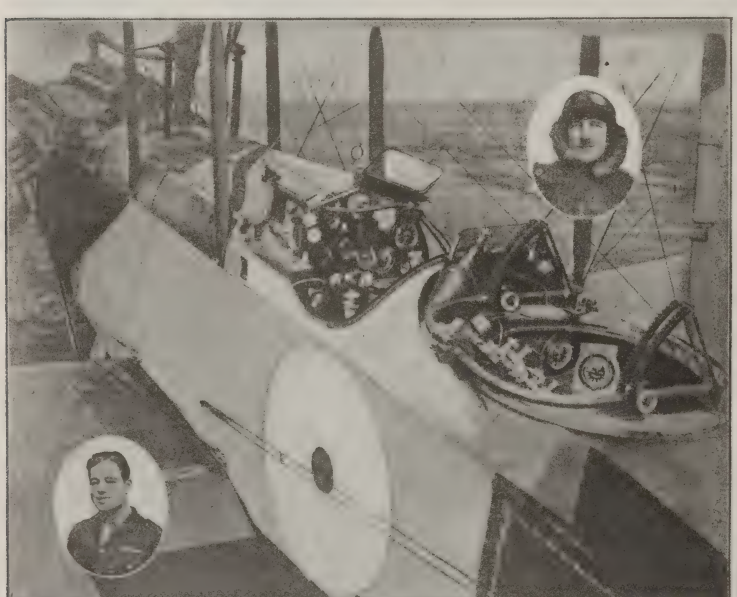
	In United States	Overseas	Per cent. In United States	Overseas
Nov. 11	79,321	78,786	50	50
Nov. 18	80,689	78,973	51	49
Nov. 25	84,785	78,361	52	48
Dec. 2	84,844	78,061	52	48
Dec. 9	89,661	70,040	56	44
Dec. 21	81,607	61,345	57	43
Dec. 26	77,140	59,917	56	44
Jan. 6	67,833	59,584	53	47
Jan. 16	51,821	58,854	47	53
Jan. 23	46,467	58,133	44	56
Jan. 30	41,314	57,527	42	58
Feb. 6	37,537	56,299	40	60

Army Aviators Fly Over Grand Canyon 1,400 Feet Up

Kingman, Arizona.—What was said here to-day to have been the first aeroplane flight over the Grand Canyon of the Colorado was made by Lieuts. R. O. Searles and E. D. Jones in a De Haviland bombing plane. They flew from Kingman to the canyon and return after following its course for many miles. The flight was made at an altitude of about 14,000 feet and lasted two hours.

Only Two U. S. Units Cited as a Whole

Washington, February 25.—Only two units of the United States Army, Sanitary Section No. 646 and the 103 Aero Squadron, have been authorized to wear the French shoulder cord, known as the fourragere, indicating that the unit as a whole has been cited for gallantry in action. This was disclosed in a circular made public by the War Department relative to uniform and decorations.



The Pilot's and the Observer's cockpits on the D. H. 9 machine with which, on January 2, an altitude record of 30,500 ft. was made at Martlesham by Capt. Lang, R. A. F., as pilot, and Lieut. Blowes as observer, both of whom are inset. The machine was equipped with a Napier "Lion" engine. The two oxygen tubes, which supplied the oxygen, are shown back of the windshield of the rear seat

Will Advise Brazilian Navy

Washington.—Assignment of Lieutenant-Commander Wadleigh Capehart, of the office of naval operations, to duty as adviser to the Brazilian Government on naval aviation matters, was announced in navy orders.

Authorization for Travel Expenses Made by War Department

Washington, D. C.—A paragraph of General Order 22 makes possible reimbursement of officers, men and civilian employees for travel expenses incurred in line of duty:

3. Section IV, General Orders, No. 27, War Department, 1918, as amended by Section III, General Orders, No. 81, War Department, 1918, is rescinded and the following substituted therefor:

"Actual and necessary expenses, not exceeding $5 per day, may be paid from the Signal Corps appropriation of July 24, 1917, or from the Air Service appropriation of July 9, 1918, to officers, enlisted men, and civilian employees of the Army, and authorized agents when sent on special duty for aviation purposes at home or abroad under specific instructions from the Secretary of War."

Vouchers submitted for payment under the provisions of this order will be accompanied by an itemized statement of expenses.

College of City of New York Starts More Aeroplane Courses

New York, N. Y.—The College of the City of New York is still enrolling students for its four courses on aeronautics, outlined below. The equipment of the school is valued at $85,000, and is on exhibition during the period of the Aeronautical Exposition at Madison Square Garden at Compton Hall every evening, except Sundays.

The instruction is designed to prepare men for the flying school, mechanical jobs with aircraft and motor companies, for positions as draftsmen, designers and aeronautical engineers. They are preparatory courses for the regular courses that will be established for a degree.

The schedule is as follows:

Aeroplane Mechanics: Lectures and laboratory work on general principles of construction and operation of an aeroplane. Course—eight weeks—two nights per week. Starts March 14. Fee $10. Laboratory, Wednesday, 7:30 to 10:15 P. M. Lecture, Friday, 7:30 to 10:15 P. M.

Advanced Aeroplane Mechanics: Lectures and laboratory work on general principles of construction and operation of aeronautical motors, both American and foreign design. Course—eight weeks—two nights per week. Starts March 14. Fee $10. Lecture, Wednesday 7:30 to 10:15 P. M. Laboratory, Friday 7:30 to 10:15 P. M.

Aeroplane Drafting: Practical work in detail and assembly drawings of airplanes and parts. Emphasis will be given to the development of practical production drawings following the systems used in all modern production plants. Course—eight weeks—two nights per week. Starts March 15. Fee $10. Drawing Room, Monday and Saturday 7:30 to 10:15 P. M.

Aeroplane Design: This course covers the theory and design of different types of airplanes. The complete engineering calculations of two machines are worked out in the classroom and in addition, each student works out the design of an original machine. There are no requisites for any of these courses but the instructors are glad to advise prospective students relative to their program. Course—eight weeks—two nights per week. Starts March 18. Fee $10. Lectures, Tuesday and Thursday 7:30 to 10:15 P. M.

Mr. E. C. McHugh, formerly in charge of an operating department of the Dayton-Wright Aeroplane Company, has accepted the position of works manager of the Stueben Truck Co., Cincinnati, Ohio.

Sir Charles Allom, one of the principal members of the British firm, Gosport Aircraft Co., has been visiting the United States for some time and has opened officers at 19 East 52nd St., New York.

Official Regulations for Transatlantic Flight

The $50,000 *Daily Mail* Prize for the first trans-Atlantic flight made within 72 consecutive hours is being offered under the following conditions formulated by the Royal Aero Club:

Qualification of Competitors.—The competition is open to persons of any nationality not of enemy origin, holding an Aviator's Certificate issued by the International Aeronautical Federation and duly entered on the Competitors' Register of the Royal Aero Club.

No aeroplane of enemy origin or manufacture may be used.

Entries.—The Entry Form, which must be accompanied by the Entrance Fee of £100, must be sent to the Secretary of the Royal Aero Club, 3, Clifford Street, London, W. 1, at least 14 days before the entrant makes his first attempt.

No part of the Entrance Fee is to be received by the *Daily Mail*. All amounts received will be applied towards payment of the expenses of the Royal Aero Club in conducting the competition. Any balance not so expended will be refunded to the competitor.

Starting Place.—Competitors must advise the Royal Aero Club of the starting place selected, and should indicate as nearly as possible the proposed landing place.

All starts must be made under the supervision of an Official or Officials appointed by the Royal Aero Club.

Identification of Aircraft.—Only one aircraft may be used for each attempt. It may be repaired en route. It will be so marked before starting that it can be identified on reaching the other side.

Stoppages.—Any intermediate stoppages may only be made on the water.

Towing—Towing is not prohibited.

Start and Finish.—The start may be made from land or water, but in the latter case the competitor must cross the coast line in flight. The time will be taken from the moment of leaving the land or crossing the coast line.

The finish may be made on land or water. The time will be taken at the moment of crossing the coast line in flight or touching land.

If the pilot has at any time to leave the aircraft and board a ship, he must resume his flight from approximately the same point at which he went on board.

General

1. A competitor, by entering, thereby agrees that he is bound by the Regulations herein contained or to be hereafter issued in connection with this competition.

2. The interpretation of these regulations or of any to be hereafter issued shall rest entirely with the Royal Aero Club.

3. The competitor shall be solely responsible to the officials for the due observance of these regulations, and shall be the person with whom the officials will deal in respect thereof, or of any other question arising out of this competition.

4. A competitor, by entering, waives any right of action against the Royal Aero Club or the proprietors of the *Daily Mail* for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or the Proprietors of the *Daily Mail* or their representatives or servants or any fellow competitor.

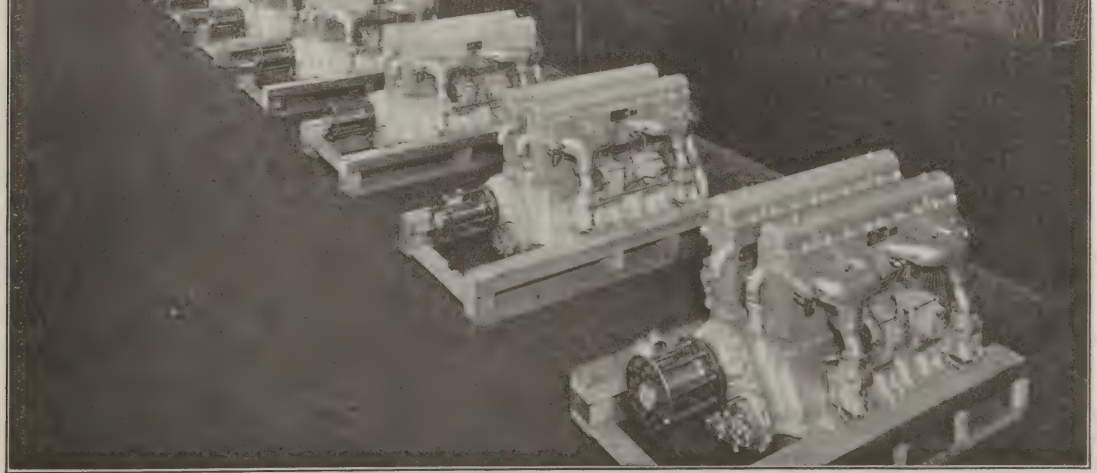
5. The aircraft shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claims for injury either to himself, or his passenger, or his aircraft, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and the proprietors of the *Daily Mail* in respect thereof.

6. The Committee of the Royal Aero Club reserves to itself the right, with the consent of the Proprietors of the Daily Mail, to add to, amend or omit any of these rules should it think fit.

1 February, 1919.

Offices: The Royal Aero Club, 3, Clifford St., London, W, 1, H. E. Perrin, secretary.

The Aero Club of America will receive the entries in the United States and will carry out the Royal Aero Club's rules and regulations.



A line-up of King-Bugatti aviation motors at the Duesenberg Motor Corporation, Elizabeth, N. J.

The AIRCRAFT TRADE REVIEW

Conference On Disposal of Surplus Plywood and Veneer

Conferences were held February 13 and 19, 1919, in the Council of National Defense Building, Washington, D. C., and were attended by the following representatives of the Government and a committee representing the plywoods and veneers industry:

War Department

Maj. W. M. Crunden, Office of Director of Sales; Maj. D. J. Beem, Ordnance Department; Capt. J. L. Synder, Bureau of Aircraft Production; Lieut. William J. Walsh, Bureau of Aircraft Production; W. P. Gleason, Office of Director of Sales; Fred S. Morse, Surplus Property Division; Edw. D. McConnell, Bureau of Aircraft Production; Frank R. Ing, Bureau of Aircraft Production; Lieut. C. P. Cronk, Bureau of Aircraft Production; W. E. Farnan, Bufreau of Aircraft Production.

War Industries Board

Richard L. Humphrey, director of building materials, Building Materials Division; M. A. Styles, Building Materials Division.

Plywoods and Veneers Industries

O. C. Lemke, Underwood Veneer Co., Wausau, Wis.; P. M. White, Algoma Panel Co., Algoma, Wis.; C. Fred Calhoun, Frosts' Veneer Seating Co., Sheboygan, Wis.; C. B. Allen, Allen Eaton Panel Co., Memphis Tenn.; F. W. Eggers, Eggers Veneer Seating Co., Two Rivers, Wis.; W. H. Rodis, Rodis Lumber & Veneer Co., Marshfield, Wis.

The chairman of the conferences, Richard L. Humphrey, stated the purpose of the meeting was to consider a method of procedure for the disposal of Government surplus stocks of plywood and veneers that would be for the best interests of the Government and at the same time meet with the approval of the industry.

As a result of these conferences a method of procedure was unanimously agreed to by the representatives of the Government and of the industry by which these stocks will be disposed of by the Government in cooperation with the industry.

The plan of procedure agreed to covers only the surplus stocks that are not absorbed through redistribution among the several bureaus of Government use.

The representatives of the industry expressed their gratification at the outcome of the conferences and the belief that the method of procedure which had been agreed to would remove the uncertainty and menace which these stocks have exercised over the veneer and plywood market.

Christian Girl Back at His Desk

Cleveland.—Christian Girl, president of the Standard Parts Co., who has been South recuperating from a slight operation this fall, is again in good health, and will resume his busines duties in April.

Personal Pars

Lieut. Fred. M. Young, who has recently returned from overseas duty in the air service, has become associated with the Perfex Radiator Co., Racine, as sales engineer.

Dedell Heads Firestone Advertising

Akron.—J. R. Dedell, until recently connected with the Corday & Gross Advertising Co., Cleveland, has been appointed advertising manager of the Firestone Tire & Rubber Co., Akron.

The Martin Cruising Bomber

The Martin Cruising Bomber is equipped with two engines located in the fuselage and driving two tractor propellers by means of bevel gear transmission. Since either engine will drive both propellers, the failure of one of the engines does not impair the efficiency of the plane.

Either two Sunbeam 300 H.P. engines drive the plane at 74 M.P.H., or two Liberty 400 H.P. engines will drive plane at 81 M.P.H.; in either case with a two ton useful load.

Fully loaded the machine can make a speed of 110 miles an hour. The useful load is three tons not including one ton of fuel and oil.

The K-bar cellule truss is used, which eliminates half of the cellule structural resistance due to wires transverse to the line of flight.

The machine is also provided with the Martin retractable landing chassis, which has been found to be strong, light and reliable. It eliminates 14 per cent of the structural resistance of the Bomber.

Mr. Martin claims that safety and dependability are increased because of independent transmission support, for the propeller breakage will not endanger cellule truss, and because cellule strusses are low and are more accurately calculable.

As the engines are enclosed, resistance is no greater than where a single engine is used. Such placing makes the engines accessible for minor repairs and adjustments.

H. H. Newsom Back With Standard Parts

Mr. H. H. Newsom is back with the Standard Parts Co. as manager of the Standard Welding Plant. In the spring of 1918, the Director of Aircraft Production requested the services of Mr. Newsom in connection with engineering and production work on radiators, Mr. Newsom's experience as production manager and director of purchases for the Standard Parts Co., then one of the few manufacturing concerns having extensive experience in the construction of radiators for military aeroplanes, particularly fitting him for the duties of his position. The department with which he was identified ten folded the output of radiator manufacturing concerns then in production.

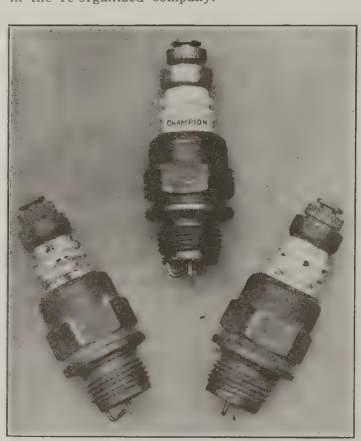
Laureati's Aeroplane at City College Exhibit

The aeroplane in which Capt. Giulio Laureati, the Italian aviator, made the historic London-Turin flight of 656 miles in six and a half hours, has been placed on exhibit in the College of the City of New York. Capt. Laureati crossed the Alps at a height of 12,000 feet.

The machine was obtained through the Italian Aeronautical Society. The addition swells the aeronautical collection of the college, and the trustees have decided to push to completion the concrete structure begun on the college grounds under Government auspices, which was to have housed the Students' Army Training Corps. The college paid the United States $3,000 for the semi-finished building.

American Bosch Stock All Sold

February 8th—Hornblower & Weeks announce that the underwriting of the notes of the American Bosch Magneto Corporation and sale of the common stock has been closed. The rapid financing of this company is an indication of the optimism and confidence which investors have in the re-organized company.



Champion Plugs Withstand Heat Test

Champion spark plugs, manufactured by the Champion Spark Plug Co., of Toledo, Ohio, were recently made the subject of a rather severe heat test, and, as shown in the accompanying cut, withstood the test remarkably well. A training plane "crashed" and the wreckage caught fire. The intense heat destroyed not only all combustible parts, but such metal parts as the crank case and bearings. After the fire died down, the spark plugs were removed, and found in good condition.

Hooven Radiator a Combination of Tubular and Honeycomb

The Hooven radiator, manufactured by the Hooven Radiator Company of Chicago, presents several novel features. It is a combination of the tubular and honeycomb types, the tubes being pressed into sheet metal running vertically, giving larger water passages and allowing a free circulation of water, thus reducing chance of clogging. By slightly building up the ends of the sheets to a width of ⅛ inch on each side with a different angle that is pressed into the water section of the core and corrugating the metal horizontally the honeycomb feature is obtained. This allows a space for a sheet of water 1/16 inch thick circulating between tubes through a staggard channel.

The relation between the cross sectional area of the water passages and its corresponding air passage cross sectional area was determined from a great number of experiments varying the water flow against the average air velocities and an empirical equation was derived.

The rigidity and durability of the radiator is greatly increased because the tubes are pressed vertically and corrugated horizontally, this making re-enforcement in both directions. The top and bottom sections of the radiator core are not merely bent over and soldered, but both lock-seamed and soldered.

Christensen Starter Survives Severe Official Tests

The Christensen starter, which has been successfully applied to Liberty, Hispano-Suiza, Duesenberg and other aircraft motors, was subjected to most severe tests before being approved for use on Government planes. The Christensen starter is a compressed air starter, which not only sets the motor in motion by means of an injection of air at high pressure into the cylinders of the motor, but insures easy and rapid starting, because the compressed air supplied to the cylinder is richly impregnated with gasoline vapor.

In a Signal Corps test of a No. 12 type starter on a cold and stiff Liberty 12 motor to determine the number of starts that could be obtained without recharge of the pressure tank, 12 starts were made in an average time of two seconds each, 19 pounds of pressure being taken from the tank for each start. The time required to recharge the tank to full pressure was 2 minutes and 45 seconds.

A test to ascertain how long the motor would run on the starter mixture with the main carhureter shut off gave the following results: Total running time, 34.2 seconds; tachometer reading, 350 R. P. M.; total number of revolutions obtained during test period, 118; motor fired evenly and regularly during test.

Captain Jean Richard of the French Commission and Captain Boer of the British Mission conducted tests to find out how many starts could be obtained from one charge of the pressure tank, with the following results: 13 starts in an average time of 1.77 seconds each were made with a cold motor having cold city water flowing through the cooling system.

At a test on a seaplane with a Liberty 12 motor at Great Lakes Naval Training Station, 20 starts were made in an average time of 1.29 seconds, some of these being made in less than 1 second.

On a Hispano-Suiza 8-cylinder motor 24 starts were obtained from a tank charged to 240 pounds pressure. When the test was completed, 150 pounds of pressure still remained, this being sufficient to obtain several more starts. On a plane in flight 1¼ seconds was sufficient to restart a dead motor.

Aluminum Co. Bonds On Sale

The Aluminum Company of America has sold $12,000,000 serial 6 per cent. gold notes to the Guaranty Trust Company of New York and the Union Trust Company and the Mellon National Bank of Pittsburgh. The notes, now on sale, will be dated March 1 and will mature in blocks of $4,000,000 each on March 1, 1921, to 1923, inclusive. Announcement was made recently that the Aluminum Company's net earnings in each of the last four years, after providing for taxes and depreciation, had been more than $8,000,000.

Hon. Albert S. Burleson, Postmaster General
Hon. Otto Praeger, Second Assistant Postmaster General
J. B. Corridon, Superintendent, Division of Aerial Mail Service

Louis T. Bussler, Chief of Maintenance and Equipment
J. Clark Edgerton, Chief of Flying Operations
George L. Conner, Chief Clerk, Division of Aerial Mail Service

PILOTS

Ira O. Biffle
Dana C. DeHart
Edward V. Gardner
Lawton V. Smith
Leon D. Smith
Robert F. Shank
Irving Graeb

John A. Jordan, Superintendent, Western Division
Trent C. Fry, Manager, Belmont Park, L. I.
Charles I. Stanton, Manager, College Park, Md.
John M. Miller, Manager, Bustleton, Pa.
O. J. Sproul, Manager, Chicago, Ill.
C. E. McMillan, Manager, Cleveland, Ohio
August Carlson, Manager, Lehighton, Pa.
Harry F. Powers, Manager, Bellefonte, Pa.
William Lindley, Manager, Clarion, Pa.
J. P. Edwards, Manager, Bryan, Ohio
Charles N. Kight, Special Representative

RESERVE PILOTS

Lester F. Bishop
Dan Davison
C. C. Eversole
E. A. Johnson
D. I. Lamb
Frank McCusker
E. H. Lee
Lyman Doty

CHIEF MECHANICS

Frank Tower
Edward C. Radel
Chas. C. King
H. E. Fremming
Albert Cryder

An Aero Mail Questionnaire

Otto Praeger, Second Assistant Postmaster General in charge of Aero Mail, has sent out a questionnaire to the pilots in the service with a view to getting consensus of opinion on the desirable type of aeroplane for the mail service. So that this discussion may be of the utmost value to the Post Office Department AERIAL AGE is presenting herewith the questionnaire with the request to our readers that they send their suggestions to Otto Praeger, Second Assistant Postmaster General, Washington, D. C.

QUESTIONNAIRE

Requirements for Ideal Mail Ship

It is requested that you fill out the following question forms, the purpose of which is to aid the Post Office Department in the development of a commercial type ship, suitable for schedule flying. You are asked to place your answers on another sheet with the proper number and letter designations.

1. *General Specifications.*
   a. How many motors?
   b. Mailing load in pounds at 17½ pounds per cubic foot?
   c. Should a pilot-mechanic be carried?
   d. Do you think wings should hinge on large ships for storage purposes, and how?
   e. At what altitude should ship be balanced?
2. *Performance* (normal load)
   a. What should cruising speed be, and at what altitude measured?
   b. Minimum buoyancy speed?
   c. Cruising radius?
   d. Have you an idea for slow landing device, either inherent or mechanical; if so, what?
   e. What should climb of 6,000 ft. be, and what service ceiling?
   f. What percentage of normal maximum power should keep a ship at an even altitude?

Ship by Units

1. *Motors*
   a. Where should motor or motors be located.
   b. Should each be independent?
   c. Should they be accessible during flight, and how?
   d. Do you recommend motor starters? What type?
   e. Should radiators have complete shutters?
2. *Fuselage.*
   a. How would you distribute landing gear stresses?
   b. How and where would you place loads?
   c. Have you any suggestions for carrying mails?
   d. Would you alter present type of tail skid? How?
   e. Should skid be steerable from rudder bar.
3. *Wings.*
   a. State ideas for wing construction.
   b. What factor of safety?
   c. Have you any changes to suggest in wing skids?
   d. What wing loading do you think advisable?
4. *Landing Gear.*
   a. Give desirable factor of safety?
   b. Where place?
   c. Do you think three strut landing gear visable?
5. *Controls and Control Surfaces.*
   a. "Dep" or stick?
   b. Should controls be accessible in flight?
   c. Should all control surfaces be balanced?
   d. Do you think stabilizer should be hinged?
6. *Gas and Oil.*
   a. Should each motor have independent gas and oil?
   b. What feed system should be used?
   c. Do you recommend accessibility for all valves and leads during flight? How placed?
   d. How should gas and oil tanks be anchored and where placed?
   e. How would you provide leads against vibration?
7. *Safety and Comfort of Crew.*
   a. Should pilot and mechanic, if any, be placed before or behind the main load?
   b. Should cock-pit be enclosed or open?
   c. How should cock-pit be heated for winter flying?
   d. Should there be passageway through fuselage to vital parts?
   e. State in detal your ideas for location of controls, instruments, seats and the amount of room available in cock-pit.
   f. Can you suggest an adequate fire extinguisher system?

French Aerial Mail Service Officially Started

Paris—On March 1st the French aerial mail service between Paris and Bordeaux, Marseilles, Toulouse, Brest and St. Nazaire, under the supervision of the director of civilian aeronautics, was officially inaugurated.

Post Office Receives Bids for DH-4 Changes

Abstract for bids for changing and modifying 12 De Haviland 4 aeroplanes and as many more up to 60, in lots of 12, as the Postmaster General may direct. Opening of bids took place February 26, 1919.

Bidder	Price, each	Total
Curtiss Engineering Corporation, Garden City, L. I., New York.....	$1,975.00	$23,700.00
Aircraft Engineering Corporation, New York, N. Y.....	3,484.65	41,815.80
Wittemann-Lewis Aircraft Co., Newark, N. J.	3,400.00	40,800.00
L-W-F Engineering Co., Inc., College Point, L. I., New York.		
Wooden landing gear	996.50	11,958.00
Nickeled steel landing gear	1,462.00	17,544.00
Continental Aircraft Corporation, 120 Liberty Street, New York, N. Y.....	2,325.00	27,900.00
West Virginia Aircraft Company, Wheeling, West Virginia.....	1,830.00	21,960.00

To Manufacture Aeroplane Parts

Newark, N. J.—John Cozzone & Co., of 61 Arlington Street, Newark, N. J., have purchased a factory site at which they are preparing to undertake the manufacture of aeroplane parts. The factory is located at 55 Branford Street, Newark.

Personal Pars

Charles B. Wilson, president and manager of the Wilson Foundry and Machine Company, Pontiac, Mich., has been elected vice-president of the Curtiss Aeroplane and Motor Corporation, Buffalo, N. Y.

Hydro-Aeroplane Garage for New York

A new venture is announced by Henry Amerman, attorney for a group of men headed by I. M. Uppercu, president of the Aeromarine Plane and Motor Company. It is proposed to build a public flying boat service station—a hydroaeroplane garage—at 181st Street and the Hudson River, at Fort Washington Point.

Mr. Amerman stated that the venture is being projected merely to encourage water flying and the private ownership of air yachts. The station will be a garage only. There is no intention of participation in passenger-carrying lines or anything of that nature other than to sell 'planes and rent hangars. However, the establishment of schools will be encouraged, as will sight-seeing airboat lines, air yacht taxi companies, etc.

The founders of the idea are hopeful that the project will be taken up throughout the country and that other plants will be established. This would be profitable as the spring will probably find many aircraft concerns seeking locations for selling agencies. It would be natural for them to choose those places already provided with municipal or privately-conducted service stations.

Cited for Distinguished Service

The Commander-in-Chief, in the name of the President, has awarded the distinguished service cross to the following-named officers and soldiers for the acts of extraordinary heroism described after their names:

First Lieut. Elliott, White Springs, Air Service. For extraordinary heroism in action near Bapaume, France, August 22, 1918. Attacking three enemy planes (type Fokker), who were driving on one of our planes, Lieut. Springs, after a short and skillful flight, drove off two of the enemy and shot down the third. On the same day he attacked a formation of five enemy planes (type Fokker), and after shooting down one plane was forced to retire because of lack of ammunition. Home address, Leroy Springs, father, Lancaster, S. C.

Sergt. (first class) Harold O. Nicholls, Balloon Service, First Army (A. S. No. 36238). For repeated acts of extraordinary heroism in action near Griscourt, France, August 11, 1918; near Avecourt, France, October 1 and 9, 1918. On August 11 Sergt. Nicholls volunteered and ascended for the purpose of making observation. He continued with his work until the balloon was set on fire by attacking enemy planes. On October 1 he remained on duty until his balloon was fired by incendiary bullets, and again on October 9, while on duty with another observer, he remained with his balloon under attack until it was set on fire by enemy planes, and he then refused to jump until his companion had escaped. Home address, Mrs. Helen Nicholls, 1716 Avenue C, Galveston, Tex.

First Lieut. Leo H. Dawson, Air Service, 94th Aero Squadron. For extraordinary heroism in action near Hartennes, France, July 19, 1918. While on a voluntary patrol, Lieut. Dawson encountered seven enemy monoplanes at an altitude of 2,000 meters. After a brief engagement his guns jammed, but, after repairing the jam in the air and under heavy fire, he returned to the fight, shot down one of the enemy in flames and drove off the others. For the following act of extraordinary heroism in action near Clery-le-Petite, France, November 4, 1918, Lieut. Dawson is awarded a bar, to be worn with the distinguished-service cross: Sighted four enemy planes (type Rumpler); Lieut. Dawson immediately attacked, despite the numerical superiority of the enemy, and destroyed one of the group, whereupon the remaining three scattered and returned to their lines. Home address, Mrs. A. G. Dawson, 942 Ogden Street, Denver, Colo.

THE THOMAS-MORSE MODEL 8-90 AERO ENGINE

Type—Eight cylinder "V", four cycle, water cooled. Propeller driven through reduction gearing. Bore: four and thirteen sixteenths inches. Stroke: six inches. Brake Horse Power at propeller shaft: 250. Engine R.P.M.: 2,200. Propeller R.P.M.: 1,512. Gasoline Consumption: .54 lbs. per H.P. hour. Oil Consumption: .04 lbs. per H.P. hour. Weight of engine, complete with propeller hub, flanges and bolts, carburetor mounted, two magnetos, gasoline supply pump but without radiator, water, oil, starting device, exhaust pipes or propeller: approximately 590 lbs.

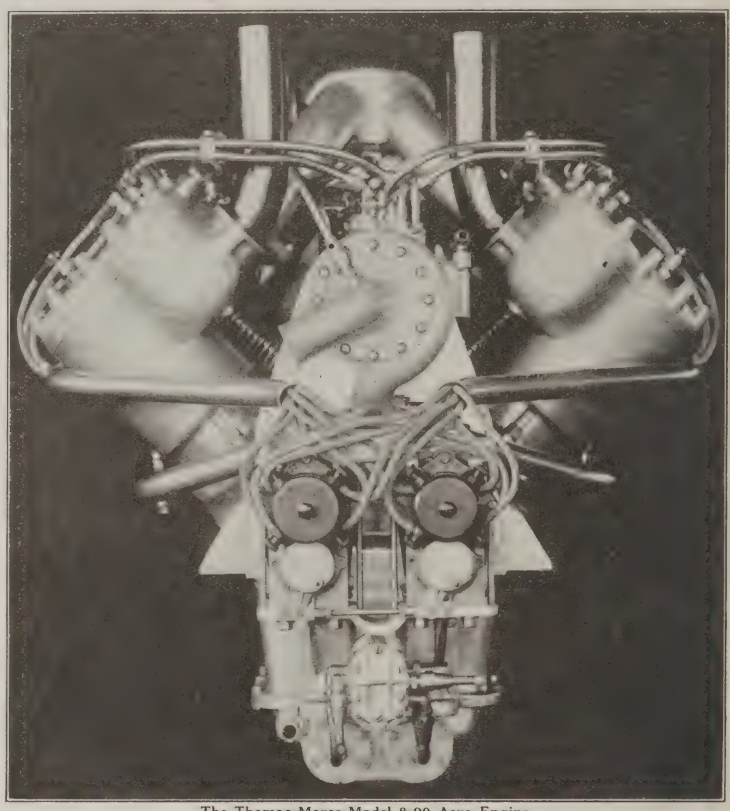
Cylinders—The cylinders are of the "L" head type. Cast in blocks of four each of special non porous, high tensile strength aluminum alloy. The integral water jackets are designed to provide ample space around all parts of the cylinder. The cylinder feet are of sturdy proportions with holding down bolts close to the cylinder barrels. The cylinder heads are bolted on, an ample number of studs evenly and closely spaced being used for this purpose. The cleaning out of the carbon and the grinding of valves and the general inspection of cylinders and pistons is thus greatly facilitated. Cast iron is used for the liners, fitted to the cylinder barrels, as no material has been found to equal it for wearing qualities.

Valve and Valve Mechanism—Valves are of Tungsten steel, made in one piece without welding and have a clear port opening of two and thirteen sixteenths inches. Valve springs are of special alloy steel to insure continuous service under the most severe conditions. The valve push rod guides are held in the cylinder feet. The push rods made of hardened tool steel are operated directly by the cams without intervening cam rockers and are provided with means for adjustment, making a light, durable and simple valve operating mechanism. Special provision prevents oil leakage at the push rods

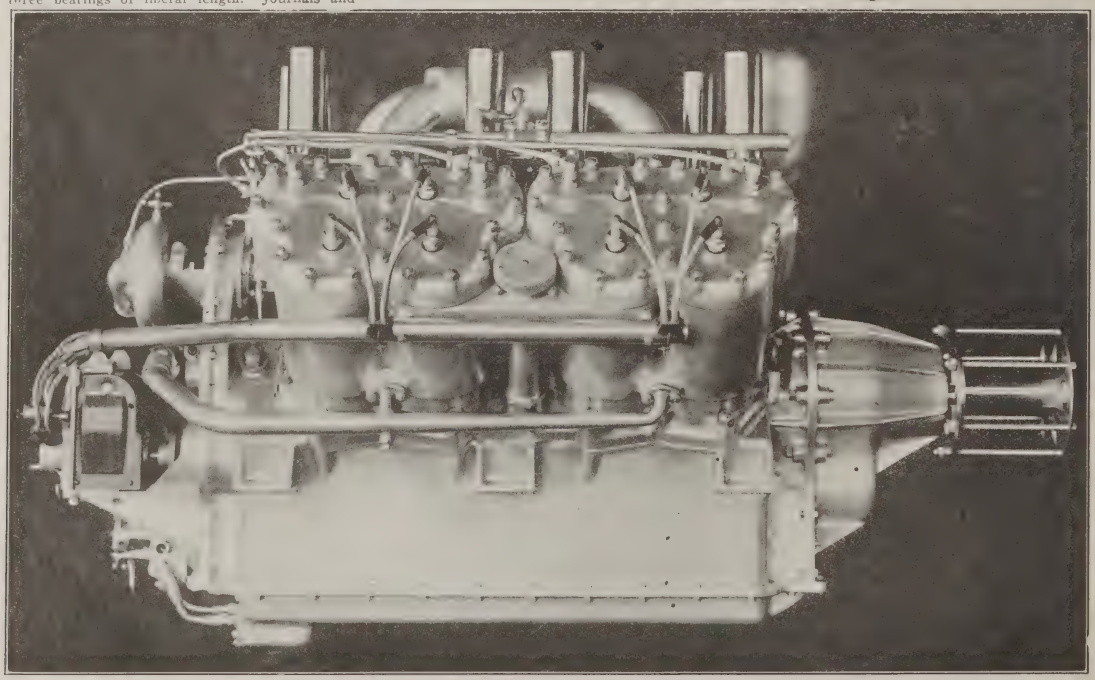
Camshaft.—The three bearing camshaft, with its sixteen integral cams hardened and ground to size, is located in the crankcase between the two banks of cylinders. To insure rigidity and long life to the camshaft bearings, it is made of generous size and drilled for lightness. The special phosphor bronze bearings are lubricated by high pressure force feed, directely from the main oil duct. The driven end of the camshaft is flanged for bolting to the timing gear.

Timing Gears—The two timing gears, with spur cut teeth, are made of chrome nickel steel, heat treated. The camshaft gear is bolted to the flanged end of the camshaft. Lubrication is provided by overflow of oil through the pressure regulating relief valve, situated adjacent to the timing gears at the end of the high pressure main oil duct

Crankshaft—The four throw crankshaft made of special chrome nickel steel, is carried on three bearings of liberal length. Journals and



The Thomas-Morse Model 8-90 Aero Engine



The Thomas-Morse Model 8-90 Aero Engine

crankpins are two and one-half inches in diameter, drilled for lightness and plugged for the high pressure force feed lubrication system. The crank webs are also drilled and plugged to lead oil to the connecting rod big ends.

Connecting Rods—The connecting rods are of H section, arranged side by side on the same crank pin for opposite cylinders. They are made from a special grade of heat treated, chrome nickel steel, having a very high elastic limit, and are machined all over, securing exceptionally light weight and uniform balance. The big ends are babbitt lined; the babbitt being applied directly to the rods and forming an integral part of them. The wrist pins are locked in the connecting rods and swing in liberal bearings in the piston bosses.

Pistons—The pistons made of special aluminum alloy are light in weight and have well ribbed heads for strength and cooling. Two concentric lap jointed compression rings are located near the head, while one oil scraper ring is carried in the skirt. The piston pin is made of chrome nickel steel, drilled hollow, park hardened and ground to size.

Crankcase—The crankcase is a special aluminum alloy casting of deep sided section, well ribbed for strength and rigidity. The lower half serves only as an oil pan or sump and is bolted directly to the upper half.

Carburetor— Stromberg, double vertical carburetor is used, bolted to a water jacketed cast aluminum double branch manifold, serving the two banks of cylinders. All manifold bends are of large radii.

Lubricating System—The lubricating system is of the high pressure, circulating type. A gear pump located within crankcase and driven from the crankshaft timing gears draws oil from an oil supply tank located at any convenient place near the engine through a fine mesh wire screen which is integral with the pump. Oil is delivered from the pump to a main oil duct, also located within the crankcase. Drilled holes in the main bearing supporting webs, connecting with this duct lead the oil directly to the three crankshaft bearings. The connecting rod big ends receive oil through the drilled crankshaft webs and crank pins. Oil is carried up from the main duct to the front camshaft bearing and from there through the hollow camshaft to the other two bearings. The wrist pins and pistons, cams and push rods are lubricated by the oil thrown off the crank pins. The reduction gears are constantly sprayed with a stream of oil from the main oil duct. A gear pump mounted on the timing gear cover is so designed that all surplus oil collecting in either end of the oil pan is drawn off through large, fine mesh, readily removable screens and delivered back to the supply tank.

Water Cooling System—A single centrifugal water pump is driven at crankshaft speed by a steel gear meshing with the camshaft timing gear. Equal water distribution to both banks of cylinders is insured by a siamese outlet from the pump to the brass water pipes at the base of the cylinder jackets. Water outlet connections are arranged over each exhaust valve. All water pipes are fitted close to the cylinders for rigidity and economy of space. Only four hose connections are necessary with each motor.

Propeller Drive—The propeller shaft is driven from the crankshaft through the two spur gears of the highest grade chrome nickel gear steel, heat treated. It is rigidly supported on three large annular ball bearings housed in a well ribbed aluminum alloy gear case, which is bolted to the crankcase. The shaft is of exceptionally large diameter and drilled to secure light weight.

Ignition System—Two Splitdorf "Dixie" Magnetos are used, each constituting an entirely independent ignition system with two spark plugs per cylinder. They are arranged side by side and driven at crankshaft speed by spur gearing at the rear end of the crankshaft. This position insures their operation under the most favorable conditions, besides providing ready accessibility. Provision has been made to allow the use of "Dixie 84" magnetos, equipped for advancing and retarding the spark or fixed spark "Dixie 810" magnetos and hand starting magnetos.

Self Starter—Provision has been made in the design for the application of the Christensen air starting system when desired. The starting unit is located between the two banks of cylinders and is driven at crankshaft speed by a steel gear engaging the camshaft timing gear. In its application to the Thomas Motor, no drive shaft is exposed, thus eliminating all chances of oil leakage. The starter is composed of four principal parts: An air pump in operation only when compressing air for storage purposes; an automatic carburetor, which supplies gasoline to the air distributed to the cylinders; an automatic distributor, which is in action during the starting period only; and a compressed air tank. The piping to the cylinders is short and direct. The entire apparatus weighs approximately 40 lbs.

Additional Equipment—A gasoline gear pump is supplied as regular equipment. It is situated near the base of the motor and is therefore gravity fed. A tachometer drive is also supplied.

LINE REAMING CRANK SHAFT BEARINGS OF LIBERTY MOTORS

By A. A. MARTELL, Chief Engineer, Taft Pierce Mfg. Co.

PUTTING the manufacture of the Liberty motor on a production basis marked a considerable step in advance of the best American practice in regard to accuracy of machine work on the component parts and also assembling the details, where unusually close limits were employed, into a smooth working and efficient engine.

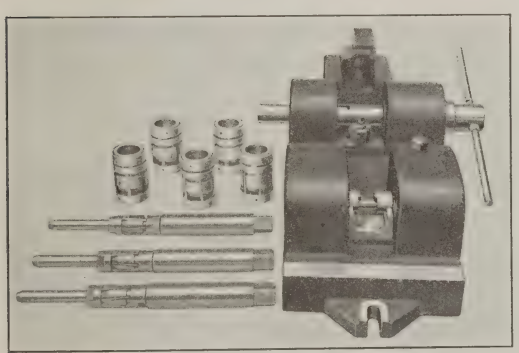
Some one of our illustrious ancestors was so impressed with the value of attention to detail that he broke out in a famous poetical recital of the loss of an important battle due to the failure of a despatch bearer to deliver his message on account of a missing nail in his horse's shoe, thereby starting a train of misfortunes that resulted in a 100 per cent loss, so far as delivering the goods was concerned.

Considering the task that the aeroplane was called upon to perform, the very best we had in machinery and skill was none too good to meet the tremendous requirements.

One of the most vital parts of any motor is the crank shaft and the bearings in which it revolves. Particularly is this true of aviation motors that are continuously run with an open throttle delivering every ounce of power of which they are capable.

The accompanying cuts show the crankcase of the Liberty motor. Note the long studs that bolt the two halves together, locking them firmly and securing a great degree of strength with little weight.

The device used for these roaming bearings is shown resting in the



Connecting rod fixture for reaming

half bearings, in the same relative position it occupies when performing the actual reaming operation, which, of course, is done while the upper and lower halves of the cases are bolted together.

This reaming equipment is known as the Martell Aligning Reamer and was very successfully used on practically all Liberty motors. The operation was performed in an average time of 30 minutes per motor. The size of holes, alignment and surface of bearings passed the most rigid inspection and tests.

To briefly describe the construction of the reaming system and method of operation.

The reamer bar is made of a special steel, pack hardened, ground and lapped. It has two grooves, on opposite sides, and recesses are milled at proper intervals along both grooves to receive the ends of driving screws that, screwing through the body of the reamers, project slightly into the bore.

This bar is supported by two plain, hardened bushings, which are snugly fitted to and held in the core of the bearings Nos. 1 and 7.

To insure the perfect alignment of the bar, there are two other bushings used in bearings 3 and 5, respectively. These bushings are of special construction, consisting of two eccentric bushings, one within the other, the assembly being completed by an outer sleeve, which receives the two eccentrics. A portion of the surface of this outer sleeve is tapered and carries in fine thread, 72 per inch.

This sleeve screws firmly into the soft metal of the bearings and forms a solid anchor for the eccentrics, which are manipulated until the bar is in absolute alignment.

The reamers are then slipped on the bar, partially withdrawing it, the bar, first from one end and then the other, so that the adjustment of the centering bushings will not be disturbed.

The reaming is done by hand, as indicated by the double end wrench shown on the bar.

The design of the reamers present some novel features of construction.

The blades, at their two ends, rest upon hardened and ground wedges, the under surface of the blades being carefully ground to the same angle as the wedges.

The blades are held firmly be means of two adjusting nuts, one at each end, whose inner edges are conically ground to receive the ends of blads which are also ground to a like angle.

There are 6 blades, 4 of them are set at a slight left hand angle in the axis of the reamer, and two are set to a corresponding angle in the opposite direction.

This disposition of cutting edges prevents chattering and produces holes that are round to within .0001.

The design of the expanding mechanism makes it possible to correct variations as small as .0002 or .0003. These corrections are easily and quickly made by simply adjusting the nuts at the two ends of blades. The rear nuts are graduated to .00025 to aid this operation.

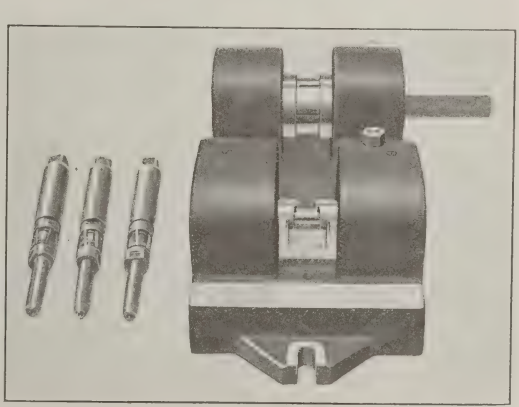
On the Liberty motor the only means of access to the bearings was through the openings provided for the cylinders. This construction naturally handicapped the operators, and it speaks well for the loyal application of the men on the job as well as the ingenious features of the tool that they "carried on" and did their bit to take the germ out of Germany.

Reaming the connection rods presented another interesting feature, and the accompanying cuts show the method of procedure.

The illustration shows the fixture for reaming both ends of the worked rod at one setting.

A hardened and ground steel hinged clamp, accurately located, held

(*Continued on page* 1353)



Connecting rod fixture for reaming

NAVAL and MILITARY AERONAUTICS

Demobilization

The War Department authorizes the following statement:

The "honorable discharge" emblem to be issued by the War Department will be a bronze lapel button somewhat similar to the G. A. R. button of like significance. It is the intention of the Government to distribute the button free of charge to all entitled to it. The buttons will be manufactured only by concerns chosen by the Government, which will furnish the dies for their manufacture and purchase the buttons, thus obviating any possible variance from the approved pattern in design, color or material.

Of appropriate and artistic design, the button is the result of a competition among American artists and sculptors, conducted by the Commission of Fine Arts, of which Charles Moore is chairman, and the following are members: Herbert Adams, J. Alden Weir, Charles A. Platt, William Mitchell Kendall, John Russell Pope, James L. Greenleaf, and Col. C. S. Ridley, secretary. Fifteen designs were submitted by the Commission for final selection by the Chief of Staff.

Overseas Troops Arriving

The War Department authorizes publication of the following:

The cruiser Frederick sailed from Brest February 19 and is due to arrive at New York March 1, with the following Air Service troops: 95th Aero Squadron, 5 officers, 165 men; 103d Aero Squadron, 6 officers, 174 men; 465 Aero Squadron, 3 officers, 126 men; 835th Aero Squadron, 2 officers, 145 men; 109th Aero Squadron, 4 officers, 126 men.

The transport Mexican sailed from St. Nazaire February 20 and is due to arrive at New York March 5, with the following troops: 2 officers, 121 men, New York; 1 officer, 130 men, Camp Upton; 23d Aero Squadron, 2 officers, 158 men; 35th Aero Squadron, 2 officers, 137 men; 149th Aero Squadron, 2 officers, 154 men; 151st Aero Squadron, 1 officer, 150 men; 153d Aero Squadron, 2 officers, 152 men; 158th Aero Squadron, 1 officer, 153 men; 173d Aero Squadron, 2 officers, 152 men; 176th Aero Squadron, 1 officer, 156 men; 184th Aero Squadron, 1 officer, 147 men; 247th Aero Squadron, 1 officer, 150 men; 264th Aero Squadron, 2 officers, 153 men; 469th Aero Squadron, 2 officers, 115 men; 374th Aero Squadron, 1 officer, 147 men; 499th Aero Squadron, 2 officers, 146 men; 500th Aero Squadron, 2 officers, 148 men.

The transport Sibone, which sailed from Bordeaux February 20 and is due to arrive at New York March 3, has on board 14 Air Service officers.

The transport Lake Gaspar sailed from Bordeaux February 20 and is due to arrive about March 8 with 1 casual officer, Air Service.

Transport Ceylon Maru sailed from Bordeaux February 20 and is due to arrive at Newport News March 7 with 1 casual officer, Air Service.

Transport Moccasin sailed from Brest February 20 and is due to arrive at New York March 4 with the following troops: 1 casual officer, Air Service.

The battleship Ohio, which sailed from Brest February 20, and is due to arrive at Newport News March 5, carries 2 casual officers of the Air Service.

The transport Buford sailed from Bordeaux February 17 and is due to arrive at Newport News March 4, with 1 casual officer, Air Service.

The cruiser Rochester sailed from Brest February 17, and was due to arrive at New York about February 25 with the following troops: 467th Aero Squadron, 4 officers and 133 men, divided as follows: 4 officers, 108 men, Camp Upton; 25 men, Camp Taylor; 1 casual officer, Air Service.

The transport Olympic sailed from Brest February 18 and was due to arrive at New York February 25 with 13 casual officers of the Air Service.

The following organizations have been assigned to early convoy: 99th Aero Squadron, Air Service Casual Co. No. 5.

Another American Ace

Lieut. J. O. Donaldson recently recommended for Military Aviator rating by the Division of Military Aeronautics' Rating Board, has been announced as an Ace, "having brought down five planes officially noted as crashes and three officially out of control." Lieut. Donaldson was not included in the first list of 63 Aces received from General Pershing; but, owing to recent confirmations from British commands with which he flew, a positive record that he brought down at least five planes is now on file in the Air Service. Lieut. Donaldson is a Washington man who took the Ground School Course at Cornell University and completed his flying training with the British. He was attached to a British Squadron when he was forced to land within the German lines. He was captured, but later escaped.

Lieut. Donaldson received the D. F. C.—the British Distinguished Flying Cross.

Preparing Air Biographies

On February 1, 1919, the Director of Military Aeronautics sent the following letter to the presidents of all universities and colleges in this country:

"The Director of Military Aeronautics asks your co-operation in the following matter, which is important to the Air Service of the country and which may be of yet more intimate concern to the locality and to the institution with which you are associated.

"This office is making every effort to assemble the personal stories of the men who have been with the Air Service overseas. It seems not unlikely that the better part of each story is contained in letters to friends and relatives at home. Letters from some of our aviators have already appeared in book form and in the magazines, and from time to time college publications have had occasion to print appreciations of fliers killed in combat.

"Such informal records may supply information of historical value to be had from no other source—information which should find a place in the written history of the country.

"The Director of Military Aeronautics therefore makes this request: That, with the full sanction of those most concerned, this office be furnished with copies of such letters, or excerpts from them, and likewise with copies of any of your student or alumni publications that have contained articles pertinent to this subject. It would be gratifying, also, if you would interest your townspeople in this matter, and would obtain the co-operation of the local press. Whatever you can do to further the assembling of this data—and with reasonable haste, that nothing may be lost—will be deeply appreciated here.

"Communications in reply should be addressed:

"Director of Military Aeronautics,
"Sixth Street and Missouri Avenue,
"Washington, D. C.

"Aeronautical Information Branch."

For a History of the War

On February 25 the War Department authorized publication of the following:

"The Secretary of War has directed that a bulletin be published to the Army to provide that officers and other persons who have served in or with the Army during the war and who are in possession of historical information of value for use in connection with the history of the war are authorized and invited to communicate such information direct by mail or otherwise to the Chief of the Historical Branch, Army War College, Washington, D. C., such material to be considered as having been furnished to the War Department unconditionally, to be used as desired and not to be returned unless request is made to do so.

"The request from the O. D. M. A. has brought assurance of co-operation from a source from which not a little might be expected. The material as received will be sifted and classified, and copies will be furnished the Historical Branch of the War College. It is desired to give all the publicity possible to this appeal from the Air Service.

"Remember, this war, too, must find its Lossing and McMaster. So officers and men in the camps who have material, in letters or other form, of the sort that goes to make histories should think to send a copy to the O. D. M. A.

"Attention Aeronautical Information Branch."

Ratings of Fliers

Major Melvin A. Hall, A.S.A., is appointed a member of the Board of Officers created by Paragraph 3, Special Orders No. 28, Division of Military Aeronautics, February 1, 1919, to pass on the qualifications of flying officers who have distinguished themselves in action, with a view to awarding them such ratings as their achievements and abilities may warrant. Major Hall is appointed vice Colonel Townsend F. Dodd, M.A., A.S.A., relieved.

Lieut. Col. Bruce B. Buttler, A.S.A., has been ordered to report at Kelly Field, San Antonio, Texas, on March 15, 1919, for examination for rating as Junior Military Aviator.

The following-named officers, having completed the required tests, are rated Reserve Military Aviators, to be effctive from the dates set after their respective names:

Second Lieut. Warren E. Calvin, A.S.A., January 20, 1919.

Second Lieut. Cyril R. Davis, A.S.A., January 20, 1919.

Second Lieut. John H. Matthews, A.S.A., February 7, 1919.

Licenses to Fly Civilian Aircraft

Licences to fly civilian aircraft issued by the Joint Army and Navy Board on Aeronautic Cognizance, up to and including February 24, 1919, are as follows:

License No.	*Issued to*	*Address*
301	Marjorie Stinson,	122 King Avenue, San Antonio, Tex.
302	Theodore Hedlund,	Boston, Mass.
303	Louis Gertson,	Chicago, Ill.
304	Baxter H. Adams,	Henderson, Ky.
305	David Gregg,	Brookline, Mass.
306	Edwin K. Jaquith,	Atlantic City, N. J.
307	Curtiss Flying Station,	Atlantic City, N. J.
308	Walter Pack,	San Francisco, Cal.
309	Leon Richardson,	Washington, D. C.
310	W. H. Fitzpatrick, Jr.,	Buffalo, N. Y.
311	Walter T. Varney,	San Francisco, Cal.
312	Clarke C. Minter,	Washington, D. C.
313	W. E. Nightingale,	Nantasket, Mass.
316	J. Riley,	Caro, Mich.
320	Harry B. Crewdson,	Chicago, Ill.
321	Warren L. Baker,	Providence, R. I.
322	Allen P. Bourden,	East Greonwich, R. I.
323	John O'Mara, Jr.,	Brooklyn, N. Y.
324	Ed R. Hutchison,	Elmira, N. Y.
326	Curtiss Aeroplane & Motor Corp.,	New York, N. Y.
327	B. H. Kendrick,	Atlantic City, N. J.
328	Prof. Rexford C. Gardiner,	Celoron, N. Y.
330	Frank Bonar,	Underwood, Iowa.
331	Charles T. Mills,	La Salle, N. Y.
332	America Trans-Oceanic Co. (David H. McCullock),	New York, N. Y.
333	Frank Mills,	Essington, Pa.
335	Walter W. Raub,	Salem, Ohio.
336	A. W. Snyder,	Bolling Field, D. C.
337	Howard A. Scholle,	New York, N. Y.
338	Melvin W. Hodgdon,	Somerville, Mass.

Licenses renewed:

License No.	*Issued to*	*Address*
117	The Lawrence Sperry Aircraft Co.,	Farmingdale, L. I.
176	Dewey Airplane Company,	Dewey, Okla.

Types of Planes Active, Obsolescent, or Obsolete

The following types of planes are declared by Circular No. 5, O. D. M. A., February 21, 1919, "active," "obsolescent" and "obsolete":

ACTIVE

Planes	*Motors*
Curtiss JN4H (JN4HB)	Hispano Suiza Model I
Curtiss JN6HO (JN4HG)	Hispano Suiza Model E
Curtiss JN7H (JN6HB)	Liberty-12
DeHaviland 4 (JN6HP)	LeRhone 80 HP
USD9A ((JN6HG1)	
SE-5 (JN6HG2)	
VE-7	
S4-C	
Martin Bomber	
Hydros	
Lepere	
Handley Page	
Spad	
Sopwith Dolphin	
Caproni	

OBSOLESCENT

Planes	*Motors*
Curtiss JN4A	Curtiss OX2
Curtiss JN4B	Curtiss OXX3
Curtiss JN4D	Curtiss OX5
Canadian JN4	Hispano Suiza Model A
Thomas Morse Scout	equipped with Gnome Motor

OBSOLETE

Planes	*Motors*
Curtiss R4	Thomas Morse -8
Curtiss R2	Curtiss Model -0
Curtiss N8	Curtiss OXX
Curtiss Twin	Curtiss OXX-2
LWF	Curtiss N-8
Standard J-1	Sturtevant 5-A
L-2	Hall Scott A5A
R-6	Hall Scott A7A
Martin -R	Lawrence

Standard D	Clerget -9
Heinrich C-1	Curtiss V-2
Aero Marine	Curtiss V-X
Boeing	Wright 6-cyl.
Martin TT	Salmson M-9
Martin R6	Renault -12
Standard H-2	Renault -8
Standard H-3	Sturtevant 4-cyl.
Sturtevant S-4	Aero Daimler 6-cyl.
Bristol Fighters	Curtiss Type S
Burgess Hydroplane	Laviateur -8

The following is the policy in regard to operation and repairs of obsolescent planes and engines:

(a) Obsolescent planes and engines will be operated and used in active training until through accident or fair wear and tear they are put out of commission.

(b) Where necessary spare parts are available at a Flying Field or Repair Depot, obsolescent planes and engines will be repaired and put back in commission.

(c) Where the necessary spare parts for making repairs are not available at a Flying Field or Repair Depot, they will be requisitioned on the supply source, which source will obtain them, if possible, from other Flying Fields, Repair Depots or Supply Depots in cases where there are none at the supply source upon which the requisition was issued.

(d) Where obsolescent planes and engines are out of commission on account of the lack of spare parts which may be easily manufactured at the Flying Fields, it will be left to the judgment of the Commanding Officer as to whether or not it is advisable to make the necessary parts to complete the repair. No extensive repairs, however, will be made.

(e) No spare parts will be purchased or manufactured other than as indicated in paragraph (d).

(f) After Surveys and Salvage Reports have been properly executed, parts from planes and engines out of commission on account of lack of spare parts will be used as spare parts for making repairs to other similar planes and engines which may be put in commission by the use of parts from the planes so surveyed and salvaged.

The policy regarding the disposition of obsolete planes will be announced later.

Flying Data

Aeroplane daily crew reports from flying fields yield some interesting summaries, according to tabulation by the Information Records Branch of the Supply Section for the month of December, 1918. Here are some of the totals for the 27 flying fields considered as one. Decimals for the larger numbers are omitted.

For All Fields

Total hrs. per mo. Engine running time	49,745
Total hrs. per mo. Aeroplane flying time	44,759
Average number ships per day	531
Total gals. gas per mo. put in	320,938
Average gals. gas per ship per hr	6.45
Total qts. oil per mo. put in	111,966
Average qts. oil per ship per hr	2.25
Qts. used oil returned	11,362

Travel for Aviation Purposes

Section III of G. O. 22 W. D., February 6, 1919, amends Section III of G. O. 81 W. D., 1918, as follows:

"Actual and necessary expenses, not exceeding $5 per day, may be paid from the Signal Corps appropriation of July 24, 1917, or from the Air Service appropriation of July 9, 1918, to officers, enlisted men, and civilian employees of the Army, and authorized agents when sent on special duty for aviation purposes at home or abroad under specific instructions from the Secretary of War."

It also announces that "Vouchers submitted for payment under the provisions of this order will be accompanied by an itemized statement of expenses."

It is to be noted that this change in General Orders has the effect of stopping reimbursement for expenses of any special duty for aviation purposes not authorized by the Secretary of War. Also, that actual expenses and not a per diem allowance will be paid, and that reimbursement will not be made for expenses in excess of $5 a day.

The officer in charge of Airship Training and Instruction at Akron, Ohio, is announced as Commanding Officer of a Balloon School, for the purpose of issuing travel orders in cases of officers, returning from free balloon flights.

The "Family Medicine Book" for Motor Troubles

A pamphlet on Motor Trouble Shooting, issued by the Training Section, has been sent to the various flying fields for the use of pilots in cross-country flying.

The compilation of this pamphlet stands to the credit of Second Lieut. Curtis C. Webb, Assistant Engineer Officer at Ellington Field, who did all the detailed work on it.

The pamphlet is a well-set-up pocket edition of about twenty pages, excellently printed and well laid out. Each "trouble" has a page to itself, where it is diagnosed in itemized form. Directions for starting Hispano-Suiza and Liberty engines and a few general rules precede.

Over 210 Hours in the Air

Ream Field boasts a JN4-H with a record of 210 hours and 20 minutes actual flying time without once having had its motor overhauled.

According to the Rockwell Field *Weekly Flight*, "this ship put in over 95 hours in combat work—conceded to be the work placing the heaviest strain on a ship—was mounted with a Marlin machine gun and used in tow target work and parachute drill, and answered in full every call on it without the mar of a single forced landing."

The chauffeur, one of Ream Field's best motor mechanicians, who was in charge of the plane throughout its entire course, was given permission to make an exhaustive endurance test of it. It was generally conceded that the machine was good for thirty or forty more hours, but the officers in authority decided that it should be stripped, the motor taken apart and photographed in detail and its history studied for the benefit of further motor construction.

Lieut. Col. William Thaw, now at Rockwell Field, has been designated Post Executive Officer.

Outstanding Contracts

The Statistics Branch, General Staff, War Department, announces the values of contract terminations and deliveries for the Army Air Service to February 8, in percentage of contracts outstanding November 9, 1918.

No allowance for settlements has been made. Value of suspensions as well as of cancellations are included in terminations.

The figures are: Terminated, 82.5 per cent.; delivered, 15 per cent.; balance, 2.5 per cent.

Recent Naval Orders

Lieutenant Louis E. Thornton, to duty under public works officer, naval air station, Pensacola, Fla.

Lieutenant (junior grade) J. R. Gibson, to duty in command of naval air station, Marginal Parkway, Brooklyn, N. Y.

Lieutenant John A. Davis, to duty as inspector of engineering material, U. S. N., Curtiss Aeroplane and Motor Corporation, Buffalo, N. Y.

Lieutenant (junior grade) J. A. Eaton, to duty naval air station, Rockaway Beach, L. I.

Lieutenant John S. Fulton, Jr., to duty office of naval operation aviation, Navy Department.

Lieutenant William B. Atwater, to duty as aviation aide Sixth Naval District.

Lieutenant J. W. Brown, to command the N-5.

Lieutenant R. D. Bussdicker, Avia., Pauillac, to Pauillac, connection Crew No. 3.

Lieutenant (junior grade) James S. Cuff, to duty U.S.S. N-2.

Lieutenant Commander W. R. Sullivan, Avia., Queenstown, to Base No. 18.

Lieutenant B. V. Eckhout, designated as Nav. Aviator.

Lieutenant P. J. Piccirilli, from Curtiss Aero and Motor Corp., Buffalo, N. Y., to duty, Nav. Yard, Washington, D. C.

Lieutenant A. Tucker, to duty in Construction and Repair Department, Nav. Station, Pensacola.

Lieutenant Edwin S. Parsons, to duty in command naval air station, Bayshore, L. I., N. Y.

Lieutenant Commander Nathan B. Chase, to duty Brunswick, Ga., report commanding officer naval air station temporary duty and for duty command upon det. of present commanding officer.

Lieutenant W. T. Hopkins, Avia., Brest, to Base No. 7.

Lieutenant Julian A. Ducray, to duty as executive officer naval air station, Miami, Fla.

Lieutenant Commander James C. Monfort, Naval Air Station, Rockaway, L. I., as executive officer.

Lieutenant (junior grade) James S. Cuff to U. S. S. N-2.

Lieutenant Commander Harold C. Van Valzah, to Miami (Fla.) Naval Air Station.

Lieutenant Thomas R. Cooley, to rejoin U. S. S. Florida.

Lieutenant Lyman K. Swenson, to U. S. S. R-17.

Lieutenant Lewis J. Strecher, to U. S. S. R-2.

Commander William B. Waite, Jr., to R-S, at New York.

Lieutenant Scott Umsted, to command U. S. S. N-2, on detachment of Lieutenant Commander Frazer.

Lieutenant Alva J. Moore, to duty U. S. S. R-3, and on board when commissioned.

Lieutenant Commander Charles M. Elder, to duty U. S. S. R-6, and in command when commissioned.

Lieutenant Benjamin H. Page, to command U. S. S. N-3.

Lieutenant (junior grade) Walter S. Mallory, to duty U. S. S. N-1.

Lieutenant (junior grade) Richard T. Guilbert, to duty U. S. S. A-4.

Lieutenant (junior grade) Roderick T. Smith, to command U. S. S. D-2, upon detachment of Lieutenant Chambers.



German machines turned over to the Allies under the armistice terms

FOREIGN NEWS

Royal Air Force Making Observations for Transatlantic Flight

London.—In a few weeks box kites carrying delicate instruments will be flown from the sterns of Atlantic liners on the various routes between England and the United States. This is to be part of a world-wide plan for recording conditions in the upper air, says the Daily Mail.

The kites are owned by the meteorological section of the British Royal Air Force. They are expected to fly at a great height and to furnish information of incalculable value to prospective transatlantic aerial pilots.

Italian Aeronautic Mission to Argentina

According to information received in Buenos Ayres, an Italian Aviation Mission, composed of four officers and several aeronautic experts, is leaving for Argentina to assist in the development of military and commercial aviation.

Dagoberto Godoy Flies Over Andes

Dagoberto Godoy, a Chilean aviator, flew from Argentina across the Andes to Chile on December 19 in a Bristol biplane. An altitude of 17,300 feet was attained during the flight. The Chilean Government has awarded a prize of 50,000 pesos (about $18,000) to the first aviator accomplishing this feat. The Military Club tendered Godoy a sumptuous banquet in celebration of his feat.

Prince Albert to Qualify for His Wings

Prince Albert of England, who for some time has been attached to the Royal Air Force and has made many flights as a passenger, is going to complete training for his wings at R. A. F. Headquarters at St. Andree, 45 miles from Bologne. A special Avro 504 type machine has been built and flown to the field from the Avro factory at Hamble.

Aerial Transport for Africa

A company has been organized in London for the establishment of aerial landing places and hangars and for the manufacture and sale of aircraft in Africa, having a capitalization of $3,000,000 and bearing the name of Aircraft Corporation of Africa, Ltd.

Looping Record Reported Broken

Issoudon, France.—Lieut. Joyce, of the testing department of the Third Aviation Instruction Center, is reported in *Plane News* as having executed 300 consecutive loops in 66 minutes. The feat was performed in a Morane monoplane with a 120 h.p. Le Rhone motor, an average altitude of 2,000 feet being maintained. 24 minutes 30 seconds were required for the first hundred loops, 20 minutes 30 seconds for the second hundred and 20 minutes for the third.

Handley Page Transatlantic Plane Being Shipped to U. S.

London.—According to a dispatch to the *New York Sun*, the Handley Page firm is packing a plane for shipment to the United States, to attempt the flight across the Atlantic from west to east. The plane is a four motored machine, propelled by four Rolls-Royce motors, totalling 1,500 horsepower and giving a speed of ninety-five miles an hour on a consumption of sixty-two gallons of petrol per hour.

Sweden Plans London to Petrograd Route

Captain Dahlbeck, a Swedish aviation expert, in an article in a Swedish commercial journal, submits a plan for a commercial air route between London and Petrograd. He points out that such a route is practicable by way of Amsterdam, Esbjerg, Copenhagen, Stockholm and Helsingfors. An alternative route through Christiania, Gothenburg and Copenhagen is also suggested for investigation.

Air Lines to Link British Dominions

London, Thursday, February 20.—"Preparations must be made for the day when all-British air routes will play a great part in the maintenance of the commercial existence of the British Empire," said Major-General Sir Frederick H. Sykes, controller general of civil aviation, in an address before members of the Australian and New Zealand Luncheon Club to-day. He said that the British government had for some time been engaged in mapping out stages on an air route from Cairo to Australia, by way of Karachi, Singapore and the Sunda Islands.

"The establishment of postal service by aeroplane is a practical proposition," he said, "and it is one the dominions will undoubtedly have in hand at an early date. Statistics show that for ten years before the war an average of £3,000,000 in gold was anually sent to the United Kingdom by Australia. I leave it to you men of business to estimate the enormous gain that would be secured if this bullion could be transferred and put into circulation in, say, ten days instead of sixty."

Sir Frederic outlined the work that is being done in establishing aerial postal routes between England and France and between Boulogne and Cologne, where British troops are located. At present a letter is five days in transit between London and Cologne, and the speaker declared this time could be reduced to seven hours. He said a regular time table is now being made out, landing stages are being fixed, and detailed preparations for the service are making progress.

British Airship Flies 5,000 Miles

London, February 21.—During a discussion of the Aerial Navigation Bill in the House of Commons to-day, Major Gen. John E. B. Seeley, Parliamentary Under Secretary of the Ministry of Munitions announced that the Government intended to make flying safer by providing a large number of aerodromes, some of them military establishments and some civil.

A British airship, according to Gen. Seeley, recently remained in the air for more than one hundred hours. At an average speed of fifty miles an hour, the Under Secretary added, the airship must have covered more than 5,000 miles. It was possible that the airship could have continued longer in the air, the speaker declared, notwithstanding the fact that it encountered considerable wind.

Four Air Lines Selected by Great Britain for Transatlantic Flight

London.—In connection with the meteorological survey and other preparations for the early crossing of the Atlantic by aeroplane, it has been announced that four routes have been selected for the feat, as follows:

1—From Scotland to Greenland, thence to Canada.

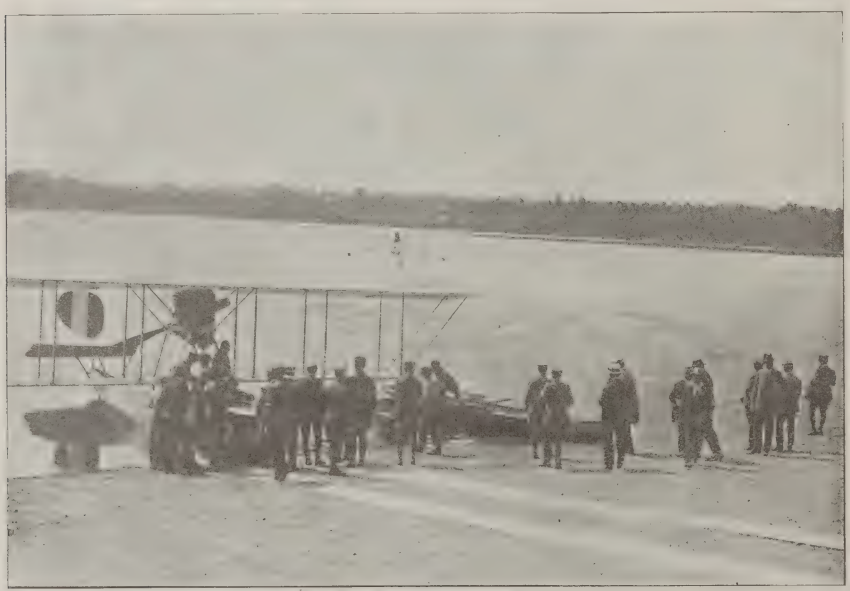
2—From the west of Ireland to St. Johns, where the landing place for the giant seaplane, that is to make the flight has been selected.

3—From the west of Ireland direct to New York, when the British fleet makes its intended visit to New York after the signing of the peace treaty, probably in July. The warships will proceed in a long line, with intervals of thirty miles between them, so as to be in position to render every possible assistance to the aeroplane crossing the ocan.

4—By way of Cornwall, Portugal, the Azores and thence direct to New York.

Vedrines to Fly Caudron to Rome

Paris.—Jules Vedrines, who recently landed on the roof of a Parisian Theater, the Galeries La Fayette, announced his intention of flying a twin-engined Caudron on a non-stop journey from Paris to Rome and back. The machine is of the type known as C23, officially, a pattern of night-bomber intended for the entertainment of the Berlin populace during the long mid-winter evenings. The armistice, however, made this unnecessary. The C23 Caudron planes are equipped with two 300 h.p. Hispano-Suiza engines and have sufficient lifting power to carry a twenty-four hour supply of fuel. It is quite possible that Vedrines will succeed in breaking the world's endurance record.



Two F. B. A. Flying Boats ready for flight

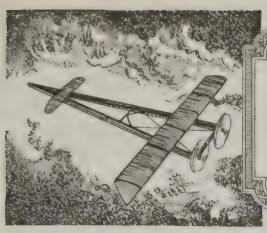
British Lighter-Than Air Anti-Submarine Patrol

London.—The London *Times* aeronautical review reveals several facts of interest regarding the lighter-than-air patrol against the submarine. A chain of lighter-than-air bases was established on the coast, from Mullion in Cornwall around the coast of England and Scotland to Pembrook. In this patrol and convoy work conducted from these bases, a total of more than 53,554 hours was flown. One of these flights lasted 50 hours and 55 minutes, which record has been bettered by ten hours since the signing of the armistice.

The airships used were of six types: S. Ss. (Submarine Scouts); S. S. Ts. (Imprvoed Submarine Scouts with two motors); Coastals, Coastal Stars, Parsevals and N. Ss. (North Seas).

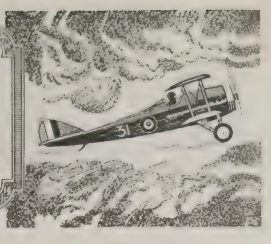
London to Glasgow Airline

London. — Grahame White has announced that a daily London to Glasgow express air service is being established.



ELEMENTARY AERONAUTICS *and* MODEL NOTES

By John F. McMahon



Three Cylinder Motorcycle Driven Machine

AS stated last week I am about to describe a light one seater medium fast motorcycle engine machine or at least an improved motorcycle engine with 3 cylinders. Before proceeding I might suggest that readers who contemplate building this machine should subscribe to this paper to insure against missing one or more of these articles which is generally the case when a reader depends on getting one from a local newsdealer.

Hundreds of letters have been received asking for back numbers of AERIAL AGE containing an article pertaining to the Ford motored aeroplane only to be refused on account of these numbers being exhausted. The reader can send his subscription to the Model Editor who will see that he gets his name placed in time for the first issue containing these series.

The weight of the body of this machine will be about 75 lbs., including gas tank, seat, and control levers, as well as landing gear. The planes including struts and wiring will weigh 65 lbs. Tail works and rudder weigh 20 lbs. which gives a total of 160 lbs. The motor will weigh 125 lbs. complete, giving us a grand total of 285 lbs. for the complete machine.

These weights can be checked up by the reader as we go along. This is not difficult as wood weighs a certain number of pounds per cubic foot according to the species.

Spruce	weighs 25 lbs. per cubic foot.
Pine	weighs 25 lbs. per cubic foot.
Fir	weighs 28 lbs. per cubic foot.
Ash	weighs 39 lbs. per cubic foot.

A pound or two can be added to this if the lumber is purchased from an ordinary moulding mill or lumber yard as wood found in these places is generally not as dry as one would find in a big Aeroplane Factory where nothing but the best of materials is purchased.

To calculate the weight of the wings and fuselage is simple and the reader can do this by finding the volume of each strut and longeron or wing beams and ribs, the same as any school boy figures the amount of water that is contained in a vessel of certain dimensions.

The weight of the machine is 285 lbs. empty, for the pilot we will allow 175 lbs., and 5 gallons of gas or roughly 40 lbs. This gives us 500 lbs. approximately for the machine ready for flight.

Now we will use the R.A.F. No. 3 wing section which has a lift coefficient of .00347 at 15°45′.

To find the surface needed we simply use the formula which was given in the early issues of these articles which is

$$\text{Area} = \frac{500}{.00347 \times 1225} = 117 \text{ sq. ft. of surface needed at}$$

35 M.P.H. This you will understand is for a monoplane wing having no interference. Biplane interference varies according to the gap to chord ratio which for the combination we are going to use gives us an efficiency of 85 per cent.

As we need 117 sq. ft. of monoplane surface it will be necessary for us to increase the Biplane surface until the lift equals that of a monoplane of 117 sq. ft. We find this by dividing 117 by .85 which gives us 137.5 sq. ft. needed. At 4 degrees the coefficient is .00175.

The machine which I am about to describe will have dimensions as follows:

Top Wing	20 feet
Lower Wing	16 feet
Chord	4 feet
Gap	4 ft. 3 in.
Overall length	15 feet

There will be a single set of struts on each side and the top wing will have an overhang of 2 feet. The planes will have a stagger of 12″. Ailerons on top wing only.

Model Aeroplane Contest in California

THAT the Western boys are beginning to catch up with the boys of the East is shown in an account of flights performed by rubber driven models in a contest for a Silver Cup held by the San Francisco Model Aero Club, under the auspices of the Pacific Aero Club who are to adopt the smaller organization as an auxiliary. Mr. Sydney Bibero represented the Pacific Aero Club, of which he is secretary. The judges were Messrs. W. F. Hopkins, George Ashley and Clion Calwary.

Those who competed were the following:

Roy Ashley	Laurence Pinkham
Lawrence Irwin	Earl Vival
Daniel Tuthill	Clion Calwary
Theodore Morse	John Gutman
George Ashley	Edward Mosone
Preston Hopkins	Raymond Hasen
George Mullins	Jack Fairfield

Many members did not compete owing to the rainy weather. The contest was won by Edward Mosone. Record of flights will be printed later. Mr. W. F. Hopkins is the Director of the Club, and Raymond Larsen is President.

The rules for the contest were as follows:

1. Model must be manufactured by member entering same.
2. Each member must abide by the rules and regulations and decision of the judges.
3. Models must be flown by members entering same.
4. All entries must be registered before the flight: name of exhibitor, type of model, and weight.
5. Each entry is entitled to three trials and three official flights.
6. Announcement must be made to judges before each official flight is flown. Official flights must not be flown before word from the judges.
7. Each entry is allowed two assistants.
8. No flight is conceded official unless the model flies 100 feet.
9. Flights will be measured in a straight course, regardless of curves, dips and circles.
10. Judges may change regulations at their pleasure.
11. The average feet flown declares the point. The winner of the contest is declared one point toward the cup.



The San Francisco Model Aero Club holds contest for a cup. Mr. R. Hansen is fourth from left standing



Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

The Soliloquy of a Modern Hamlet

To fly, or not to fly—that is the question.
'Tis not befitting that we stand aloof—and
In the aerial fields we pioneered—see
Other nations plunged in contest keen
To wrest the laurels of the skies
That, once, were ours,—to be but cast aside
As trifling baubles nothing worth.
Much better that we gird ourselves anew
And, in the lists, compete for what is but our own
By right of heritage, and in accord
With hist'ry's records of ambitions won and held
In every sphere where skill of men count aught
And Progress holds its sway.

One fain would ask how 'twas we failed
To heed the deeds and pleas of those, our pioneers,
Wrights, Curtiss, Martin,—others who saw,
Writ large on backgrounds of celestial blue,
The warning prophecies of coming days.
Yet we lay dormant. Men of other lands
Foresaw the uses of the bird-like thing
Conceived and born beneath our flag
But fostered 'cross the seas, while we
Inert, supine with smug contemptuous mien
Cared nothing for our passing fancy's child.

So came grim Mars—in tragic, fearsome garb of modern cut
And tailored by the hand of science in callous style,
And brave men fought on land and 'neath and on the sea, and—
As if in irony to mock us—
High in the clouds where we have staked our claims,—
And quit them as if 'twere barren soil
And yielding naught but Death to trespassers.

Two years,—And then the call to Freedom's standard
Rang throughout our land, and Freedom's sons responded
As in other days. Each to his bent—on sea or in the trench—
And many sought adventure in the skies
Beside their fellows—gallant Lafayettes who'd scorned
The niceties of warring etiquette—
And played their parts
The men were ours, but not the craft they flew
That helped their winning—thus they won
With Yankee grit plus skill of European design
And we would fain have had that winning all-American.
And so we paid the price of indolence that left a blot
'Pon 'scutcheon bright that ne'er before
Was tarnished by so gross a fault 'gainst our traditions.

Thrice-blessed Peace, wrought by our help
(As Saladin's Crusaders of the long-gone times)—
And with intent to prove our might in other fields
Than those of skill and wit and money-getting—
Spread out her wings and a war-tired world
Set to the task of counting up the cost
And make best use of lessons learned,—and found
That fashioning of plowshares from swords a-rust
Has counterpart in aerial craft of war
For needs of Peace in varied form and use.

Where rests the fault that we—who should be first—
Are still alacking (in most grievous shape) that
Enterprise that needs must be applied
To gain the mastership in such directions
And so compete with those who headway made
By reason of our own short-sighted ken
And yet make headway while we—again—
Withhold the aid from those who strain at leash
To join the friendly fray of import grave?

Blame not the Press—that ever-ready friend
Of Progress in whatever guise assumed—
Nor yet our youth, well-learned in art of flight,
Awaiting but a chance to prove their worth
In fields of Commerce—as was proved in War—
On aerial highways knowing neither bounds nor fence.
Blame not our craftsmen, keen to test their skill
Against all comers in design and build
To factor conquest of the elements aloft.
And—still again—there rests no blame with those
Whose workshops idle lie and wait that wide demand
Accorded luckier rivals o'er the seas.

Where then lies the fault?,—ah, there's the rub.
To end this talk of good intent and high ambition
And let the skies bespeak that laggardness has ceased
Would be—indeed—becoming more our prestige won by deeds.
And held by greater deeds.
Much better that we know and talk cold truth,
And face the fact that contest must decide
Where—from the race-tracks of the Heavens—there comes
The shout,—"They're off!—and Europe holds the fields"
And we talk on, of trans-Atlantic flight and Polar quest,
(Great ambitions,—but scarcely all that's to 't)
And Aerial Mails,—that needs must wait awhile, forsooth,
While Europe with her far-flung sky routes laid
O'er wide dominions, linking distant colonies and sons
With Mother-lands,—and with but little said in boast.

And Europe knows—and steels herself to meet—
Our grim determinings, when aroused,
In making war or tilting in the lists of Peace
And that, eventually—
Eventually!—out upon the word—
Why not NOW?

HARRY E. TUDOR, in the Brooklyn *Daily Eagle*.

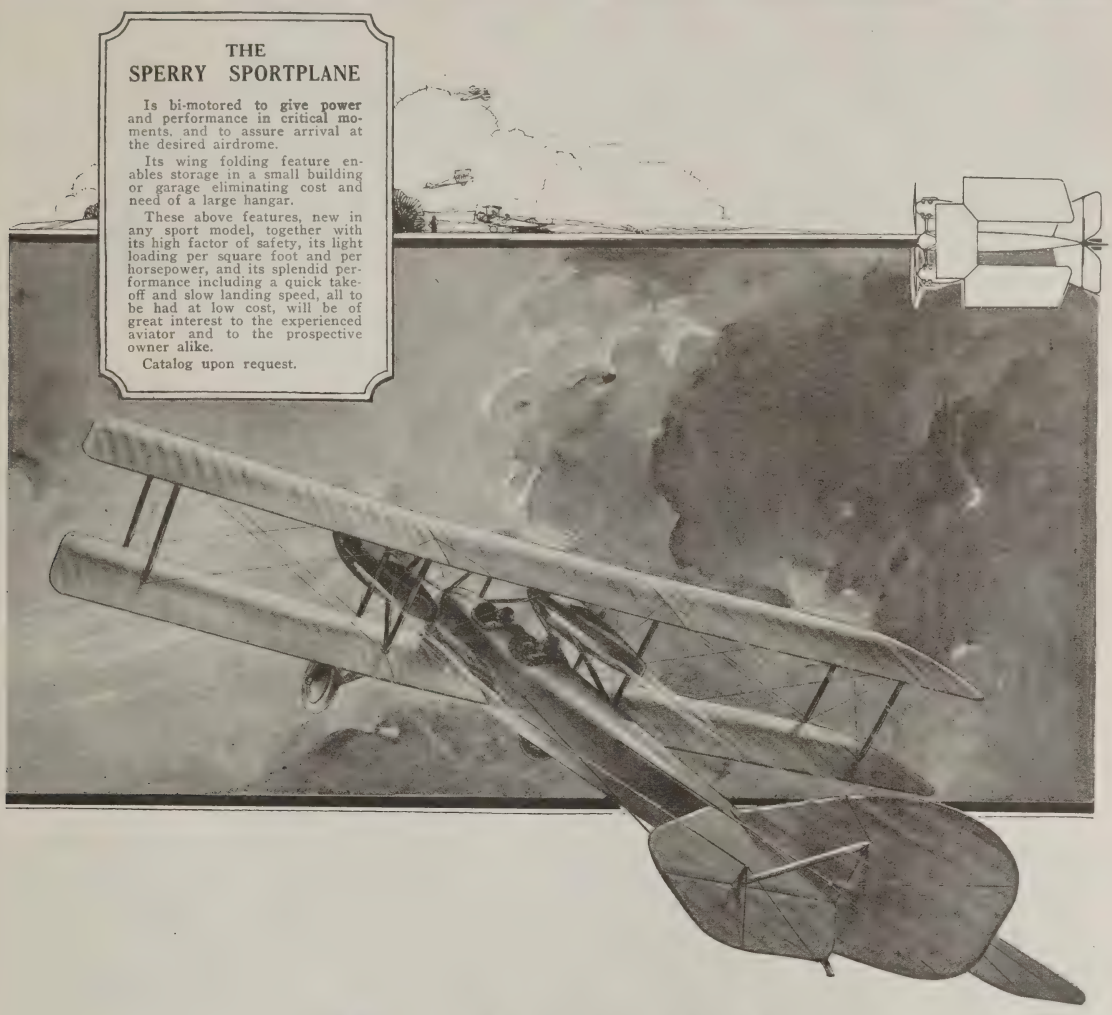
(Dedicated to those, who—with heart and mind and hand—are ready to make full amends for a fault not theirs.)

MUTT AND JEFF—Mutt Isn't in Tom Edison's Class . . . . . By BUD FISHER

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Courtesy of N. Y. World



The W. B. Aeromotor

WE are ready to fill single or quantity orders for this remarkable little motor which is the product of investigation and development thruout the war.

It is a four cylinder, V type, air-cooled 129¾ pound motor developing 38 horsepower.

Besides our exhibit at the Aero Show, we will demonstrate, by appointment at a place convenient to the Show, its simplicity of installation and upkeep and its reliability of operation.

LAWRENCE SPERRY
President
THEODORE ARTER
General Manager

THE LAWRENCE SPERRY AIRCRAFT COMPANY.

FARMINGDALE, LONG ISLAND

plane and balloon fabric on Government specification, and which contributed a good proportion of the national output, had on exhibit a complete fabric-testing laboratory. One machine automatically performed and recorded tensile strength tests of fabrics while another machine made bursting tests, which were automatically recorded by the device.

This company has brought out a cotton fabric for use on aircraft which is superior to linen in that it has the same stretching characteristics as possessed by dope, thus preventing peeling and cracking. This material, known as Warwick Seamless Aero Cord, has 35 to 40 per cent. less stretch than linen, although it weighs no more than 3-ounce linen fabric. It is built up on the same principle as the automobile cord tire. A heavier weight—5.75 ounces—of this fabric withstands a bursting test of 50 pounds and possesses 300 to 400 per cent. greater strength than the cotton fabric which was first developed as a substitute for linen.

WYMAN-GORDON COMPANY

(Garden, Space 320-321)

The Wyman-Gordon Company are exhibiting their extensive line of crankshafts, which have been used on Liberty motors, Rolls Royce, Curtiss and Alberto motors, manufactured by the Fiat Company, also on the British B. H. P. and numerous others. The product of this company is well known to the industry and their extensive manufacturing experience and production facilities has enabled them to render exceptional service in supply of materials for the war program.

The Zenith Exhibit

The Zenith Carburetor Company, who, with their French, English, Italian and American factories, supplied a large majority of the carburetor equipment for the Allied Air Forces, will have an exceedingly interesting and instructive exhibit in space Nos. 101, 102 and 103, on the elevated platform at Madison Square Garden during the Aeronautical Exposition.

The Zenith Company supplied all the carburetor equipment for Liberty engines and their product was also used on such other engines as Hispano Suiza, Curtiss, Renault, Lorraine-Deitrich, Salmson, Anzani, etc. Their carburetor exhibit will consist of the following models:

US52, used on Liberty 12-cylinder aircraft engines.

US52 in section, exposing the jets, fuel and air passages, etc., so that its principle of operation may be easily explained and grasped.

US52, cut away so that the action of the altitude correcting device can be clearly seen.

48DC (French design, but American built), used on 150 H.P. Hispano Suiza.

58DC (French built), used on 220 H.P. and 300 H.P. Hispano Suiza.

65TE (French built), used on Salmson Radial engine.

55GD. This is the latest development in Zenith aeronautical carburetors, it having been approved and accepted after careful and thorough tests for the 8-cylinder Liberty engine. It was later to have replaced the US52 on the 12-cylinder engine. The signing of the armistice stopped all work on this and it was never actually put into production, although quite a few were manufactured to be used on the 8-cylinder engines completed.

L8A, used on Hall Scott 4-cylinder engine, and now used on Union Gas Engine Company's aeronautical engine.

06DS, used on Curtiss OX and OXX engines.

06DS. Sectional model showing all parts and operation.

The Zenith Company also have a very interesting and instructive booklet descriptive of the Liberty engine and of the Liberty engine carburetor. The operation of the carburetor is carefully and clearly explained, some data on the Liberty engine is set forth, and there are some very interesting photographs. These pictures include views of the carburetor, of the Liberty engine, of the first plane in which a Liberty engine was mounted, an L. W. F. specially built for the purpose, the testing outfit used on Pike's Peak, etc. These will be had on request at the exposition.

Zenith Carburetor Company representatives at the exposition: V. R. Heftler, president and general manager; V. I. Shobe, assistant general manager; L. A. Pratt, advertising manager; R. H. Taylor, New York branch manager; C. C. Sands, road engineer.

Specialized Wood-working Machinery Unnecessary for Making Aircraft Parts

It is the general opinion that large investment in new machinery is required if a joinery or cabinet work plant is to turn to making small aircraft parts. While highly specialized machinery for making finished parts have been designed and are of great value in quantity production, the equipment of a small wood-working factory is frequently sufficient to produce profitably such parts as wing beams, ailerons, struts, elevators, and landing gear parts.

A British contemporary publication lists the essential machinery for the production of such parts as follows:

Circular saw
Surface planer } May be a combined machine.
Thicknesser

Band saw
Jig saw
Two double spindles
One single spindle
Dimension saw
Drilling machine.

There may not appear sufficient machines above, but it is quite practical to recess or box spars on a single spindle. Although it may appear a delicate undertaking, the article produced is smooth enough to be left without further cleaning up, apart from papering the stop of the cut.

Also struts may be spindled in a box or jig very simply constructed and do not take longer to clean up and finish than those made on a copying lathe or strut-former.

The manufacture of propellers has proved very profitable to some sub-contractors, and only requires machinery available in almost any wood-working mill. In addition to the machinery listed below, if four blade propellers are to be produced a tennoning machine is required for half lapping.

Band saw
Surface planer
Thicknesser
Double spindle
Light drilling machine for pilot hole
Heavy drilling machine for hub and bolt holes.

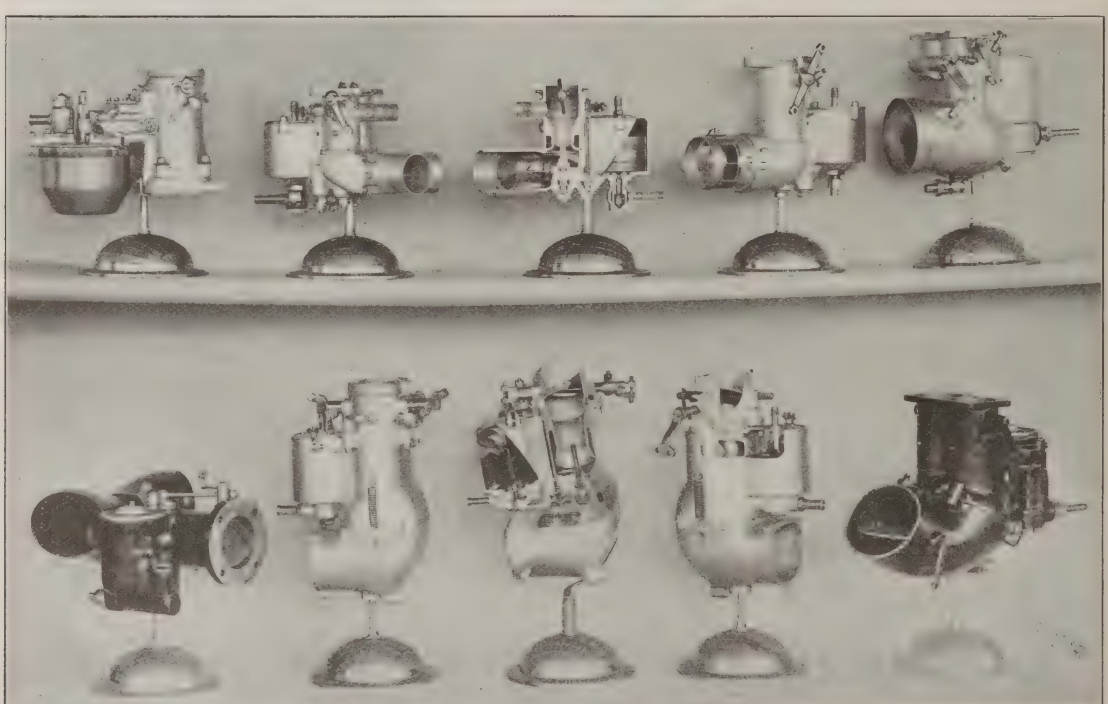
A good deal of shaping with only the above equipment is necessary, but only where there is production in considerable quantities is any material saving effected by recessing machines and the like, as the original investment required is large.

It has been frequently demonstrated that greater attention to the salvage of waste material is sufficient to make profitable the employment of a good man with the sole duty of watching and advising on the conversion of timber during its passage through the saw mill.

Weather Does Not Affect Liberty Motor

Captain J. L. Robinson, who flew from Detroit to Ellington Field, Houston, Texas, in a De Haviland Four plane equipped with a Liberty motor, is quoted as stating that the Liberty motor operates as efficiently in zero weather as in summer weather.

Captain Robison, accompanied by Lieutenant A. A. Adams, is making cross country flights to make technical observations of the Liberty motor under winter flying conditions. On January 3rd to 4th they made a flight from St. Louis to Indianapolis to Detroit, and although the weather was below zero it was merely necessary to renew gas and oil to make the plane ready for the long southward flight.



Section views of various Zenith models

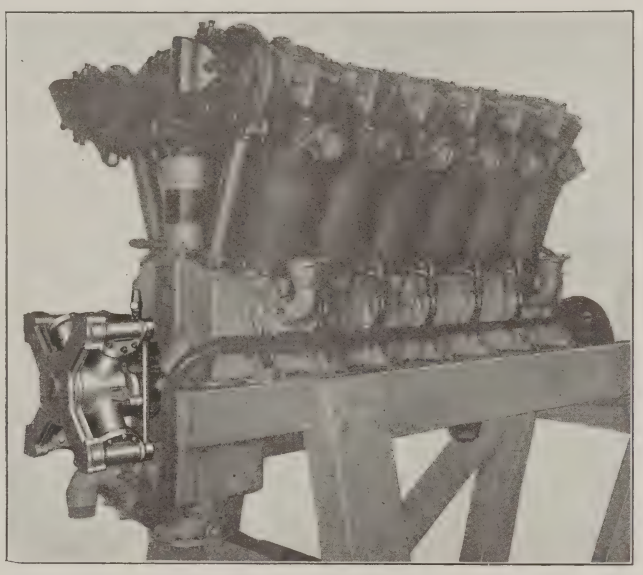
SEE IT AT THE AERO SHOW

(Madison Square Garden)

Liberty Starter

Approved and Now Being Made For U. S. Naval Hydroplanes

Weight, 49 pounds complete.
Cranks motors up to 500 horsepower.
The device itself weighs but 30 pounds.
It is entirely self-contained without brackets or other gearing, bolting direct to crankcase of engine, and cranking direct to end of crankshaft.



A small air cylinder, 1¼" x ¾" with piston running continuously for air pressure on gasoline feed tank is combined with the device and entirely independent in action. This starter furnished with or without it at option.

Official Tests All Satisfactory

CURTISS AIRPLANE CORPORATION
April 20-22, 1916

HALL-SCOTT MOTOR COMPANY
Dec. 6-7, 1916

WASHINGTON NAVY YARD
Aeroengine Testing Lab.
Oct. 23-24, 1917

LANGLEY FIELD
May 15, 1918

Information regarding these trials given on request.

THE simplicity and reliability of the Liberty Starter for Airplanes are due to the fact that compressed air, the most reliable and easily controlled motive force known, is the actuating energy.

Where chances of starter trouble cannot be taken, as, for instance, on naval seaplanes, this type of starter is equipped. Liberty Starters have been thoroughly tested by the U. S. Navy, and are used on U. S. Naval Planes. (See list of tests made.)

The Liberty Starter is an air motor for starting, and a compressor to store air for its own energy in starting. It is entirely self-contained; couple direct to end of crankshaft of motor; needs no alteration in motor or gear reduction, and has ample power for magneto starting. It is the *one* efficient, *dependable* type of starter for airplanes to-day.

We welcome comparative tests, and will gladly arrange for any kind of trial for the Liberty Starter.

Specifications on Request

MOTOR COMPRESSOR COMPANY
52-60 Dickerson Street Newark, N. J.

STREAMLINE WIRE VS. CABLE

THE superiority of streamline wire over cables for the rigging of aeroplanes is shown in some interesting comparative flying tests made at McCook Field, Dayton, Ohio, on November 15 and 25.

A De Haviland 4 plane was equipped with streamline wire and its performance compared with a similar machine having cable.

The results are as follows:

	—With Cables—		—With Streamline—	
Altitude (feet)	Speed M.P.H.	Engine R.P.M.	Speed M.P.H.	Engine R.P.M.
5,000	122.0	1,700	126.0	1,680
6,500	121.0	1,670	125.5	1,670
10,000	118.5	1,620	124.0	1,620
13,000	115.0	1,570	122.0	1,680
15,000	110.5	1,540	119.0	1,540

Speed with cable at 15,000 ft. is low.

Average increase in speed attained is 5.5 M.P.H.

With reference to mention of increase speed attained of 5.5 miles per hour, this is an increase over the use of cables covered with rubber streamline, which in themselves increased the speed about 8 miles per hour, making a total increase through the use of Hartshorn streamline of about 15 miles per hour.

A detailed report of the flight test has been made by Mr. A. J. P. Bertschy, A.M.E., of the Airplane Engineering Division, by direction of the Director of Production, B.A.P.

The report dated November 15, 1918, telling of the test flight of a De Haviland 4 plane equipped with streamline wires, is as follows:

"At 11.34 A. M. to-day, DH-4 Ship P31 Serial No. 32086 took off McCook Field in charge of Pilot Hambly with Lt. McCoy as observer for the purpose of testing streamline wires made by the Stewart Hartshorn Company.

"This ship was equipped at McCook Field with wires and fittings in order to check wire lengths, strap ends made by the Stewart Hartshorn Company and strainer plates made by the Dayton-Wright Airplane Company. The assembly consisted of double streamline fiying wires and single streamline landing, drift, interplane and tail unit brace wires. All of the measurements check correctly with blueprints and the assembly was completed without trouble. Dihedral, incidence and stagger angles were according to specifications.

"The first 5,000 feet elevation was obtained in 3 minutes 40 seconds; highest altitude reached, 16,000 feet. The ship landed again on the field at 12.12 P. M., having been in flight approximately 40 minutes. Upon landing, all wires and fittings were found to check up correctly with all measurements taken before the take-off.

"Pilot and observer report: Noticeable increase in climbing and flying speed, as will be noted in reports when curves from indicators are plotted and computed. The air speed indicators used have been checked with the ground course; no speed test was made to-day on account of unfavorable conditions. The temperature recorded at highest altitude was 24 degrees above zero.

"This ship has been previously equipped with double cables which were streamline and an increase in speed of 8 miles per hour recorded. It is thought that with the streamline wire equipment a speed of from 10 to 12 miles will be recorded. The wires used were made by the cold reverse rolling method according to specifications drawn up by me covering wires for experimental purposes only and all wires made by this method should be accepted because they are superior to wires made by the old specifications. Further data and tests are attached.

"Mr. J. M. Layngm, representing the Stewart Hartshorn Company, and Mr. W. H. Radtke, metallurgist from the Pittsburgh Laboratories, who has been assisting me in the manufacture of streamline wires for test purposes, witnessed the applications of the wires, fittings and strap ends, and the final test of these parts in assembly, by flying as above reported.

"It should be stated here that all wires manufactured by the Stewart Hartshorn Company of East Newark, N. J., are of the same quality of those used to-day in the test flight, and I consider them superior to any wires made by any other process and very much superior to wires made in England. By reference to reports which are attached hereto, a noticeable improvement in all qualities in streamline wires made by the cold reverse rolling method will be noted."

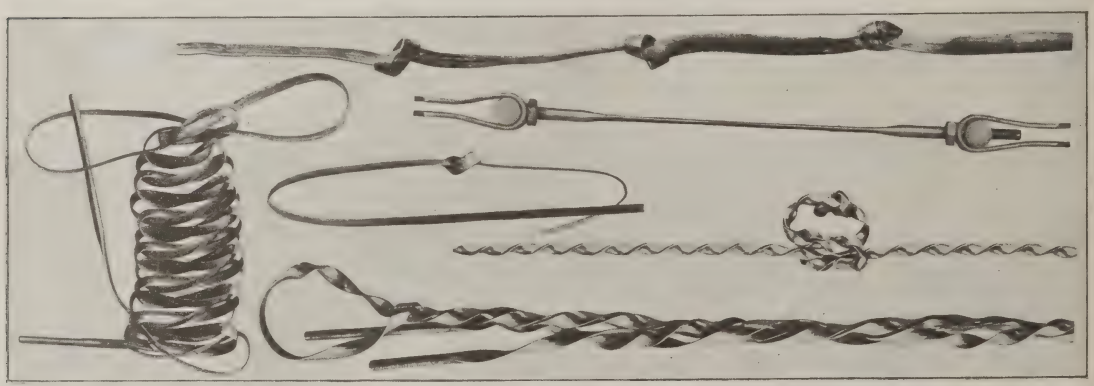
Physical tests upon universal strap ends for the De Haviland 4 were recorded in a report dated August 29, 1918, submitted by Mr. J. S. MacGregor, A.E., of the Testing Department, Production Engineering Department, Washington.

The strap ends were made of B. H. P. Steel No. 2330. They were furnished to the laboratory assembled with streamline wires with the request that they be tested in tension assembled.

These tests were made by gripping the wire in the wedge of the machine and using pin connections on the straps. The failure occurred in every case in the streamline wire. The results are recorded below. An attempt was then made to break the strap ends without the use of the wires; pin connections, however, were used. Considerable difficulty was experienced in breaking these straps, but a fair test was obtained upon two, the results of which are shown in the tabulation. It will be noted that the strap ends have over twice the capacity of the streamline wires which are furnished with them.

Table of Results.

Laboratory Number	4835	4836	4837	4838	4839	4840	4841	4842	4843	4844
Specimen marked	1	2	3	4	5	6	7	8	9	10
Width, Original Ins., Major Axis	.357	.357	.356	.354	.353	.355	.351	.353	.356	.358
Thickness, Original Ins., Minor Axis	.088	.088	.089	.092	.092	.092	.092	.092	.090	.094
Maximum Load, lbs., wire	4120	3840	3835	3860	3870	4050	3930	3920	3885	3990
Strap		9830	11000							



Some interesting bending tests of the Stewart Hartshorn Streamline Cable

(*Continued from page* 1349

the large end of the rod, acting directly on the bronze back of the Babbitt lined main bearing.

The small end was held by means of a floating clamp that was securely locked when the small reamer, passed through the guides in the fixture, located the up and down position.

A Standard Martell Reamer was used on both ends, the whole operation taking only a few minutes.

The large end of the "Blade" rod was ground to size, the steel rod bearing directly on the outer surface of the Babbitt lined bearing of the "forked" rod.

As shown in the figure, this fixture was for reaming the small end only. The large end was located and held by means of an expanding bushing and tapered plug, located in bushed holes in the fixture.

The call for accuracy stimulated by the production of aircraft motors is extending all along the line. The practice of before-the-war methods is rapidly becoming obsolete in many instances, and the well known accuracy and speed of the Martell Reaming System should call for many installations in the motor field, not only for aviation motors, but passenger car, truck, tractor and marine motors as well.

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During Process of Transforming the Colossal War Armament Plants of the Manufacturers of the "Bellanca" Airplane Types, for Aircraft Quantity Production, Prompt Placing of Orders FOR IMMEDIATE CONSTRUCTION is Recommended. Machines Delivered Strictly in Rotation of Receipt of Orders.

Full Illustrated Specifications and Test Performances. Particulars on Request.

ADDRESS: **HARRY E. TUDOR, Sales Representative**

Box 105X, Aerial Age Offices, 280 Madison Ave., New York City.

(*Continued from page* 1336)

ciples of aeronautical engineering in a machine which would be scientifically correct as well as practically fitted for its function and duties. The aim of the designers was to produce a plane combining the qualities of the two types of machines then in use. On the one hand, there was the pursuit plane, with its rotary engine, having remarkable flexibility, speed and climb, but having short range of action, due to limited fuel carrying capacity, and being more or less unreliable because of the type of engine used and its light construction. For the time, the rotary motor had attained its limit in power and performance; efforts to increase its size and power and the number of cylinders were unsuccessful.

On the other hand, the reconnaissance and day bombing machines were somewhat cumbersome and considerably inferior in speed and climb, the advantage of their greater power being largely offset by increased fuel consumption and the larger size and weight of the machine itself.

Power Plant

The S. V. A. was therefore built to use a newly developed light and highly efficient stationary engine; the 200 h.p. 6-cylinder S. P. A., the superior of any rotary engine in power, reliability and low fuel consumption, without being considerably heavier. As a matter of fact, the S.P.A. is actually lighter, if the total of engine plus fuel for several hours flight is considered.

The compactness of the 6-cylinder type permitted a very small front area, and limited the head resistance.

Details of Construction

The wind resistance of the fuselage was made the subject of exhaustive wind tunnel tests, resulting in the peculiar triangular section of the tail gradually connected to the rectangular body. This possesses high aerodynamical efficiency and permits very rigid construction. The wooden frame and plywood panels are very strong and rigid and designed to allow no warping.

The system of trussing is novel and very successful. Instead of the usual system of struts and cables, involving considerable head resistance and requiring frequent adjustment and "tuning," a rigid system of stream-lined steel tubes was introduced, which makes the whole wing rigid under all conditions and assembly and disassembly very simple.

The wings are covered with a special silk "Ansine," manufactured for aeronautical purposes and doped by a special process.

The Landing Gear

The landing gear consists of a very simple and strong system of steel tubes. The horizontal member connecting the two sides and containing the axle is made of pressed sheet steel in a stream-lined frame having very light weight and low head resistance. A special tail-skid made of steel spring insures efficient braking effect in long landings. The machine is very sturdy and has a factor of safety larger than eight in all parts; and stands hard usage satisfactorily with very little attention.

It is armed with two fixed machine guns firing through the propeller with mechanical synchronizer.

Specifications of the S. V. A.

The specifications of the S.V.A. are as follows:

Wing spread	29′ 10″
Overall length	26′ 7″
Overall height	10′ 6″
Lifting surface	261 sq. ft.
Weight, empty (including 66 lbs. of water),	1510 lbs.

Motor: S. P. A.—Ansaldo—

190 h.p. at 1500 R.P.M.
210 h.p. at 1600 R.P.M.
225 h.p. at 1700 R.P.M.

Gasoline consumption—

16 gallons per hour at 1500 R.P.M.
17.5 gallons per hour at 1600 R.P.M.

Oil consumption ..... 6 lbs. per hour

The total fuel consumption is therefore about 100 lbs. per hour at full speed.

Useful Load: (a) Reconnaissance—500 lbs., distributed as follows:

Pilot and instruments	180 lbs.
Guns and ammunition	90 lbs.
Gasoline (2 hours on wide open throttle; about 3 cruising)	200 lbs.
Oil	30 lbs.
Total	500 lbs.

(b) Bombing—920 lbs. distributed as follows:

Pilot and instruments	180 lbs.
Guns and ammunition	90 lbs.
Gasoline (4½ hours wide open, about 6 cruising)	450 lbs.
Oil	35 lbs.
Bombs (3 bombs of 6" .38 diameter)	165 lbs.
Total	920 lbs.

(c) In many instances and for special purposes the S. V. A. has been safely loaded up to 1,100 lbs. of useful load.

Performance:

Speed at sea-level	136 m.p.h.
Speed at 3,000 ft.	133 m.p.h.
Minimum speed	45 m.p.h.
Climb (with 500 lbs. load)	10,000 ft. in 10 minutes
	20,000 ft. in 28 minutes

The War Service of the S. V. A.

That the designers of the S. V. A. were right in their theories was apparent when the results of the static tests came within a few thousandths of an inch from the calculated; when at the first trial flights Sergeant Stoppani, the pilot, emphatically declared that no aeroplane could have better balance and manœuvring ability. It was confirmed in experimental flights and bombing trips; such as the raid, Turin-Udine-Turin, 700 miles in 5 hours by Pilot Stoppani; the raid, Malpeusa-Foggie-Bologna, 900 miles in 6 hours 50 minutes by Major Lombardo and many others.

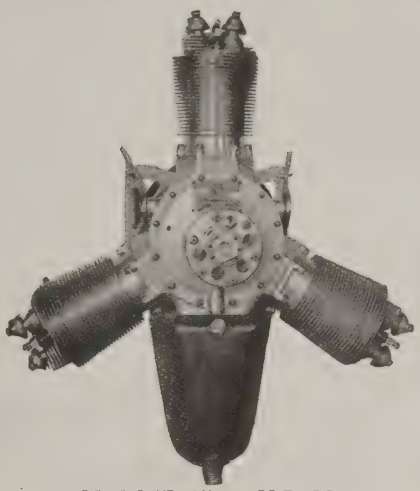
At the front, the S. V. A. was received with enthusiasm by the pilots who found in it a machine adapted to daring expeditions over the enemy's country. The S. V. A. became the master of the Italian sky, equally dreaded by the enemy's pilots, who feared its two machine guns, and by the enemy's infantrymen, who soon knew its bombs and bullets. The remotest emplacements and works of the enemy were detected and photographed by the S. V. A.'s. Swift patrols observed the Austrian fortresses in preparation for great bombing expeditions over Pola, Cattaro, Fieume, and other cities, and returned escorting the heavy bombers, after releasing their own cargoes of high explosives. A squadron of three machines headed by Captain Polli crossed the Alps and bombed the station of Innsbrück. Another flew from the Italian front to the nest of German Zeppelins, Friedrichshafen, on the lake of Constance, and returned unharmed. Captain Polli, alone, hunting for an Austrian dirigible, crossed the Adriatic, flew all over Albania, Montenegro, Dalmatia, and returned by Trieste—about 50 miles, half of which was over the sea.

Finally, the most impressive aviation exploit of the war—the flight over Vienna. A whole squadron of 7 machines, commanded by Major Gabriele d'Annunzio, who flew a two-seater S. V. A., left the Italian front, crossed the Alps despite a storm, passed over the mountains and forests of Central Austria, reached the enemy's capital unmolested in compact formation. To the great surprise of the enemy, the Italian planes circled lower and lower over the city, took photographs at surprisingly low altitudes, dropped thousands of three colored leaflets illustrating German lies and spreading seeds of revolt. It is stated that the young Emperor Charles himself watched with fearing eyes the unprecedented and unexpected spectacle from his imperial mansion. The total distance was over 700 miles and the flight lasted about 5½ hours.

The S. V. A. Seaplane

In the meantime the S. V. A. had been modified in various forms: first, a hydroaeroplane, in

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which pontoons take the place of the landing gear, the machine remaining unchanged in all other respects; second, a two-seater for reconnaissance and fighting.

The S. V. A. Pursuit Plane

As a result of the comment of pilots at the front, the constructors became convinced that the S. V. A. was essentially a long-distance craft adapted to endurance and speed, but it was not designed for the extreme rapidity of climb and flexibility of manœuvring required of the pursuit plane, which must be ready at all altitudes for instant combat at the first sight of an approaching enemy.

The wonderful results attained by the combination of the S. P. A. engine and the S. V. A. machine encouraged the builder to study a new type in which the successful qualities of the S. V. A. could be preserved, but the size and weight reduced, the carrying capacity limited to the fuel necessary for 2½ hours' flight, with a corresponding increase in flexibility, climb and speed. The problem was not easy, but after careful experimenting the "Ansaldo I," or "Balilla," was produced.

In this machine the wing spread is reduced and the upper wings are of same size as the lower. The motor and the pilot have been brought nearer to the center of gravity and the tail shortened, reducing the moment of inertia. With the smaller wing spread, sufficient trussing is obtained with but two struts on each side, braced by diagonal cables. A special device permits dropping the gasoline tank by pulling a lever should it be set afire in combat. The motor is then fed by gravity tank.

Specifications of the Balilla

The specifications of the Balilla are:

Wing spread	25′
Overall length	21′ 8″
Overall height	10′ 6″
Motor: Same as for S. V. A.	
Useful load (with 2 hours fuel wide open or 3 cruising)	500 lbs.
Speed	140 m.p.h.
Climb	16,000 ft. in 16 minutes

This machine had not been very long at the front before the enemy's collapse; but the results were very satisfactory, as many Austrian planes shot down by it testify.

Commercial Aspects

With the end of the war, the problems of civilian aviation comes to the front.

In this field, the S. V. A. deserves special attention, being amongst the military planes nearest and most adapted to transformation to the uses of peace. We have seen that it has been built since its inception as a long-distance plane. The greatest reliability of the engine and the plane was therefore the first consideration of the builders, and without it the machine could not have given any satisfactory service in war, where a forced landing while flying over enemy territory would have meant its complete loss.

Speed, long range and fuel economy are its main qualities. The power, while being low enough to avoid useless costs, is high enough to insure high speed, and, above all, a large reserve of power, making the handling of the plane easy and safe even through bad weather. The minimum landing speed is especially slow, and the handiness and strength of the machine reduces the damage in case of forced landing on unfavorable ground to a minimum. The operation of the machine is very economical, due to its small size, easy sheltering and handling on the ground.

In Italy it has been adopted as mail-carrier on several lines throughout the country. With the progressive spread of civilian aviation, which, though perhaps slow, cannot fail, the S. V. A. is ready to become the aerial roadster for the enterprising sportsman, in the single or two-seater types and the standard type of mailplane for the postal authorities.

Cited for Bravery

First Lieut Herbert B Bartholf, pilot, Air Service, 103d Aero Pursuit Squadron. For extraordinary heroism in action near Aincreville, France, October 3, 1918, and near Baalon, France, November 4, 1918. On October 30, in the region of Aincreville, Lieut. Bartholf, with one other pilot, engaged five enemy planes. Outnumbered, he did not hesitate to attack, and, although subjected to the severe fire of five enemy planes, he succeeded in destroying one. On November 4, in the region of Baalon, while on a bombing expedition, he encountered an enemy patrol of eight machines, Fokker type. He immediatly dived into their formation and, despite the severe fire to which he was subjected, continued a spirited combat with one of the enemy until it crashed to the ground. Home address, C. S. Bartholf, father, 535 Longwood Avenue, Chicago, Ill.

First Lieut. H. Weir Cook, Air Service, 94th Aero Squadron. For extraordinary heroism in action near the Bois de Dole, France, August 1, 1918. Sighting six enemy single seaters at an altitude of 3,500 meters, Lieut. Cook attacked them despite their numerical superiority, shooting down one and driving off the others. For the following act of extraordinary heroism in action near Crepion, France, October 30, 1918, Lieut. Cook is awarded a bar to be worn with the distinguished service cross. Lieut. Cook attacked three enemy two seaters at an altitude of 1,000 meters. After a few minutes of severe fighting his guns jammed, but after clearing the jam he returned to the attack, shot down one of his adversaries in flames, and forced the other two to retire to their own lines. Home address, Dr. B. H. Cook, father, 1327 Jackson Street, Anderson, Ind.

For the following act of extraordinary heroism in action near Fontaine, France, November 4, 1918, Lieut. Guthrie is awarded one bar; as flight commander, Lieutenant Guthrie led his formation of six planes to the attack of seven enemy stroyed, one of which was sent down by this officer. Immediately following this combat he attacked and drove off four hostile machines (type Fokker) which were about to attack one of our planes (type Fokker), six of the enemy were deballoons. Home address, K. R. Guthrie, father, care of A. T. & N. Railway, Mobile, Ala.

First Lieut. Lloyd A. Hamilton (deceased), 17th Aero Squadron. For extraordinary heroism in action at Varssenuere, Belgium, August 13, 1918. Leading a low bombing attack on a German aerodrome thirty miles behind the line, Lieutenant Hamilton destroyed the hangars on the north side of the aerodrome and then attacked a row of enemy machines, flying as low as 20 feet from the ground, despite intense machine-gun fire, and setting fire to three of the German planes. He then turned and fired bursts through the windows of the chateau in which the German pilots were quartered, twenty-six of whom were afterwards reported killed. Next of kin, Rev. John A. Hamilton, father, 25 Buell Street, Burlington, Vt.

First Lieut. Louis G. Bernheimer, Air Service, Pilot, 88th Aero Squadron. For the following act of extraordinary heroism in action near Tailley, France, November 2, 1918: Lieutenant Bernheimer and First Lieut. Ralph P. Bagby, observer, on their own intiative went on a reconnaissance mission, flying fifteen kilometers behind the German lines, securing valuable information on the condition of the bridges across the Meuse River and enemy activity in the back areas and harassing enemy troops. Home address, Sidney Bernheimer, father, 138 East Seventy-second Street, New York City.

Thomas



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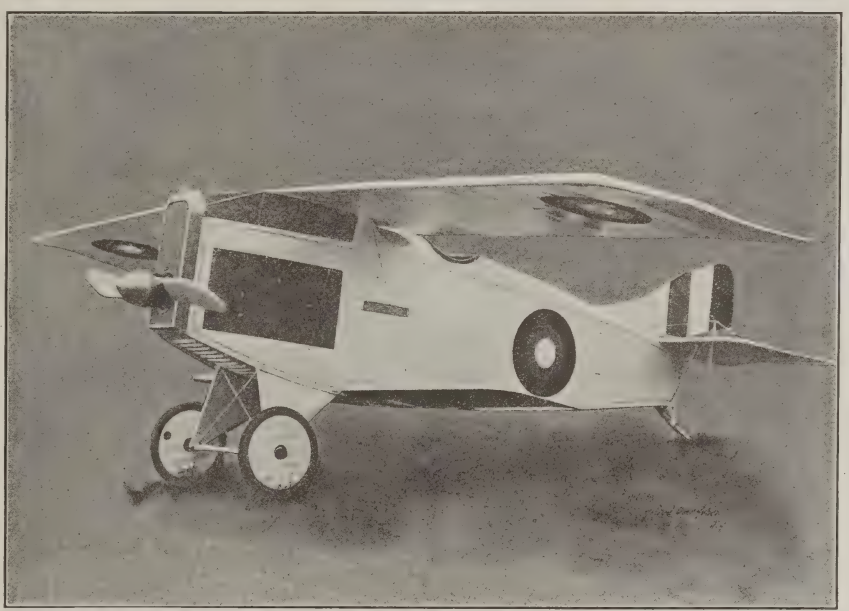
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Invented and perfected the Flying Boat.

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Originated the famous JN-4D machine — the international training-plane.

Supplied aeronautical motors, flying-boats, aeroplanes, hydro-aeroplanes for United States, Great Britain, Italy, Denmark, Russia, Norway, Sweden, Brazil and the Argentine Republic.

Published and distributed first handbooks on aeronautical motors and aeroplanes.

Furnished instructors and instruction-data for all ground-schools and flying-fields.

Ninety-five per cent of American and Canadian aviators trained in Curtiss machines during the war.

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Designed and built the fastest hydroaeroplane—Model H-A.

Designed and built the fastest land-machine—Model 18-T.

Navy Air Service of the United States was 95% Curtiss design.

Designed and built the lightest high-powered twelve-cylinder "V"-type motor—the Curtiss K-12.

Invented and built first flying aerial limousine—the Curtiss "Autoplane."

Designed and built the only flying life-boat.

Designed and built the only flying fire-boat.

Largest and most modern aeroplane factories in the world.

Largest commercial Aeronautical Research Department.

Largest privately-owned wind-tunnel in the world.

Largest number of internationally-known Aeronautical Engineers on staff.

Most modern aeronautical manufacturing plants in the world.

Produced more airplanes than all other United States Manufacturers combined.

Curtiss Engineering Corporation
Garden City, Long Island

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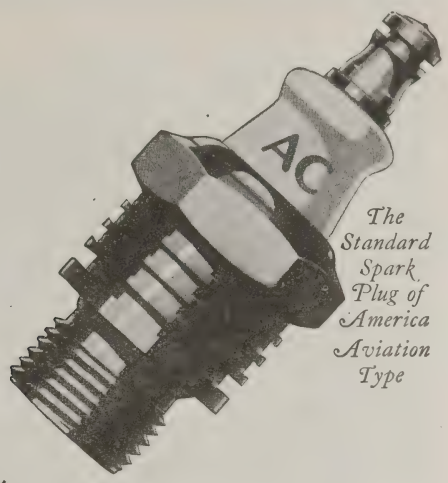
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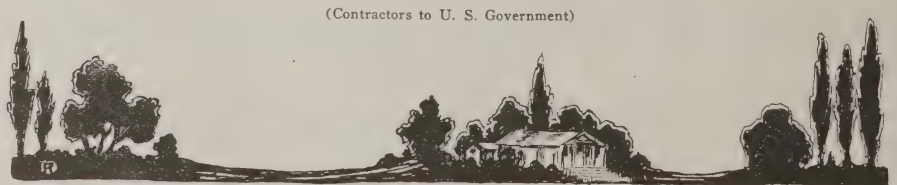
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WE BELIEVE in the future of aircraft in the United States. As an evidence of this belief we are exhibiting at the Aeronautical Show in New York City two Packard aircraft engines—an eight and a twelve—also a new type of plane designed by Packard engineers.

These products, as yet, are not on the market. Our purpose at this time is to do our part, along with others, in giving to the public a true picture of what the near future has in store. By so doing, we turn into useful channels the results of experience gained in producing planes and engines for war.

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SECOND PAN-AMERICAN AERONAUTIC CONVENTION AND EXHIBITION

To Be Held Under the Auspices of The Aero Club of America, The Aerial League of America and the Pan-American Aeronautic Federation.

From Thursday, May 1st, 1919,
to
June 1st, inclusive,
at
Atlantic City, N. J.

CONTESTS TO BE HELD EACH SATURDAY

(1) Seaplane Contests (general),
(2) Curtiss Marine Flying Trophy and Prizes,
(3) Intercollegiate Seaplane Contests,
(4) Land Aeroplane Contests,
(5) Dirigible Contests,
(6) Kite Balloon Speed in Ascending and Descending, and Maneuvering Contests,
(7) Parachute Competition,
(8) Aviette (bicycles and motorcycles with wings) Contests.

EVERY DAY ACTIVITIES

(1) Exhibits of Aeroplanes, Motors and Accessories on the Steel Pier,
(2) Demonstrations and tests of Seaplanes, Land Aeroplanes, Motors, Dirigibles, Kite Balloons, to prospective purchasers and representatives of different governments,
(3) Aerial Passenger Carrying by seaplanes and dirigibles, and kite balloon ascensions,
(4) Moving pictures and Addresses by leading authorities on most important phases of aeronautics.

The Governments and Aeronautic, Sporting, Scientific, Industrial and Civic organizations of the United States and all the countries in the world, excepting Germany and her allies, are invited to send representatives to attend this great aeronautic event. On arrival in the United States these representatives should call at the Headquarters of the Convention Committee at No. 297 Madison Avenue, New York City, to register and receive their official badges and the official program.

In the event that it is more convenient for them to go directly to Atlantic City they will register at the offices of the Convention located at the following Atlantic City hotels: Hotel Traymore, Hotel Chalfonte, The Breakers Hotel, Hotel St. Charles, Hotel Marlborough-Blenheim, Hotel Chelsea, Hotel Alamac, Hotel Dennis and Hotel Haddon Hall.

Representatives of the Convention Committee will be at the Bureaus of the Aeronautic Convention at the above-named hotels and will issue the official badges which admit the bearer to the Aeronautic Hall, as well as the Aero Exhibition on the Steel Pier, the judges' enclosure during contests, and to the Aerodrome and seaplane stations where the aircraft and motors will be demonstrated.

All communications until May 1st, should be addressed to Rear Admiral Peary, Chairman, Aeronautic Convention, Aero Club of America, 297 Madison Avenue, New York City.



DAILY PROGRAM FOR PAN-AMERICAN AERONAUTIC CONVENTION, EXHIBITION AND CONTESTS

THURSDAY, MAY 1ST

Opening of Convention and Exhibit.

AFTERNOON—Reception at Aeronautic Hall on the Steel Pier. Addresses by United States Government State and aeronautic authorities.

EVENING—Aero Show and addresses by officials.

FRIDAY, MAY 2ND

AFTERNOON—Aero Show. Preliminary tests of seaplanes, dirigibles and kite balloons.

EVENING—Moving pictures and address on flying for sport and pleasure.

SATURDAY, MAY 3RD

AFTERNOON—Seaplane and dirigible races, and kite balloon ascending and descending contest.

EVENING—Ball.

SUNDAY, MAY 4TH

MORNING—Memorial service by eminent Divine for the dead airmen.

AFTERNOON AND EVENING—Reception to allied aces and heroes of the air and their parents, and announcement of the award of the Aero Club of America Medal of Valor, and the Aerial League of America Diploma of Honor.

MONDAY, MAY 5TH

AFTERNOON—First parachute contest for $500 Bennett Prize.

EVENING—"The Large Dirigible and Its Value for Transportation." Representatives of railroads, express, steamship and other transportation organizations invited to attend.

TUESDAY, MAY 6TH

AFTERNOON—Illustrated addresses on "Aerial Forest Patrol." Forestry Department of every State invited.

EVENING—"Work of Aerial Police Squadrons, and Why Every City Should Have One."

WEDNESDAY, MAY 7TH

AFTERNOON AND EVENING—Aerial Mail Day. Illustrated address on, and consideration of, "Aerial Mail Planes." Chairman of Post Office and Post Roads Committees of House of Representatives and Senate, and Postmaster General Burleson invited to deliver addresses. (26,000 United States Postmasters, and Chambers of Commerce of 13,000 cities invited to attend.)

THURSDAY, MAY 8TH

AFTERNOON AND EVENING—Illustrated addresses on the "Need of Municipal Aerodromes, and the Part to be Played by Aircraft in City Planning." Chambers of Commerce and City Planning Commissions of 13,000 cities invited to attend.

FRIDAY, MAY 9TH

AFTERNOON—Arrival of seaplanes and army planes from Army and Navy Air Stations. Second parachute competition for the $500 Bennett Prize.

EVENING—Illustrated addresses on "Latest Developments in Aerial Warfare and Adventures in Aerial Warfare," told by famous aces.

SATURDAY, MAY 10TH

AFTERNOON—Army, Navy and Marine Corps Day. Aerial contests and tournament.

EVENING—United States Army and Navy Officers' Reception. Reception and addresses at Aeronautic Exhibition Hall on the Steel Pier.

SUNDAY, MAY 11TH

AFTERNOON AND EVENING—Presentation of the flags by each State of the United States to the Aero Squadrons representing the States. Each State will present a flag to each Aero Squadron, the members of which were overwhelmingly natives of that State. The presentation will be made by representatives from the State and the Aero Club and Aerial League branch of that State. All States and cities invited to send delegates, and Army, Navy and Marine Corps to send representatives.

MONDAY, MAY 12TH

AFTERNOON—Demonstrations and illustrated addresses on the "Value of Aircraft for Advertising by Day and by Night." All national advertisers and advertising agents invited to attend.

EVENING—"Pan-American Aerial Transport Over Land." Addresses by members of the commissions of the 20 Latin-American Republics.

TUESDAY, MAY 13TH

AFTERNOON AND EVENING—"Pan-American Aerial Transport Over Water." Addresses by members of the 20 Latin-American Republics' Commissions.

WEDNESDAY AND THURSDAY, MAY 14TH AND 15TH

AFTERNOONS AND EVENINGS—"The Airways and Aerial Transport in Europe, Canada, Africa, Australia and Asia."

FRIDAY, MAY 16TH

AFTERNOON AND EVENING—"Aerial Navigation Instruments for Flying Over Land and Water." Aviators, navigators, scientific instrument makers and aeronautic experts invited.

SATURDAY, MAY 17TH

AFTERNOON—Aerial races and contests. Illustrated addresses on Aerial Photography.

EVENING—Extensive exhibit of aerial photographs and photographic apparatus. All photographers, professional and amateur, and makers of photographic apparatus invited.

SUNDAY, MAY 18TH

AFTERNOON AND EVENING—Illustrated addresses on "Aerial Exploration and the Use of Aircraft for Coast and Geodetic Survey."

MONDAY, MAY 19TH

AFTERNOON—Addresses on "Need of Broader Attitude Regarding Insurance for Aircraft and Aviators."

EVENING—Illustrated address on "How Army Medical Standards and Inspection Lessen Accidents." Insurance companies and agents invited.

TUESDAY, MAY 20TH

AFTERNOON AND EVENING—Illustrated addresses showing different ways of crossing Atlantic by air and the problems to be solved to accomplish same successfully.

WEDNESDAY, MAY 21ST

AFTERNOON—Aero Safety Day. Discussion of aero safety provisions made; improvements in aeroplane construction; increased reliability of aero motors; devices which make for safety in flying.

EVENING—"Progress Made in the Art of Piloting Aeroplanes." Illustrated.

THURSDAY, MAY 22nd

AFTERNOON AND EVENING—Addresses and discussions of meteorology—"How the Weather Forecasts Can be Extended and Made More Efficient by the Use of Aircraft in Exploring the Upper Air," also "How the Weather Forecasts Help Aerial Navigation," and "Telegraphic and Climatic Factors in Relation to Aeronautics.

FRIDAY, MAY 23RD

AFTERNOON AND EVENING—Addresses on "Aerial Jurisprudence—Aerial Laws and Regulation of Air Traffic." (First day.) Lawyers, traffic commissioners and police authorities of different countries invited.

SATURDAY, MAY 24TH

AFTERNOON—Races and contests.

EVENING—Illustrated address on "Need of Establishing Altitude Levels for International, Interstate and Interurban Air Travel."

SUNDAY, MAY 25TH

AFTERNOON AND EVENING—Aeronautic Art Day. Address on "Aerial Painting and Sculpture of Different Countries, and Exhibition of Aerial Paintings," by Lieut. Farre, Lieut. Ruttan and others. All prominent artists, managers of art galleries and art patrons invited to attend.

ENGINEERING WEEK.

MONDAY, MAY 26TH

AFTERNOON—"Aeronautic Engineering Problems and Their Prospective Solution."

EVENING—Opening of contests for designs and ideas for large aeroplanes.

TUESDAY, MAY 27TH

AFTERNOON—"Factors That Increase the Efficiency for Large Dirigibles."

EVENING—"Advantages of Veneer and Plywood for Aircraft Construction."

WEDNESDAY, MAY 28TH

AFTERNOON—Address on "Problems of Flying at 35,000 Feet and Over, and Their Prospective Solution."

EVENING—"Present Day Aero Engines."

THURSDAY, MAY 29TH

AFTERNOON—"Flying Boats Versus Hydroaeroplanes for Sport and Transportation."

EVENING—Contest for designs and ideas for large aeroplanes.

FRIDAY, MAY 30TH (Memorial Day)

AFTERNOON—Dirigible races, kite balloon speed ascending contest; parachute contest.

EVENING—Reception at the Aeronautic Hall, Steel Pier.

SATURDAY, MAY 31ST

AFTERNOON—Seaplanes, land planes and dirigible contests. Aviette competition at which all cyclists and makers of bicycles and motorcycles will be invited.

EVENING—"International Medical Standards for Aviators in War and Peace." Reports from different countries illustrated with attractive films. 50,000 medical men invited.

SUNDAY, JUNE 1ST

AFTERNOON AND EVENING—Award of prizes and diplomas for all events.

PROGRAMME

Deuxième Convention et Exposition Aeronautique Pan-Américaine
Sous les auspices de l' "Aero Club of America," "The Aerial League of America," et la "Pan-American Aeronautic Federation."
Du Jeudi 1 Mai, 1919 au 1 Juin, inclus. à Atlantic City, N. J.

CONCOURS DEVANT ETRE TENUS CHAQUE SAMEDI.

1. **Concours d'hydravions.**
2. **Trophées et Prix Curtiss pour Aviation Navale.**
3. **Concours Intercollegiaux pour Hydravions.**
4. **Concours d'Avions.**
5. **Concours de Dirigeables.**
6. **Concours de rapidité d'ascension, de descente et de manoeuvre pour ballons captifs.**
7. **Concours de Parachutes.**
8. **Aviettes (bicyclettes et motocyclettes munies de voiles).**

EPREUVES QUOTIDIENNES.

1. **Exposition d'Avions, Moteurs et Accessoires sur la jetée d'acier.**
2. **Demonstration et essais d'hydravions, avions, moteurs, dirigeables, ballons captifs, aux acheteurs eventuels.**
3. **Transport de passagers par hydravions et dirigeables, et ascensions en ballons captifs.**
4. **Representations cinématographiques et conférences sur les phases les plus importantes de aéronautique suivant le programme ci-dessous:—**

JEUDI, 1ER JOUR
Ouverture de la Convention et Exposition.
Après-midi—Réception au Hall de l'Aéronautique sur la jetée d'acier. Discours par des autorités du Gouvernement.
Soir—Des Etats-Unis, et l'Etat et de l'Aeronautique Exposition aeronautique et discours par des personnages officiels.

VENDREDI, 2EME JOUR
Après-midi—Exposition aeronautique. Essais préliminaires. D'hydravions, dirigeables et ballons captifs.
Soir—Représentation cinématographique et conférences sur l'aviation en tant que sport, et agrément.

SAMEDI, 3IEME JOUR
Après-midi—Courses d'hydravions et dirigeables, et concours d'ascension et de descente pour ballons captifs.
Soir—Bal.

DIMANCHE, 4IEME JOUR
Matin—Service pour la mémoire des aviateurs morts.
Après-midi, et soirée—Réception des As Alliés et Héros de l'air et de leur familles. Remise de la Médaille de Valeur de l'Aero Club d'Amérique et du diplome d'Honneur de la Ligue Aérienne d'Amérique.

LUNDI, 5IEME JOUR
Après-midi—Premier concours de Parachutes pour le Prix Bennett de $500.00.
Soir—Le grand dirigeable et sa valeur au point de vue transport. Les représentants des Compagnies de chemin de fer, d'Express, de Navigation et autres organisations de transports, sont invités à y assister.

MARDI, 6IEME JOUR
Après-midi—Conférences, accompagnées de projections sur la surveillance aérienne des forets. (Les membres du département forestier de chaque Etat sont invités).
Soir—Le rôle des escadrilles de police aérienne, et pourquoi chaque ville devrait en posséder.

MERCREDI, 7IEME JOUR
Après-midi—Journée de la poste aérienne. Conférences avec projections; considérations sur les avions postaux. Le Président du Comité des bureaux de poste et des voies postales au Sénat et à la chambre, et le Directeur Général des Postes, Burleson, sont invités à prononcer des discours. (26000 Directeur des Postes des Etats-Unis et des représentants des Chambres de Commerce de 13,000 villes y sont invités.)

JEUDI, 8IEME JOUR
Après-midi et soir—Discours avec projections sur la nécessité d'Aerodromes municipaux, et la part qui sera joué par l'aviation dans le "City Planning". (Les chambres de commerce et les commissions de City-planning" de 13000 villes sont invités.)

VENDREDI, 9IEME JOUR
Après-midi—Arrivée d'avions et hydravions militaires de leurs différents centres. Deuxième concours de Parachutes pour le prix Bennett de 500 dollars.
Soir—Conférences avec projections par des As célèbres, sur les derniers développements de la guerre aérienne et sur leurs aventures personneles.

SAMEDI, 10IEME JOUR
Après-midi—Journée, de la Marine et des fusillers marins. Concours aériens.
Soir—Réception d'officiers de l'Armée et de la Marine Américaine. Réception et discours au hall de l'Exposition Aeronautique sur la Jetée d'Acier.

DIMANCHE, 11IEME JOUR
Après-midi et soir—Presentation de drapeaux par chaque Etat des Etats Unis au escadrilles représentant les Etats-Chaque Etat offrira un drapeau à chaque escadrille dont la majorité des membres sont originaires de cet Etat. La présentation sera faite par les représentants, de l'Etat, de l'Aero Club, et de la branche de la Ligue Aérienne de cet Etat. (Tous les Etats et villes sont invités à envoyer des délégués, et l'Armée et la Marine à envoyer des représentants.)

LUNDI, 12IEME JOUR
Après-midi—Démonstration et conférences avec projections sur la valeur de l'Avion pour la publicité diurne et nocturne (Tous les agents et sociétés de publicité sont invités).
Soir—Transport aérien continental, Pan-Américaine. Discours par des membres des commissions de 20 Républiques latines-Américaines.

MARDI, 13IEME JOUR
Après-midi et soir—Transport aérien intercontinental Pan-Américaine. Discours par des membres des commissions de 20 Républiques Latines-Américaines.

MERCREDI ET JEUDI, 14IEME ET 15IEME JOUR
Après-midi et soir—Les voies aériennes et le transport aérien en Europe au Canada en Afrique en Australie et en Asie.

VENDREDI, 16IEME JOUR
Après-midi et soir—Instruments de Navigation aérienne pour voler au-dessus de la terre ou de l'eau (aviateurs, navigateurs, fabricants, d'instruments scientifiques et experts en aeronautique invités).

SAMEDI, 17IEME JOUR
Après-midi—Courses et concours aériens. Conférences et projections sur la photographie aérienne.
Soir—Exposition de photographies aériennes et d'appareils photographiques (Les photographes, professionels, et amateurs, et les fabricants d'appareils photographiques sont invités).

DIMANCHE, 18IEME JOUR
Après-midi et soir—Conférences sur la nécessité d'une attitude pluslarge en regard de l'assurance pour l'avion et les aviateurs.
Soir—Conférences avec projections. Comme quoi les mesures médicales et les inspections en vigueur dans l'armée diminuent les accidents. (Agents et compagnies d'assurance, invités).

MARDI, 20IEME JOUR
Après-midi et soir—Conférences avec projections, montrant les différentes routes aériennes pour traverser l'Atlantique, et les problèmes à résoudre pour accomplir la chose.

MERCREDI, 21IEME JOUR
Après-midi—Journée de la sureté de l'aviation. Discussions des mesures prises pour la sureté de l'aviation. Améliorations dans la construction d'avions. Sureté augmentée dans les moteurs d'avions. Dispositifs pour la sureté en vol.
Soir—Progrès faits dans l'art du pilotage d'avions. (Projections).

JEUDI 22IEME JOUR
Après-midi et soir—Conférences et discussions sur la Meteorologie. Comme quoi les bulletins meteorologiques peuvent être étendues et rendus plus efficaces par l'emploi de l'avion pour explorer les plus hautes couches de l'atmosphère. Comme quoi ces bulletins météorologiques sont d'assistance à la navigation aérienne. Les facteurs climatérique et télégraphiques et leur relations à l'aeronautique.

VENDREDI, 23IEME JOUR
Après-midi et soir—Conférences sur la jurisprudence aérienne. Lois et reglements sur le trafic aérien (1er jour). Avocats, commissaires de trafic, autorités de police de différents pays, invités.)

SAMEDI, 24IEME JOUR
Après-midi et soir—Courses et concours. Conférences avec projections sur la necessité d'etablir un niveau d'altitude pour la circulation aérienne, internationale, interstate et interurbaine.

DIMANCHE, 25IEME JOUR
Après-midi et soir—Journée artistique de l'Aéronautique. Discours sur la peinture et la sculpture aérienne; et exposition de peintures par Lieut. Farré, Lt. Ruttan et autres. (Artistes, Directeurs de Galleries d'Art et amateurs d'oeuvres artistiques, invités.)

LUNDI, 26IEME JOUR
Après-midi et soir—Problèmems aéronautiques et leurs solutions probables Ouverture du concours pour les idées et projets de grands avions.

MARDI, 27IEME JOUR
Après-midi—Facteurs qui augmentent l'efficacité des grands dirigeables.
Soir—Les avantages du plaquage et contre-plaquage dans la construction d'avion.

MERCREDI, 28IEME JOUR
Après-midi—Conférences sur le problème du vol à une altitude de ou supérieure à 25000 pieds et leur solutions probables.
Soir—Les moteurs d'avions actuels.

JEUDI, 29IEME JOUR
Après-midi—Hydravions versus avions pour le sport et le transport.
Soir—Concours pour les idées et projets de grands avions.

VENDREDI, 30IEME JOUR—"Memorial Day".
Après-midi—Courses de dirigeables; concours de rapidité d'ascension pour ballons captifs; concours de parachutes.
Soir—Réception au Hall de l'Aeronautique. Jetée d'acier.

SAMEDI, 31IEME JOUR
Après-midi—Concours d'avions, d'hydravions et de dirigeables. Concours d'aviettes auquel les cyclistes et les fabricants de cycles et motorcyclettes seront invités.
Soir—Aptitudes médicales pour les aviateurs de paix et de guerre. Rapports de différents pays, illustrés par des films intéressants (50,000 autorités médicales invités.)

DIMANCHE, 32IEME JOUR
Après-midi et soir—Remise des prix et diplômes pour tous concours et courses.

Le Gouvernement Français, les organisations aéronautiques, sportives, scientifiques, industrielles, et civiques de France sont invités à envoyer des représentants pour assister à cette grande convention aéronautique. En arrivant aux Etats Unis, ces représentants sont invités à se présenter à l'Etat Major du Comité de la Convention, au numéro 297, Madison Avenue, à New York pour se faire inscrire et recevoir leur insigne et le programme officiel.
Au cas où il leur serait plus facile de se rendre directement à Atlantic City, ils pourront s'y faire inscrire aux bureaux de la Convention, situés à l'un des Hotels suivants: Hotel Traymore, Hotel Chalfonte, The Breakers Hotel, Hotel St. Charles, Hotel Marlborough-Blenheim, Hotel Chelsea, Hotel Alamac, Hotel Dennis, et l'Hotel Haddon Hall.
Des représentants du Comité de la Convention seront aux bureaux de la convention aux hotels ci-dessus et délivreront les insignes officiels qui admettront les porteurs au Hall de l'aéronautique, à l'exposition sur la jetée d'acier, au stand des juges, pendant les concours, et à l'aérodrome et au centre d'hydravion où moteurs et machines seront démontrés.

Toutes comunications jusqu'au ler mai, devront être adressées au: Rear Admiral Peary, Chairman, Aeronautic Convention, Aero Club of America, 297 Madison Avenue, New York City.

LA SEGUNDA CONVENCION Y EXPOSICION AERONAUTICA PAN-AMERICANA

Celebrada Bajo Los Auspicios del "Aero Club of America," "The Aerial League of America" y "The Pan-American Aeronautic Federation".

Desde el Jueves Primero de Mayo Hasta el Primero de Junio, Ambos Inclusives de 1919 En Atlantic City, Estado de New Jersey, Estados Unidos de America

PROGRAMA

Concursos Que se Verificaran Todos Los Sabados:

(1) Concurso de Hidroaeroplanos (en general).
(2) Trofeo y Premios de Curtiss por Aviacion Maritima.
(3) Concurso de Hidroplanos Entre Universidades.
(4) Concurso de Aeroplanos Terrestres.
(5) Concurso de Globos Dirijibles.
(6) Concurso de Globos Sobre Velocidad en Ascender y Descender y sus Maniobras.
(7) Concurso de Paracaidas.
(8) Concurso de "Aviettes" (bicicletas y motocicletas con alas).

Programa Diario

(1) Exhibición de Aeroplanos, Motoras y sus Accesorias en el "Steel Pier."
(2) Demostracion y Ensayos de Hidroaeroplanos, Aeroplanos Terrestes, Motoras, Globos Dirijibles y Globos Cautivos, Para Compradores.
(3) Ascencion de Hidroplanos y Dirijibles con Pasajeros y Globos Cautivos.
(4) Vistas Cinematografas y Discursos Sobre Las Fases Mas Importantes de la Aeronautica, Como Siguen:

JUEVES PRIMER DIA

Apertura de la Convencion y Exposicion

EN LA TARDE—Recepcion en el salon aeronautico en el "Steel Pier." Discursos de los funcionarios del gobierno de los estados Unidos de America, del estado y de las sociedades aeronauticas.

EN LA NOCHE—Exposicion aeronautica y discursos de funcionarios.

VIERNES SEGUNDA DIA

EN LA TARDE—Exposicion aeronautica, ensayos preliminares de hidroplanos y globos dirijibles y cautivos.

EN LA NOCHE—Vistas cinematografas y discursos sobre aviacion de sport y paseo.

SABADA TERCER DIA

EN LA TARDE—Carreras de hidroaeroplanos y globos dirijibles y concurso en ascender y descender de globos cautivos.

EN LA NOCHE—Gran baile.

DOMINGO CUARTO DIA

EN LA MANANA—Serivios conmemorativos en honor de los aviadores difuntos por un prelado distinguido.

EN LA TARDE Y NOCHE—Recepcion a los aviadores mas renombrados aliados y a sus familiares y entrega de la medalla de valor del "Aero Club de America" y del diploma de honor de la "Aerial League de America."

LUNES QUINTO DIA

EN LA TARDE—Primer concurso de paracaidas por el premio de quinientos dollars de bennett.

EN LA NOCHE—El gran globo dirijible y su valor en la transportacion. Representantes de las empresas de ferrocarril, expreso, vapores y demas de transportes quedan invitados para asistir.

MARTES SESTO DIA

EN LA TARDE—Discursos con ilustraciones, de patrulla aeria de montes. (El departamento de montes de cada estado queda invitado.)

EN LA NOCHE—Trabajo de vigilancia policiaca aeria y razones por las cuales toda ciudad debe tener esta clase de servicio.

MIERCOLES SEPTIMO DIA

EN LA TARDE Y NOCHE—Dia de correos aerios. Discursos con ilustraciones y estudio de aeroplanos para servicio de correos. El presidente de la comision de correos de la camara de representantes y el de igual comite del senado asi como el ministro de comunicaciones de los Estados Unidos Sr. Burleson. Quedan invitados para dirijir la palabra. (Veinte seis mil administradores de coreo de los Estados Unidos y las camaras de comercio de trece mil ciudades quedan invitados para asistir.)

JUEVES OCTAVO DIA

EN LA TARDE Y NOCHE—Discursos con ilustraciones sobre las necesidades de aerodromos municipales y de la parte que debe tomar la aeronautica en los proyectos de ciudades. (Las camaras de comercio y las comisiones de proyectos de ciudades de 13,000 ciudades quedan invitadas para asistir.)

VIERNES NOVENO DIA

EN LA TARDE—Llegada de hidroplanos y aeroplanos del ejercito y la Marina de sus respectivas estaciones. Segundo concurso de paracaidas por el premio de $500 de Bennett.

EN LA NOCHE—Discursos con ilustraciones de los mas recientes desarollos en la guerra aeria y hazañas relatadas por famosos aviadores.

SABADO DECIMO DIA

EN LA TARDE—Dia del Ejercito y Marina. Concurso aeronautico.

EN LA NOCHE—Recepción a los oficiales de la Marina y Ejercito de los Estados Unidos. Recepción y discursos en el Salón de Exhibición Aeronautica en el "Steel Pier."

DOMINGO ONDECIMO DIA

EN LA TARDE Y NOCHE—Presentación de banderas por cada uno de los Estados de los Estados Unidos de America a sus respectivos escuadrones aereos. Cada Estado presentará una bandera al escuadron aereo respectivo que contenga el mayor número de naturales de aquel estado. La presentación se hara por los representantes del estado y del Club Aereo y Liga Aeria de aquel Estado. (Todos los Estados y ciudades quedan invitados para enviar sus delegados y el ejercito y marina para enviar representantes.)

LUNES DUODECIMO

EN LA TARDE—Demostraciones y discursos con ilustraciones sobre el valor de la aeronautica para anuncios de dia y de noche. (Todas personas y agentes dedicados al negocio de anuncios quedan invitados para asistir.)

EN LA NOCHE—Transporte aereo terrestre Pan-Americano. Discursos por los miembros de las Comisiones de las veinte Republicas Pan-Americanas.

MARTES DECIMO-TERCERO

EN LA TARDE Y NOCHE—Transporte aereo maritimo Pan-Americano. Discursos por los miembros de las Comisiones de las veinte Republicas Pan-Americanas.

MIERCOLES Y JUEVES DIAS 14 Y 15

EN LA TARDE Y POR LA NOCHE—Dias y transportes aereos en Europa, Canada, Africa, Australia y Asia.

VIERNES DIA 16

EN LA TARDE Y POR LA NOCHE—Instrumentos para la aviación terestre y marítima. (Aviadores, navegadores, fabricantes de instrumentos cientificos y peritos en aeronautica quedan invitados.)

SABADO DIA 17

POR LA TARDE—Carreras y concursos aereos. Discursos con ilustraciones sobre la fotografia aerea.

POR LA NOCHE—Exhibición extensa de fotografias aereas y aparatos fotográficos. (Fotografos, tanto los profesionales como los afisionados y fabricantes de aparats fotograficos quedan invitados.)

DOMINGO DIA 18

EN LA TARDE Y POR LA NOCHE—Discursos con ilustraciones sobre la exploración aerea y el uso de la aereonave para estudios geodéticos y de costas.

LUNES DIA 19

EN LA TARDE Y POR LA NOCHE—Discursos sobre la necesidad de un concepto mas ámplio relativo al seguro de aereonaves y aviadores.

POR LA NOCHE—Discursos con ilustraciones sobre la manera en que los requisitos e inspección medico-militares disminuyen el número de accidentes. (Compañias de seguros y agentes quedan invitados.)

MARTES DIA 20

EN LA TARDE Y POR LA NOCHE—Discursos con ilustraciones mostrando diferentes modos de cruzar el Mar Atlantico por el aire y los problemas que deben resolverse para realizar dicho objeto.

MIERCOLES DIA 21

EN LA TRADE—Dia de Seguridad Aerea. Discusiones sobre las disposiciones hechas para la sceguridad aerea; mejoras en la construcción de aeroplanos; aumento de estabilidad en las motoras aereas; divisas para aumentar la seguridad aerea.

EN LA NOCHE—Progreso realizado en el manejo de los aeroplanos (con ilustraciones).

JUEVES DIA 22

EN LA TARDE Y NOCHE—Discursos y discusiones sobre metereología-manera de extender los informes metereologicos y hacerlos mas eficaces mediante el uso de aeronaves en la exploración de las altas regiones del aire así como la manera en que los pronosticos metereologicos pueden ser de auxilio en la navegación aerea; y factores telegraficos y climaticos en relación a la aeronautica.

VIERNES DIA 23

EN LA TARDE Y NOCHE—Discursos sobre la jurisprudencia aerea-leyes aereas y reglamentación del trafico aereo (primer dia). (Abogados Jefes de Trafico y Autoridades Policiacas de los distintos paises quedan invitados.)

SABADO DIA 24

EN LA TARDE—Carreras y concursos.

EN LA NOCHE—Discursos con ilustraciones sobre la necesidad de establecer lineas de altitud para viajes internacionales, entre los estados y entre las ciudades por medio del aire.

DOMINGO DIA 25

EN LA TARDE Y NOCHE—Da de Arte Aeronautica. Discurso sobre la pintura y escultura aeronautica de los distintos paises y exhibición de los cuadros aereos por el Teniente Farré, Teniente Ruttan y otros. (Artistas prominetes y directores de Salones de Artes y demás interesados quedan invitados.)

SEMANA DE INGENIERIA.

LUNES DIA 26

EN LA TARDE—Problemas de ingenieria aeronautica y su porspectiva solución.

EN LA NOCHE—Apertura del Concurso para diseños e ideas sobre grandes aeroplanos.

MARTES DIA 27

EN LA TARDE—Factores que contribuyen al aumento de la eficiencia de los grandes globos dirijibles.

EN LA NOCHE—Ventajas de enchapear y de la madera denominada "plywood" en la construcción de aereonaves.

MIERCOLES DIA 28

EN LA TARDE—Discursos sobre los problemas de volar a una altura de 25,000 pies y mas, y su solución prospectiva.

EN LA NOCHE—Máquinas aereas de la actualidad.

JUEVES DIA 29

EN LA TARDE—Tema: "Flying-boats" contra hidroplanos para sport y transporte.

EN LA NOCHE—Concurso sobre diseños e ideas para grandes aeroplanos.

VIERNES DIA 30

EN LA TARDE—Carreras entre globos dirijibles, concurso de velocidad de ascender y descender de globos cautivos; concurso de paracaidas.

EN LA NOCHE—Recepción en el Salón Aeronautico en el "Steel Pier."

SABADO DIA 31

EN LA TARDE—Concursos de hidroplanos, aeroplanos, y globos dirijibles. Concurso de "Aviettes" al cual serán invitados todos los biciclistas y fabricantes de bicicletas y motocicletas.

EN LA NOCHE—Requisitos medicos para aviadores en tiempo de guerra y de paz. Informes de distintos paises ilustrados con vistas cinematografas de atractivo. (50,000 medicos quedan invitados.)

DOMINGO DIA 32.

EN LA TARDE Y NOCHE—Presentación de premios y diplomas de todos los concursos.

Los Gobiernos de la Argentina, Brasil, Bolivia, Chile, Colombia, Costa Rica, Cuba, República Dominicana, Ecuador, Honduras, Haiti, Panamá Guatemala, Paraguay, Perú, Portugal, El Salvador, Espaïna, Uruguay, Venezuela, Mejico, y Nicaragua, asi como las Sociedades Aeronaúticas, Deportivas, Cientificas, Industriales y Civicas, de los mismos paises, por la presente quedan invitadas para enviar representantes a asistir a eete gran concurso aeronaútico. Dichos representantes a su llegada a los Estados Unidos deberán presentarse a la oficina principal del Comité encargado de la Convención, en el número 297 Avenida de Madison, en la ciudad de New York, para inscribirse y al proprio tiempo recibir sus credenciales y copia del programa oficial.

En el caso de que les sea mas conveniente a algunos de los representantes ir directamente a Atlantic City, dichos señores podrán inscribirse en las oficinas de la Convención que estarán constituidas en dicho lugar en los siguientes hoteles: "Traymore," "Chalfonte," "The Breakers," "St. Charles," "Marlborough-Blenheim," "Chelsea," "Alamac," "Dennis" y "Haddon Hall."

En Comité de la Convención tendrá representantes en las oficinas de la Convención Aeronaútica en dichos hotelesquienes expedirán las credenciales o chapas oficiales de entrada al portador para el Salón Aeronaútico, la Exposi-ción Aeronaútica en el "Steel Pier," la sección apartada para los Jueces durante el concurso, y al "Aerodromo" yestaciones para hidroaeroplanos donde habrán exhibiciones de aeronaves y sus motoras.

Sírvase dirijir todas sus comunicaciones hasta el primero de Mayo Próximo venidero, al Sr. Contraalmirante Peary, en la forma siguiente: Rear Admiral Peary, Chairman, Aeronautic Convention, Aero Club of America, 297 Madison Avenue, New York City.

SECONDA CONVENZIONE ED ESPOSIZIONE AEREONAUTICA PAN-AMERICANA

Sotto gli Auspici dell'Aero Club of America, dell'Aerial League of America e della Federazione Aeronautica Pan-Americano

Dal Primo Maggio 1919, al Primo Giugno incluso,

ad

Atlantic City, N. J.

PROGRAMMA

GARE CHE AVRANNO LUOGO OGNISABATO

(1) Gare Idroplani (generale).
(2) Voli nautici apparecchio tipo Curtiss-Trofei e Premi.
(3) Gare Idroplani (Universita).
(4) Gare Aeroplani di terra.
(5) Gare Dirigibili.
(6) Gare Velocita ascesa e discesa, e manovre di Palloni frenati.
(7) Gare Paracadute.
(8) Aviette (Velocipedi e motocicli alati).

AVVENIMENTI QUOTIDIANI

(1) Esposizione di Aeroplani, Motori ed accessori sullo Steel Pier (Ponte d'Acciaio).

(2) Esercitazioni e prove idroplani, Aeroplani di terra, motori, Dirigibili, Palloni frenati.

(3) Trasporto Aereo passeggeri su Idroplani, e Dirigibili-Ascensioni Palloni frenati.

(4) Spettacolo cinematografico e discorsi sul elpiu importanti fasi dell'Aereonautica, nell'ordine seguente:

GIOVEDI, 1MO GIORNO

Apertura Convenzione ed Esposizione.

POMERIGGIO—Ricevimento nella Sala Aereonautica sullo Steel Pier. Conferenze Autorita Federali, Statali, ed Aereonautiche.

SERA—Esposizione Aereonautica e discorsi ufficiali.

VENERDI, 2DO GIORNO

POMERIGGIO—Esposizione Aereonautica—prove preliminari, idroplani, Dirigibili, e Palloni Frenati.

SERA—Cinema e conferenza-soggetto "Aereonautica Sportiva."

SABATO, 3O GIORNO

POMERIGGIO—Corse Idroplani e dirigibili; gare di velocitá ascesa e discesa Palloni frenati.

SERA—Ballo.

DOMENICO, 4TO GIORNO

MATTINO—Un eminente Ecclesiastico commemorerá gli Aviatori defunti.

POMERIGGIO E SERA—Ricevimento "Assi" alleati ed eroi dell'Aria e loro parenti—Annunzio conferimento medaglia al valore dell'Aero Club of A. e diploma d'onore dell'Aerial League of America.

LUNEDI, 5TO GIORNO

POMERIGGIO—Prima Gara Paracadute. Premio Bennett $500.

SERA—Il Dirigibile di grosse dimensioni e la sua utilitá per trasporti. Sono invitati i Sigg. Rappresentanti delle ferrovie, dell Compagnie di Express, delle Compagnie di Navigazione e di altri servizi-trasporti.

MARTEDI, 6TO GIORNO

POMERIGGIO—Conferenze con proiezioni sulla "Guardia Forestale Aerea" (Sono invitati i rappresentanti dei Dipartimenti forestali di ogni Stato.)

SERA—Polizia aerea (squadre) e le ragioni per le quali ogni cittá dovrebbe averne una.

MERCOLEDI, 7MO GIORNO

POMERIGGIO E SERA—Giornata "Posta Aerea". Conferenza con proiezioni—Considerazioni su la "posta aerea". Sono invitati a parlare: il Capo del Comitato ufficio Posta e servizio Stradale della Camera di Deputati e del Senato e il Direttore Generale della Posta, Sig. Burleson (26,000 impigati postali ed i rappresentanti delle Camere di Commercio di 13,000 cittá).

GIOVEDI, 8VO GIORNO

POMERIGGIO E SERA—Conferenza con proiezioni sulla necessitá di costruire aerodromi municipali e sull agrande influenza che gli aeroplani avranno nella costruzione e nello svliuppo delle nuove cittá. (Sono invitati i Commissari delle Camere di Commercio e degli uffici Planimetrici municipali di 13,000 cittá.)

VENERDI, 9O GIORNO

POMERIGGIO—Arrivo di Odroplani e di aeroplani dell'esercito da stazioni aeree dell'esercito e della marina. Seconda gara paracadute premio Bennett $500.00.

SERA—Conferenza con proiezioni sui recentissimi progressi della lotta aerea narrate da famosi "Assi."

SABATO, 10MO GIORNO

POMERIGGIO—Giornata in onore dell'esercito e della Marina—Gare Aeree e tornei.

SERA—Ricevimenti Sigg. Ufficiali dell'Esercito e della S. U. Trattenimento e discorsi nella sala dell'-Esposizione Aereonautica sullo Steel Pier.

DOMENICA, 11MO GIORNO

POMERIGGIO E SERA—Presentazione delle bandiere da parte di ciascun Stato degli S. U. alle squadre aeree che li rappresentano. Ciascun Stato presentera una bandiera a ciascuna squadra aerea, i membri della quale saranno possibilmente tutti nativi dello Stato che rappresentano. I rappresentanti delle succursali in ogni Stato dell'-Aereo Club e dell'Aerial League faranno tale rappresentazione. (Ciasun Stato e ciascuna cittá saranno invitati a mandare delegati e l'Esercito e la Marina a mandare rappresentanti.)

LUNEDI, 12MO GIORNO

POMERIGGIO—Conferenze illustrate sul valore della macchine deree come mezzi di "reclame" di giorno e di notto. (Sono invitati tutte le compagnie di pubblicita nazionali ed estere.)

SERA—Trasporto Aereo Pan-Americano su terra. Conferenze di membri delle Commissioni delle venti repubbliche America-latine.

MARTEDI, 13MA GIORNATA

POMERIGGIO E SERA—Trasporto Aereo Pan-Americano sopra acqua. Conferenze di membri delle Commissioni delle venti repubbliche Americo-Latine.

MERCOLEDI, E GIOVEDI, 14MO E 15MO GIORNO

POMERIGGIO E SERA—Le Vie Aeree ed il Trasporto Aereo in Europa, Canada, Africa, Australia ed Asia.

VENERDI, 16MO GIORNO

POMERIGGIO E SERA—Istrumenti di navigazione Aerea per voli sopra terra e sopra mare. (Sono invitati aviatori, naviganti, fabbricanti strumenti scientifici a periti aereonautici.)

SABATO, 17MO GIORNO

POMERIGGIO—Corse e gare aerenautiche. Conferenze con proiezioni sul l'Arte Fotografica Aerea.

SERA—Esposizione su vasta scala di Fotografie Aeree e di apparati fotografici. (Sono invitati tutti i fotografi, professionisti e dilettanti, e fabbricanti di apparati fotografici.)

DOMENICA, 18MO GIORNO

POMERIGGIO E SERA—Conferenze Illustrate con proiezioni sull'Esplorazione Aerea e sull'uso di velivoli per le misurazioni costiere e geodetiche.

LUNEDI, 19MO GIORNO

POMERIGGIO—Conferenze sul bisogno di un miglior trattamente da parte delle Compagnie d'Assicurazione nelle condizioni di assicurazione delle macchine e degli aviatori.

SERA—Conferenze con proiezioni sull'influenza che i sistemi del Corpo Medico dell'Esercito hanno sulla diminuzione delle disgrazie. (Sono invitati tuttigli agenti delle Compagnie di Assicurazione.)

MARTEDI, 20MO GIORNO

POMERIGGIO E SERA—Conferenze Illustrate indicanti i vari modi gi studiati per attraversare l'Atlantico nell'Aria—ostacoli da vincere, problemi da risolvere per poter compiere felicemente il viaggio.

MERCOLEDI, 21MO GIORNO

POMERRIGIO—Giornata dedicata alla sicurezza Aerea—Discussioni su provvedimenti presi per la sicurezza Aerea—Perfezionamenti nella costruzione degli aereoplani; Aumentata sicurezza di motori aerei; congegni atti a migliorare la stabilitá dei voli.

SERA—Progressi fatti nell'arte dei piloti aviatori. (Illustrazioni.)

GIOVEDI, 22MO GIORNO

POMERIGGIO E SERA—Conferenze e discorsi di meteorologia; come possono essere fatte piu esattamente le previsioni meterorologiche esplorando l'aria con velivoli negli strati superiori, e come queste previsioni meteorologiche possono essere utili alla nagivazione aerea—Fattori telegrafici e climatici in relazione all'Aereonautica.

VENERDI, 23MO GIORNO

POMERIGGIO E SERA—Conferenze sulla giurisprudenza aerea; leggi e regolamenti per il traffico Aereo. (Avvocati, Commissario di traffico, Autorita di Polizia dei differenti paesi invitati.)

SABATO, 24MO GIORNO

POMERIGGIO E SERA—Corse e gare—Conferenze illustrate sul bisogno di stabilire un livello di altezza per il traffico aereo internazionale, interstatale, e interurbano.

DOMENICA, 25MO GIORNO

POMERIGGIO E SERA—Giornata d'Arta Aeronautica. Conferenze sulla Pittura e sulla Scultura di ogni paese su soggetti d'Aereonautica. Esposizione di quadri di soggetto dei tenenti Farre, Ruttan, e di altri. (Sono invitati tutti i piú Valenti artisti, i direttori di Gallerie d'Arte e gli amatori d'Arte.)

SETTIMANA DEDICATA ALLA "MECCANICA"

LUNEDI, 26MO GIORNO

POMERIGGIO—Problemi di meccanica aeronautica e la loro probabile soluzione.

SERA—Apertura di un concorso—disegni ed idee per la costruzione di grandi aeroplani.

MARTEDI, 27MO GIORNO

POMERIGGIO—Fattori che possono aumentare l'efficienza di grandi dirigibili.

SERA—Vantaggi del legno compensato per la costruzione di velivoli.

MERCOLEDI, 28MO GIORNO

POMERIGGIO—Conferenze sui problemi che si affacciano per voli a 25,000 piedi a piu e la loro probabile soluzione.

SERA—Macchine aere d'oggi.

GIOVEDI, 29MO GIORNO

POMERIGGIO—Battelli volanti contro Idroplani per Sport e per trasporti commerciali.

SERA—Gare—Disegni ed idee per aeroplani di grandi dimensioni.

VENERDI, 30MO GIORNO (Giorno Commemorativo)

POMERIGGIO—Corse Dirigibili—Gare di velocita d'ascensione tra palloni frenati—Gara paracadute.

SERA—Grande ricevimento nella Aereonautic Hall, Steel Pier.

SABATO, 31MO GIORNO

POMERIGGIO—Gare tra idroplani, aereoplani dirigibili—Gara Aviette alla quale interveranno tutti i ciclisti ed i fabbricanti di biciclette e di motociclette.

SERA—Sistemi e regolamentari medici internazionali per aviatori in guerro ed in pace. Relazioni sui sistemi adottati nei differenti paesi, illustrate da interessanti proiezioni. (Sono invitati 50,000 Sanitari.

DOMENICA, 32MO GIORNO

POMERIGGIO E SERA—Distribuzione generale dei diplomi.

Il Governo d'Italia e le organizzazioni italiane di Aeronautica di Sport e di Scienze sono invitati a mandare rappresentanti ad assistere a questo grande evento aereonautico. Arrivando negli Stati Uniti i Signori Rappresentanti dovranno presentarsi al Quartiere Generale del Somitato al N. 297 Madison Ave., N. Y., per registrarsi e ricevere la targhetta ufficiale, nonché il programma.

Nel caso fosse per loro piú conveniente recarsi direttamente ad Atlantic City, potranno registrarsi colá presso gli uffici situati nei seguenti alberghi: Hotel Traymore, Hotel Chalfonte, The Breakers Hotel, Hotel St. Charles, Hotel Marlborough-Blenheim, Hotel Chelsea, Hotel Alamac, Hotel Dennis and Hotel Haddon Hall.

I Rappresentanti del Comitato di Convenzione si troveranno negli uffici della Convenzione Aereonautica nei sunnominati Alberghi e distribuiranno i distintivi ufficiali che daranno al portatore il diritto di essere ammesso all'Aereonautic Hall, all'Esposizione sullo Steel Pier, nel recinto occupato dai giudici durante la gara, all'Aerodromo, all stazione degli idroplani dove saranno esibiti i velivoli ed i motori.

Ogni comunicazione sino al primo Marzo dovrá essere indirizzata al Rear Admiral Peary, Chairman, Aeronautic Convention, Aero Club of America, N. 297 Madison Ave., New York.

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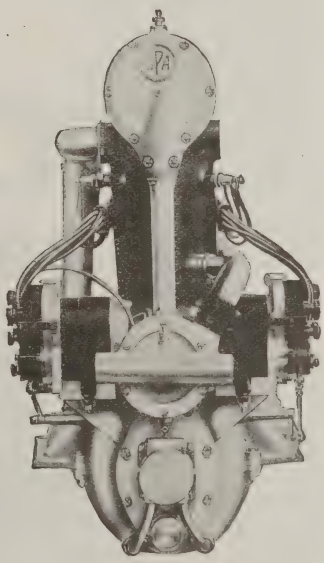


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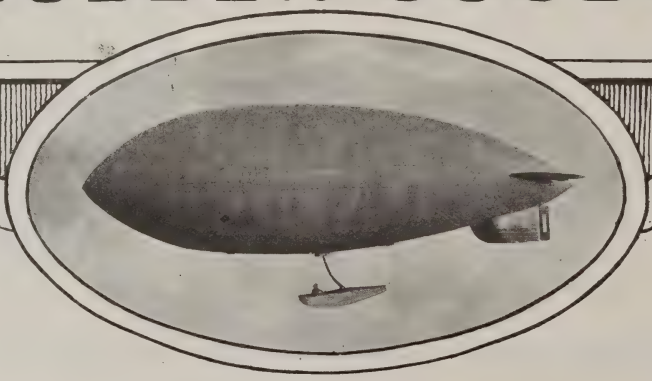
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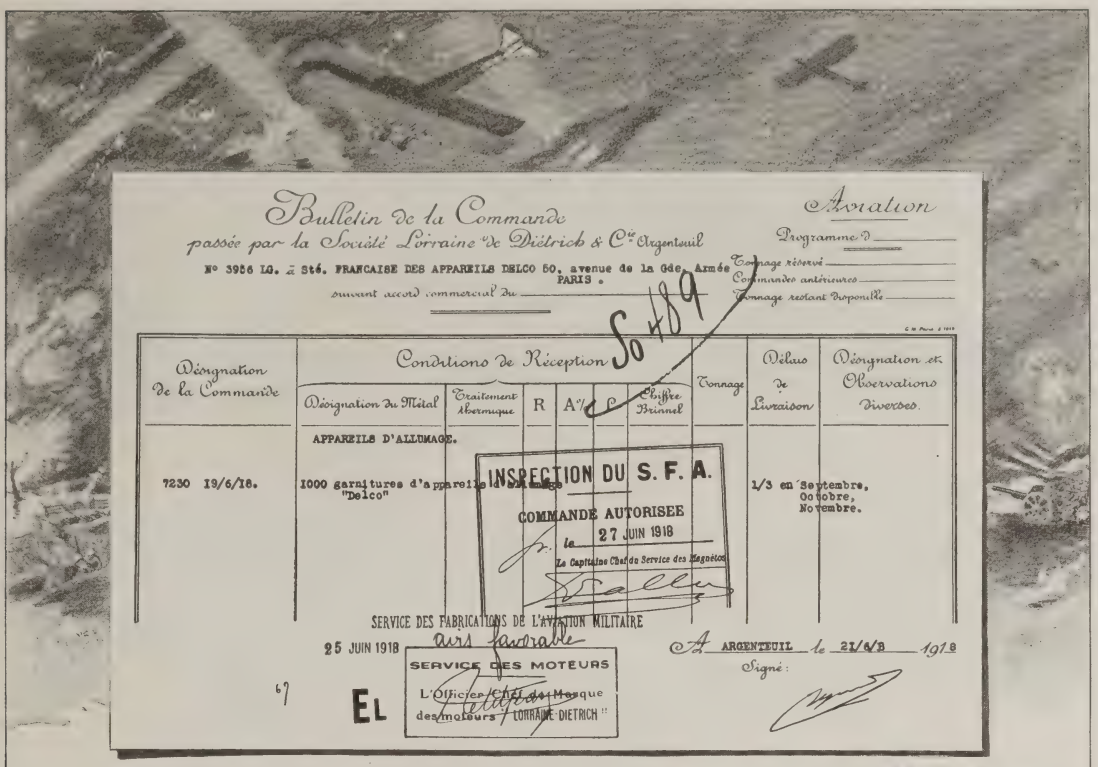
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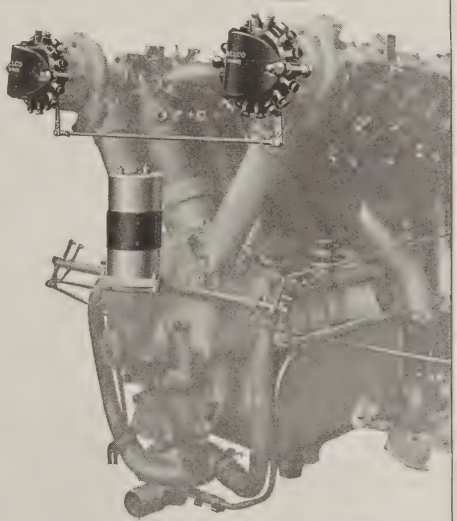
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Photograph of order issued by the Lorraine-Dietrich Company, countersigned by the French Government, Department of Motors and the Division of Magnetos requiring delivery of 1,000 Delco Ignition Systems to supplant standard magneto equipment on the latest French aeroplane motors.

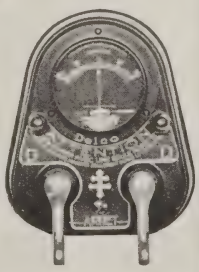


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Above: Delco installation on Lorraine-Dietrich motor.

Right: Delco switch used with this type of ignition.



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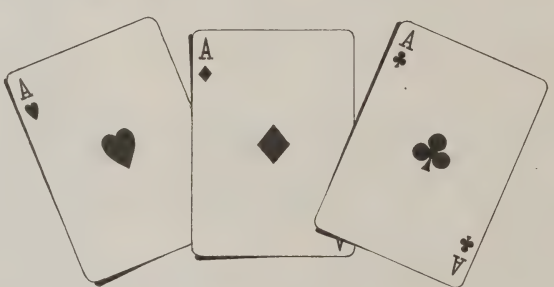
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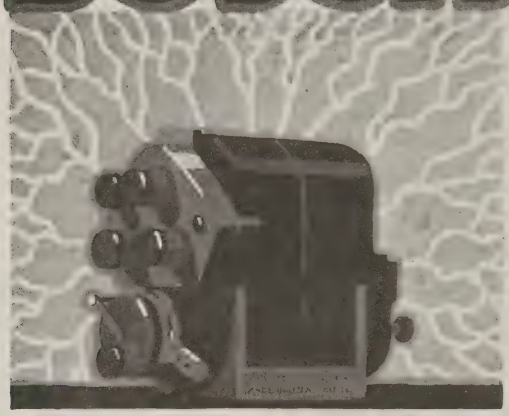
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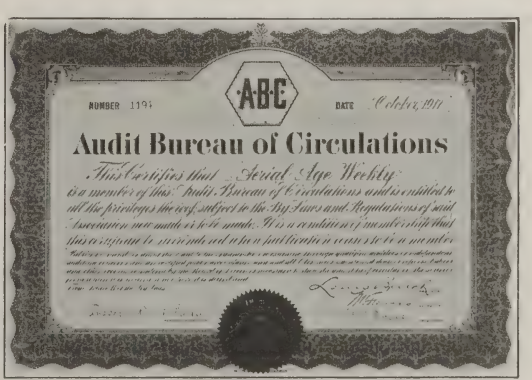
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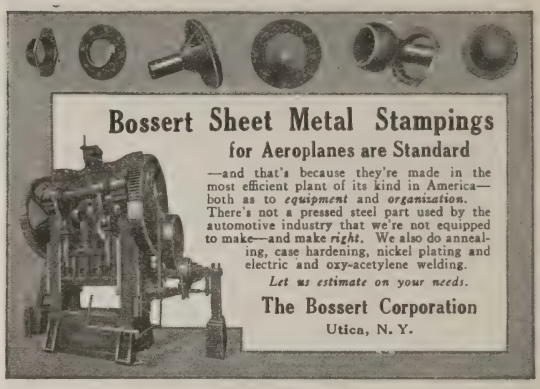
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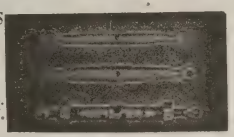
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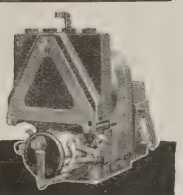
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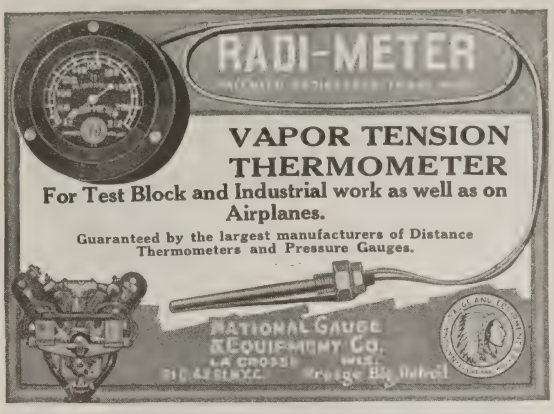


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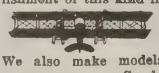
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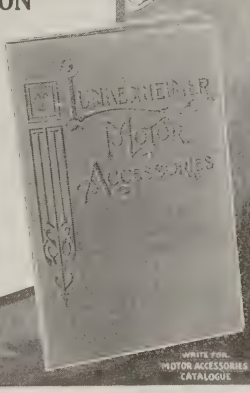
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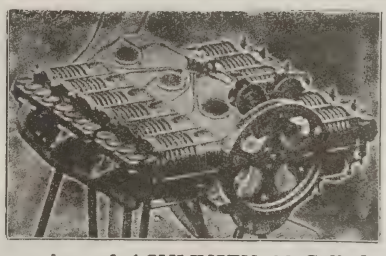
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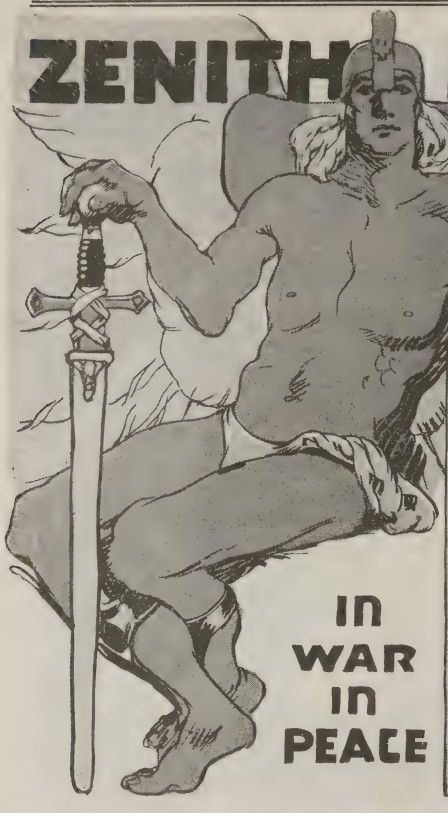
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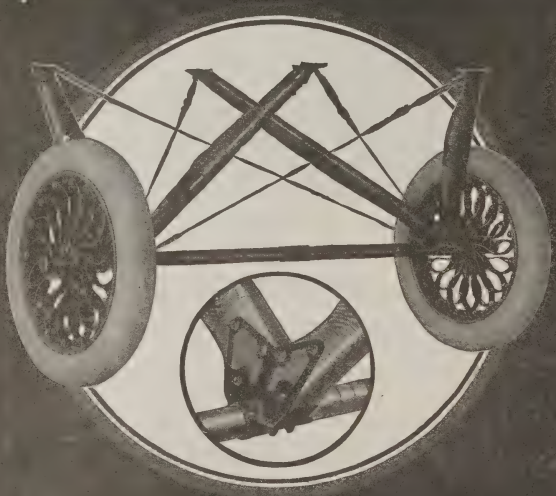
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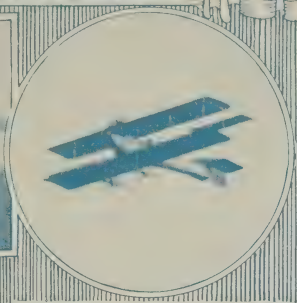
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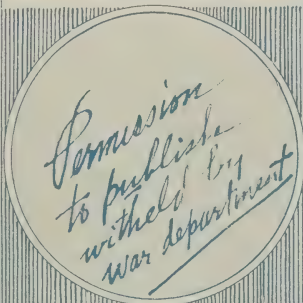
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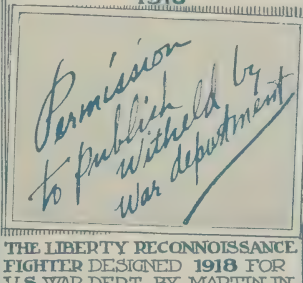
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